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HEREFORD·DOOLEY
ARCHITECTS

Project Manual for the

HCA Gulf Coast Hospital
Panama City **ER** Expansion

3711 US Highway 231
Panama City, Florida 32404
Bay County
HCA Project Number: 3093000034

VOLUME 1 – Civil, Structural, Architectural, and Interiors

Construction Documents
HD Project No.: 225004.00
Date: June 9th, 2025

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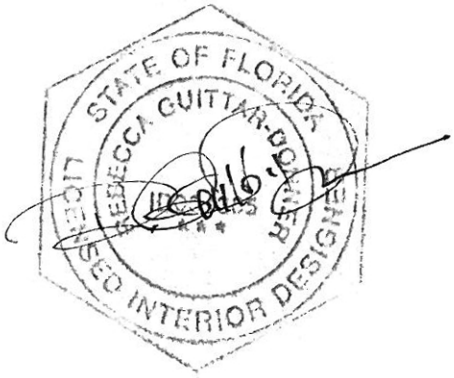
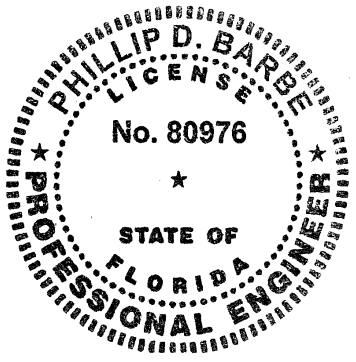
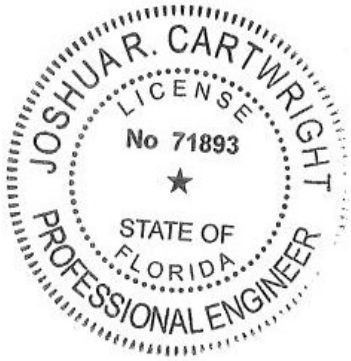
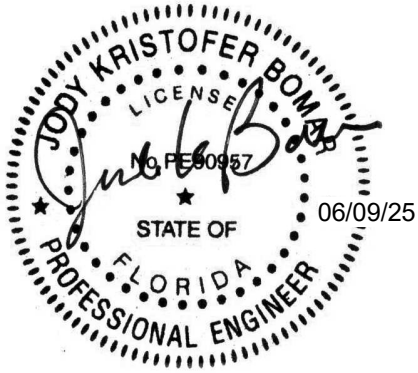
SECTION 00 01 07
SEALS PAGE









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333000 SANITARY SEWAGE SYSTEMS
334000 STORM DRAINAGE SYSTEMS

REFER TO VOL 2 SPECS FOR ADDITIONAL SECTIONS

SECTION 000115
LIST OF DRAWING SHEETS

DRAWING LIST

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GENERAL			
G000	COVER SHEET	•	•
G001	SHEET INDEX & GENERAL NOTES	•	•
G002	PARTITION TYPES	•	•
G003	TYPICAL PARTITION DETAILS	•	•
G004	ADA INFORMATION	•	•
G100	LIFE SAFETY CODE DATA	•	•
G101	LIFE SAFETY PLAN	•	•
G200	UL DETAILS	•	•
G201	UL DETAILS	•	•
G202	UL DETAILS	•	•
G203	UL DETAILS	•	•
G204	UL DETAILS	•	•
CIVIL			
C0.0	COVER SHEET	•	•
C1.0	EXISTING CONDITIONS	•	•
C1.1	EXISTING CONDITIONS	•	•
C2.0	NOTES	•	•
C3.0	EROSION CONTROL PLAN	•	•
C3.1	EROSION CONTROL DETAILS	•	•
C4.0	DEMOLITION PLAN	•	•
C5.0	SITE LAYOUT PLAN	•	•
C6.0	GRADING & DRAINAGE PLAN	•	•
C7.0	UTILITY PLAN	•	•
C8.0	DETAILS	•	•
C8.1	DETAILS	•	•
C9.0	COUNTY DETAILS	•	•
STRUCTURAL			
S001	STRUCTURAL NOTES		•
S002	STRUCTURAL NOTES (cont.)		•
S003	STRUCTURAL NOTES (cont.)		•
S004	STRUCTURAL QUALITY ASSURANCE PLAN		•
S005	STRUCTURAL QUALITY ASSURANCE PLAN (cont.)		•
S006	WIND PRESSURE DIAGRAMS		•
S100	FOUNDATION PLAN	•	•
S110	ROOF FRAMING PLAN	•	•
S111	SCREEN WALL FRAMING PLAN		•
S200	FOUNDATION SECTIONS AND DETAILS	•	•
S201	FOUNDATION SECTIONS AND DETAILS		•
S202	FOUNDATION SECTIONS AND DETAILS	•	•
S203	MASONRY SECTIONS AND DETAILS	•	•
S204	MASONRY SECTIONS AND DETAILS	•	•
S300	FRAMING SECTIONS AND DETAILS	•	•
S301	FRAMING SECTIONS AND DETAILS		•
S302	FRAMING SECTIONS AND DETAILS		•
S303	FRAMING SECTIONS AND DETAILS		•
S310	OWNER FURNISHED EQUIPMENT	•	•
ARCHITECTURAL DEMO			
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AD110	FLOOR PLAN - DEMOLITION	•	•
ARCHITECTURAL			
A100	SITE ORIENTATION PLAN	•	•
A110	FLOOR PLAN - NOTED	•	•
A120	FLOOR PLAN - DIMENSION	•	•
A130	FLOOR PLAN - EQUIPMENT	•	•
A140	FLOOR PLAN - ACCESS CONTROL		•
A150	REFLECTED CEILING PLAN	•	•
A160	ROOF PLAN	•	•
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A300	BUILDING SECTIONS	•	•
A301	WALL SECTIONS	•	•
A302	WALL SECTIONS	•	•
A401	ENLARGED PLANS & ELEVATIONS - TYP. EXAM	•	•
A402	ENLARGED PLANS & ELEVATIONS - TOILET	•	•
A403	ENLARGED PLANS & ELEVATIONS - NURSE STATION	•	•
A500	EXTERIOR DETAILS	•	•
A501	EXTERIOR DETAILS	•	•
A502	EXTERIOR DETAILS		•
A503	ROOF DETAILS	•	•
A505	INTERIOR DETAILS	•	•
A600	DOOR & WINDOW SCHEDULES	•	•
A601	DOOR & WINDOW DETAILS	•	•

DRAWING LIST

		DD 04/01/25	CD 06/09/25
A700	INTERIOR ELEVATIONS	•	•
A701	INTERIOR ELEVATIONS	•	•
A710	CASEWORK DETAILS	•	•
A711	CASEWORK DETAILS	•	•
INTERIORS			
F0.1	FINISH SELECTIONS & GENERAL NOTES	•	•
F0.2	FINISH SELECTIONS & GENERAL NOTES, ROOM SCHEDULE	•	•
F1.1	FINISH PLAN	•	•
F1.2	WALL PROTECTION PLAN	•	•
F1.3	FLOOR PATTERN PLAN	•	•
F1.4	FURNITURE PLAN	•	•
F1.5	SIGNAGE PLAN	•	•
F1.6	SIGNAGE DESIGN KEY	•	•
F1.7	SIGNAGE DESIGN KEY	•	•
F1.8	SIGNAGE DESIGN KEY	•	•
FIRE PROTECTION			
FP001	FIRE PROTECTION - SCHEDULES & DETAILS	•	•
FP002	FIRE PROTECTION - DETAILS	•	•
FP101	FIRE PROTECTION - FLOOR PLAN - LEVEL 1	•	•
FP102	FIRE PROTECTION - SITE PLAN	•	•
PLUMBING			
P001	PLUMBING - SCHEDULES & NOTES	•	•
P002	PLUMBING - FIRESTOPPING DETAILS	•	•
P003	PLUMBING - MED GAS DETAILS	•	•
P004	PLUMBING - DETAILS	•	•
P005	PLUMBING - DETAILS	•	•
P101	UNDERGROUND - FLOOR PLAN	•	•
P201	PLUMBING - FLOOR PLAN - LEVEL 1	•	•
P301	SANITARY - FLOOR PLAN - LEVEL 1	•	•
P302	SANITARY - ROOF PLAN	•	•
P401	MED GAS - FLOOR PLAN - LEVEL 1	•	•
P501	RISER DIAGRAMS	•	•
MECHANICAL			
M001	HVAC - SCHEDULES	•	•
M002	HVAC - SCHEDULES	•	•
M003	HVAC - SCHEDULES	•	•
M101	HVAC - FLOOR PLAN	•	•
M102	HVAC - ROOF PLAN	•	•
M201	PIPING - FLOOR PLAN	•	•
M401	HVAC - DETAILS	•	•
M402	HVAC - DETAILS	•	•
M403	HVAC - DETAILS	•	•
M404	HVAC - DETAILS	•	•
M405	HVAC - DETAILS	•	•
M501	HVAC - CONTROLS	•	•
M502	HVAC - CONTROLS	•	•
M503	HVAC - CONTROLS	•	•
ELECTRICAL			
E000	ELECTRICAL - LEGEND	•	•
E101	LIGHTING - FLOOR PLAN	•	•
E201	POWER - FLOOR PLAN	•	•
E301	FIRE ALARM - FLOOR PLAN	•	•
E401	ELEC-HVAC - FLOOR PLAN	•	•
E402	ELEC-HVAC - ROOF PLAN	•	•
E501	ELECTRICAL - RISER DIAGRAM	•	•
E502	ELECTRICAL - ONE LINE DIAGRAM	•	•
E503	ELECTRICAL - PANEL SCHEDULES	•	•
E504	ELECTRICAL - PANEL SCHEDULES	•	•
E505	ELECTRICAL - BREAKER CURVES	•	•
E506	ELECTRICAL - NORMAL CONDITION	•	•
E507	ELECTRICAL - EMERGENCY CONDITION	•	•
E601	ELECTRICAL - LIGHTNING PROTECTION DETAILS	•	•
E602	ELECTRICAL - LIGHTNING PROTECTION DETAILS	•	•
E603	ELECTRICAL - LIGHTNING PROTECTION DETAILS	•	•
E604	ELECTRICAL - LIGHTNING PROTECTION DETAILS	•	•
E701	ELECTRICAL - DETAILS	•	•
E702	ELECTRICAL - DETAILS	•	•
E703	ELECTRICAL - DETAILS	•	•
ES01	ELECTRICAL - SITE PLAN	•	•
ESL	ELECTRICAL - PHOTOMETRICS PLAN	•	•
TECHNOLOGY			
T000	TELECOMMUNICATIONS - LEGEND	•	•
T101	TELECOMMUNICATIONS - FIRST FLOOR PLAN - LEVEL 1	•	•
T201	COMMUNICATIONS - FIRST FLOOR PLAN - LEVEL 1	•	•
T301	NURSE CALL - FLOOR PLAN - LEVEL 1	•	•
T401	TELECOMMUNICATIONS - DETAILS	•	•

SECTION 000130
NOA & FLORIDA PRODUCT APPROVALS

FPA / NOA LISTINGS

EIFS	FL P/A 20110.1
ALUMINUM FIXED WINDOW	FL P/A 14218.1
GLAZING INTERLAYER	NOA # 23-0717.30*
TPO ROOFING	NOA # 24-0502.06
METAL COPING	NOA # 22-0411.03
ROOF MECHANICAL SCREEN	NOA # 23-1117.02
SINGLE FLUSH HM DOORS	NOA # 23-0821.18

* CERTIFICATION NOT REQUIRED FOR THIS PRODUCT MANUFACTURER BY FPA

SECTION 002150
PREFERRED VENDORS AND MANUFACTURERS

PART 1 - GENERAL

1.01 GENERAL

A. The following list identifies manufacturers and vendors preferred by the Owner, for involvement in their many construction projects. This list may or may not preclude involvement by other companies.

B. HCA has a relationship with HealthTrust Purchasing Group (HPG) and wishes to receive quotes from their contracted vendors. The list includes the latest available information regarding HPG contracts. These contracts should be utilized regarding HPG specific pricing and contract terms. Projects that contain products in specification sections where an HPG contracted vendor is available, the HPG contract vendor must be contacted to provide a quote for the Project. Not all manufacturers and vendors preferred by HCA participate with HPG and their purchasing agreements.

C. Not all manufacturers or distributors identified provide materials intended or expected to be used on this Project and interested individuals must refer to individual technical specification sections of this Project Manual for those elements appropriate to this Project.

D. Manufacturers identified in this list but not specifically identified in the technical specifications, if willing and capable to provide materials meeting the stated criteria, may be presented by the Contractor for considerations as alternates.

1.02 LIST

A. The HCA Preferred Vendor List may be obtained using the following internet web address: https://app.e-builder.net/public/publicLanding.aspx?QS=2f5d0a05cbaa45d5b63e386dde7a531e

B. The HPG suppliers and manufacturers with negotiated purchasing agreement numbers are identified in the list.

1.03 DEFINITIONS

A. Sole Source (no substitutions) – This is the only product/manufacturer that can be used. This precludes involvement by other companies to bid and receive awards.

B. Multi-source (no substitutions) – There are multiple products/manufacturers that can be used, which are all identified on the list. This precludes involvement by other companies to bid and receive awards.

C. Preferred vendor – The manufacturer shall be allowed to a bid price for the Project. This does not preclude involvement by other companies to bid and receive awards.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 002151
HCA PREFERRED VENDOR LIST

PART 1 GENERAL

1.01 SECTION INCLUDES

A. REFER TO NEXT PAGE FOR INSERT(S).

Preferred Vendors

Last Update: October 2024

Designation	Description
Sole-source (no substitutions)	This is the **only product** / **manufacturer** that can be used. This precludes involvement by other companies to bid and receive awards.
Multi-source (no substitutions)	There are multiple products / manufacturers that can be used, which are all identified on the list. This precludes involvement by other companies to bid and receive awards.
Preferred Vendor	While not a negotiated contract, the manufacturer has preferred status and shall be allowed to provide a bid price for the job. This does not preclude involvement by other companies to bid and receive awards.
NA	Not applicable to work / scope preformed internally

Contract Category	Supplier	HPG Contract Number	Contact Information	HCA Designation
Division 03 - Concrete				
Gypsum Concrete Underlayment	Ardex			Multi-source
	Mapei			Multi-source
Division 06 - Wood, Plastics and Composites				
Sheathing	USG			Preferred
	Georgia Pacific			Preferred
Division 07 - Thermal and Moisture Protection				
Exterior Insulation and Finish System (EIFS)	Dryvit			Multi-source
	Sto		Mike Gracey (Primary) mgracey@stocorp.com Phone: 404-973-9249 Tim Salerno (StoPanel Division) tsalerno@stocorp.com Phone: 407-466-5371	Multi-source
Slab-On-Grade Vapor Retarder	Ardex			Multi-source
	Concure			Multi-source
	Koester			Multi-source
	Stauf			Multi-source
	WR Grace			Multi-source
	Tremco - Weatherproofing Technologies Inc	5768	Rick Mosholder rmosholder@wtiservices.com Phone: 216-280-9201	Multi-source
EPDM	Carlisle - Syntec			Multi-source
	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi-source
	Firestone			Multi-source
	J. Reynolds & Company		Matt Skipper mskipper@jreynolds.com Phone: 817-306-9596	Multi-source
	Tremco - Weatherproofing Technologies Inc	5768	Rick Mosholder rmosholder@wtiservices.com Phone: 216-280-9201	Multi-source
Thermoplastic Polyolefin (TPO) Roofing	Carlisle - Syntec			Multi-source
	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi-source
	FiberTite			Multi-source
	Firestone			Multi-source
	Genflex			Multi-source
	J. Reynolds & Company		Matt Skipper mskipper@jreynolds.com Phone 817-306-9596	Multi-source
	Sarnafil		Bill Love love.bill@us.sika.com Phone: 586-201-0431	Multi-source
	Tremco - Weatherproofing Technologies Inc	5768	Rick Mosholder rmosholder@wtiservices.com Phone: 216-280-9201	Multi-source

Modified Bitumen	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi-source
	Firestone			Multi-source
	J. Reynolds & Company		Matt Skipper mskipper@jreynolds.com Phone: 817-306-9596	Multi-source
	Johns Manville		Eric Smith smithe@jm.com 916-230-1536	Multi-source
	Siplast			Multi-source
	Soprema			Multi-source
	Tremco - Weatherproofing Technologies Inc	5768	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi-source
Sheet Metal Roofing	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi-source
	J. Reynolds & Company		Matt Skipper mskipper@jreynolds.com Phone 817-306-9596	Multi-source
	Tremco - Weatherproofing Technologies Inc	5768	Rick Mosholder rmosholder@wtiservices.com Phone: 216-280-9201	Multi-source
Thermal Insulation	Owens Corning			Preferred
Applied Fireproofing	WR Grace			Multi-source
	CAFO			Multi-source
	Isolatek			Multi-source
Penetrating Firestopping	WR Grace			Multi-source
	3M			Multi-source
	STI			Multi-source
	Hilti			Multi-source
	Multiple Manufacturers	148	Mike Harrod mike.harrod@grainger.com Phone: 502-655-0258	Multi-source
Joint Sealants	Sherwin Williams	5893	Andy Flippin andrew.flippin@sherwin.com Phone: 404-304-3834	Multi-source
	Koroseal			Multi-source
	Tremco - Weatherproofing Technologies Inc	5768	Rick Mosholder rmosholder@wtiservices.com Phone: 216-280-9201	Multi-source
Division 08 - Doors and Windows				
Wood Doors	VT		Doug Bachand dbachand@vtindustries.com Phone: 919-452-3716	Preferred
Metal Doors and frames	Steelcraft	7702	Gene Jones gene.jones@allegion.com Phone: 615-631-8650	Sole-source
	Republic			
Mechanical lock	Schlage	7702	Gene Jones gene.jones@allegion.com Phone: 615-631-8650	Sole-source
	Falcon			
Door closers	LCN	7702	Gene Jones gene.jones@allegion.com Phone: 615-631-8650	Sole-source
	Falcon			Sole-source
	Von Duprin		Gene Jones	

Exit Devices	Falcon	7702	gene.jones@allegion.com Phone: 615-631-8650	Sole-source
Accessories	IVES	7702	Gene Jones gene.jones@allegion.com Phone: 615-631-8650	Sole-source
	Glenn			
	Falcon			
Sliding Glass ICU/CCU Doors Automatic Door Operators	Besam			Multi-source
	Stanley	7702	Gene Jones gene.jones@allegion.com Phone: 615-631-8652	Multi-source
Division 09 - Finishes				
Gypsum Board Assemblies	USG			Preferred
	Georgia Pacific			Preferred
Resilient Flooring	Mannington	5468	Terri Bailey terri_bailey@mannington.com Phone: 615-427-8980	Sole-source
Carpeting	Shaw	500169	Deborah Smith deborah.k.smith@shawinc.com Phone: 704-249-6758	Multi-source
	Mannington	5468	Terri Bailey terri_bailey@mannington.com Phone: 615-427-8980	Multi-source
Tile	Crossville Ceramics			Multi-source
	Daltile Corporation			Multi-source
	Louisville Tile (Crossville Ceramics)			Multi-source
	Royal Mosa			Multi-source
	Stonepeak Ceramics, Inc.			Multi-source
Base	Mannington	5468	Terri Bailey terri_bailey@mannington.com Phone: 615-427-8980	Sole-source
Paint and Coatings	Sherwin Williams	5893	Andy Flippin andrew.flippin@sherwin.com Phone: 404-304-3834	Sole-source
Wallcovering	Eykon			Multi-source
	DesignTex Inc. (includes J.M. Lynne and Essex)		Available through contract furniture dealers	Multi-source
	Koroseal Interior Products			Multi-source
	MDC Wallcoverings		Available through contract furniture dealers	Multi-source
	National Wallcovering		Available through contract furniture dealers	Multi-source
	Maharam		Available through contract furniture dealers	Multi-source
	Sherwin Williams	5893	Andy Flippin andrew.flippin@sherwin.com Phone: 404-304-3834	Multi-source
Wall Protection	InPro Corporation	44661	Teri Jablonski tjablonski@inprocorp.com Phone: 262-682-5319	Sole-source
Solid Surface	Avonite			Multi-source
	Corian			Multi-source
	Formica			Multi-source
	Wilsonart International, Inc.			Multi-source
	InPro Corporation	44661	Teri Jablonski tjablonski@inprocorp.com Phone: 262-682-5319	Multi-source
Acoustic Ceilings	Armstrong World Industries	6924	Hedda Metzler hmmetzler@armstrongceilings.comPhone: 717-209-2793	Sole-source

Plastic Laminate	Formica			Multi-source
	Panola Industries - Nevamar			Multi-source
	Panola Industries – Pionite			Multi-source
	Wilsonart International, Inc.			Multi-source
Division 10 - Specialties				
Marker Boards	Claridge		Matt Green matt@chameleonwhiteboard.com Phone: 615-656-3280 ext. 1	Multi-source
	Staples Advantage	2532	Rod Howard rob.howard@staples.com Phone: 678-592-8967	Multi-source
	Peter Pepper		Available through contract furniture dealers	Multi-source
Solid Surface Shower System	InPro Corporation	44661	Teri Jablonski tjablonski@inprocorp.com Phone: 262-682-5319	Sole-source
Lockers	Quantum Medical	5522	Elizabeth Faller elizabethf@quantumstorage.com Phone: 305-479-4711	Multi-source
	Storage Systems	500166	Bill Kreager bkreager@storagesystemsul.com Phone: 615-468-1234	Multi-source
Division 11 - Equipment				
Food Service Equipment	Inman Foodservices Group	7227	Billy Inman billy.inman@inman-inc.com Phone: 615-321-5591	Multi-source
Division 12 - Furnishings				
Ice Machines	Follett Corporation	5000041	Sue Magasich smagasich@follettice.com Phone: 610-252-7301	Multi-source
Audio-Visual Equipment (TVs, Accessories)	Grainger	4077	Mike Harrod mike.harrod@grainger.com Phone: 502-655-0258	Multi-source
	Remar	3248	Darrell Leftwich dleftwich@remartg.com Phone: 615-784-0052	Multi-source
	Avidex Industries	500045	Michael Stammire mlstammire@avidexav.com Phone: 949-981-6989	Multi-source
Division 13 - Special Construction				
Division 14 - Conveying Systems				
Elevators	Schindler	7257	Edward Lawler edward.lawler@schindler.com Phone: 973-223-1956	Multi-source
	Otis	4229	Sabrina Kramer sabrina.kramer@otis.com Phone: 443-597-3894	Multi-source
	Kone	6008	Julie Loosbrock julie.loosbrock@kone.com Phone: 917-567-3602	Multi-source
Pneumatic Tube System	Pevco			Multi-source
	Swisslog			Multi-source
Division 21 - Fire Suppression & Detection				
Division 22 - Plumbing				
Domestic Water Piping and Valves	Mueller - Ferguson	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Borzan			
	Dura-Line			
	Uponor			
	Nibco			
	Milwaukee			
	B-Line			
	FNW			
	Conbraco			
	Anvil			
	Ipsco			

	Victaulic - Ferguson			
Domestic Water Backflow Preventers, Trap Primers, and Shock Absorbers	Zurn/Wilkins	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Proflo			
	PPP			
	Sioux Chief			
	Watts			
Domestic Water Pumps	Ferguson - Taco	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Grundfos			
	Bell & Gossett			
	SyncroFlo			
	Canariis			
	Systecon			
Domestic Waste Piping and Drains	Charlotte	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Tyler Pipe			
	ABI			
	Ideal			
	Proflo			
	Zurn			
Mechanical Piping	Ipsco	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Borzan			
	Nupi-Niron			
	Weldbend			
	Milwaukee			
	Nordstrom			
	B-Line			
	FNW			
	Nibco			
	Anvil			
General Service Compressed Air Piping and Valves	Beacon Medeas			Multi-source
	Allied Health Products			Multi-source
	Amico	5943	Hayden Neuman hneuman@amico.com 905-764-0800	Multi-source
	Powrex			Multi-source
Commercial Domestic Water Softeners	Culligan			Multi-source
	Chem-Aqua	7104	Dale Jones dale.jones@nch.com Phone: 561 693-8982	Multi-source
	Bruner			Multi-source
	Hydromax			Multi-source
	Stay-rite			Multi-source
	Marlo			Multi-source
	Garratt-Callahan Company	3968	John Reseland jreseland@g-c.com Phone: 412-721-5292	Multi-source
	Nalco	3923	Michael Schunk michael.schunk@ecolab.com Phone: 201-919-5831	Multi-source
Commercial Storage Electric Domestic Water Heaters	Ruud	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	State			
	Lochinvar			
	AO Smith			
	PVI			
Commercial, Atmospheric, Gas Domestic Water Heaters	Teledyne Laars			Multi-source
	Aerco			Multi-source
	Intellihot			
	Hesco			Multi-source
	Bradford White			Multi-source
	Patterson Kelly			Multi-source
	Lochinvar	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Multi-source
	PVI			
	AO Smith			
Commercial, Power-Vent, Gas Domestic Water Heaters	Aerco			Multi-source
	Hesco			Multi-source

Water Heaters	Patterson Kelly			Multi-source
	Armstrong			Multi-source
Plumbing Fixtures and Drinking Fountains	Symmons	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Zurn			
	Elkay			
Medical Gas Piping System	Elkhart	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Mueller			
	Nibco			
Deionized Water Piping	Enfield	5999	Bettina Dawson bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Orion			
Division 23 - Heating, Ventilation and Air Conditioning (HVAC)				
Electric Motors	MagneTek			Multi-source
	Lincoln			Multi-source
	Marathon			Multi-source
	Gould			Multi-source
	Toshiba			Multi-source
	Baldor			Multi-source
	Reliance			Multi-source
	US Motors			Multi-source
	General Electric			Multi-source
Vibration Isolation	Mason Industries			Multi-source
	kinetics Noise Control			Multi-source
	Vibration Eliminator			Multi-source
	Korfund			Multi-source
	Amber Booth			Multi-source
Building Automation System	Johnson Controls	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Multi-source
	Siemens	3574	Ed Tambornino ed.tambornino@siemens.com Phone: 615-329-2601	Multi-source
	Distech Apex/Eclipse	6379	Renee Jacobs rjacobs@distech-controls.com 913-329-5857	Multi-source
	Schneider Electric via Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226 Stephen Brennan stephen.brennan@se.com	Multi-source
Fuel Oil Storage and Handling System	Xerexes			Multi-source
	Owens Corning			Multi-source
	Convault			Multi-source
	Ecovault			Multi-source
	Park Equipment Super Vault			Multi-source
Fuel Oil Leak Detection and Alarm System	Enterprise Brass			Multi-source
	Veeder-Root			Multi-source
	Pollulert			Multi-source
	PetroVend			Multi-source
HVAC Pumps	Peerless	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Armstrong			
	Ferguson - Bell & Gossett			
	Aurora			
	Paco			
	Tigerflow			
	Patterson			
	Taco			
	Grundfos			
	Weinman			
	Ipsco		Bettina Dawson	
	Borzan			
	Nupri - Niron			
	B-Line			
	FNW			

Steam and Condensate Heating Piping	Milwaukee	5999	Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole-source
	Weiss			
	Sarco			
	Weldbend			
	Nibco			
	Anvil			
Sound Alternators	McGill			Multi-source
	Rink			Multi-source
	IAC			Multi-source
	Vibro-Acoustics			Multi-source
Variable Air Volume (VAV) units	Johnson Controls	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Multi-source
	Daikin Applied	3574	Ward Martindale edward.martindale@daikinapplied.com Phone: 615-278-8697	Multi-source
Air Filters	CamFil		David Blackwell dave.blackwell@camfil.com Phone: 806-773-8408	Multi-source
	Palmico Air	6686	Rachel Robinson rachelr@palmico-air.com Phone: 860-418-7354	Multi-source
	Clarcor		Chuck Lehman clehman@clcair.com Phone: 502-810-5764	Multi-source
Prefabricated Gas Vent System	American Metal Products			Multi-source
	Metal-fab			Multi-source
	Selkirk			Multi-source
	Metalbestos			Multi-source
Fire Tube Boilers	Chicago Heater			Multi-source
	Cleaver Brooks			Multi-source
	Superior Boiler			Multi-source
	Industrial Combustion			Multi-source
	Crane Cochrane			Multi-source
	Victory			Multi-source
	Aerco			Multi-source
	Hurst			Multi-source
Deaerator	Cleaver Brooks			Multi-source
	Chicago Heater			Multi-source
	Crane Cochrane			Multi-source
	Industrial Steam			Multi-source
Air-Cooled Condensing Units	Carrier	6741	Justin Leslie justin.leslie@carrier.com Phone: 352-318-5139	Multi-source
	Trane	3572	Christy Fetsch christy.fetsch@trane.com Phone: 502-830-2484	Multi-source
	Daiken - McQuay	3574	Ward Martindale edward.martindale@daikinapplied.com Phone: 615-278-8697	Multi-source
	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Multi-source
Centrifugal Water Chiller	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Sole-source
Packaged Air Cooled Chiller	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Sole-source
Packaged Air Cooled Chiller for MRI	Filtrine			Multi-source
	KKT			Multi-source
	Kraus			Multi-source
	Neslab			Multi-source
Cooling Tower	Baltimore Air Coil			Multi-source
	Evapco			Multi-source
	Marley			Multi-source

Air-Handling Unit - Medium Or Low Pressure	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Sole-source
Rooftop Air Handling Unit	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Sole-source
Packaged Rooftop Unit	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Sole-source
Computer Room Air-Conditioning Unit	Liebert			Multi-source
	Airedale			Multi-source
	HiRoss			Multi-source
	Compu-Aire			Multi-source
	Schneider Electric via Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226 Stephen Brennan stephen.brennan@se.com	Multi-source
	Stultz			Multi-source
Split System A/C Units	Carrier	6741	Justin Leslie justin.leslie@carrier.com Phone: 352-318-5139	Multi-source
	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Multi-source
	Daiken - McQuay	3574	Ward Martindale edward.martindale@daikinapplied.com Phone: 615-278-8697	Multi-source
	Trane	3572	Craig Elliott craig.elliott@trane.com Phone: 334-201-7555	Multi-source
Duct Heaters	Carrier	6741	Justin Leslie justin.leslie@carrier.com Phone: 352-318-5139	Multi-source
	Daiken - McQuay	3574	Ward Martindale edward.martindale@daikinapplied.com Phone: 615-278-8697	Multi-source
	Trane	3572	Craig Elliott craig.elliott@trane.com Phone: 334-201-7555	Multi-source
	Johnson Controls - York	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Multi-source
Humidifiers	Armstrong			Multi-source
	Hermidifier			Multi-source
	Dristream			Multi-source
	Pure Stream			Multi-source
	Nortec			Multi-source
Division 26 - Electrical				
Pad-Mounted Transformers	Schneider via Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226	Sole-source
Generator Synchronizing Switchgear	ASCO via Graybar	7228	Ron Caprio 770-757-8747 ron.caprio@ascopower.com	Sole-source
Circuit Breaker Distribution Switchboards	Schneider via Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226	Sole-source
Safety Switches	Schneider via Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226	Sole-source
Emergency Standby Engine Generator	Cummins	6344	Christopher Banet christopher.m.banet@cummins.com Phone: 615-478-2057	Multi-source
	Thompson Machinery - CAT	46261	Jack McCown jack.mccown@tmcat.com Phone: 615-259-5832	Multi-source

System	Nixon Power - Kohler	66551	Keith Kraemer kkraemer@nixonpower.com Phone: 615-664-1487	Multi-source
	Generac	3489	Mike Evans HCA@essellc.com Phone: 865-806-9435	Multi-source
Surge Protective Devices	Schneider via Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226	Sole-source
Lighting	Acuity via Graybar	43268	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226	Sole-source
Fire & Life Safety Systems	Johnson Controls	3273	Christopher Vissman christopher.vissman@jci.com Phone: 615-516-1938	Multi-source
	Daikin - Siemens	3574	Ward Martindale edward.martindale@daikinapplied.com Phone: 615-278-8697	Multi-source
	Edwards			Multi-source
Structured Voice and Data Cabling Infrastructure	Accu-Tech	6715	Tim Flannagan tim.flannagan@accu-tech.com Phone: 615-430-0813	Multi-source
	Graybar	6379	Charlie Shannon charlie.shannon@graybar.com Phone: 615-743-3226	Multi-source
Division 28 - Electronic Safety and Security				
Security System	ADT	101614	Rick Gillespie richardgillespie@everonsolutions.com Phone: 215-292-7551	Multi-source
	Stanley			Multi-source
Access Controls	Lenel Systems International, Inc.		Rick Keebler richard.keebler@lenel.com Phone: 513-260-1140	Multi-source
	Software House / Tyco International		Keg Giles kgiles@tycoint.com Phone: 770-595-4719	Multi-source
	aptiQ	7702	Gene Jones gene.jones@allegion.com Phone: 615-631-8650	Multi-source

SECTION 002152
OFE BROCHURE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. REFER TO ATTACHED DOCUMENT ON FOLLOWING PAGES.

OWNER FURNISHED EQUIPMENT BROCHURE

June 24, 2025

HCA Florida Gulf Coast Hospital

00034 – Panama City FSED Expansion

Panama City, FL 32405

PROJECT # 3093000034

BRAD COLLINS
MEDICAL EQUIPMENT MANAGER
(615) 344-8096
BRAD.COLLINS@HCAHealthcare.com

MONICA SONAFELT
MEDICAL EQUIPMENT COORDINATOR
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HCA

Table of Contents

- **Owner Furnished Equipment Index**
- **Contact Project Equipment Manager for Equipment Delivery Schedule**
- **Design Responsibility Matrix**
- **Fixed Equipment / Responsibility Matrix**

Owner Furnished/Contractor Installed Equipment Notes

NOTE: Include date for special backboxes (such as OR Lights, Illuminators) although no item number is assigned to this rough-in item.

NOTE: If the project is a renovation project that would involve several phases causing Owner Furnished Contractor Installed Equipment to be delivered by phase, it is the General Contractor's responsibility to submit a separate delivery schedule for each phase with a clear description of areas included in a particular phase, along with an anticipated completion date of this phase.

NOTE: If early delivery of equipment is required, contractor is required to store in secure environmentally controlled space and confirm with HCA Medical Equipment Manager.

NOTE: HCA requires that the enclosed Owner Furnished/Contractor Installed equipment Delivery Schedule (excel) be completed by the contractor and returned to the HCA Equipment Manager with ten (10) working days of the written contractor's notice to proceed.

NOTE: No payments can be made, until receipt of the schedule(s) by the HCA Construction Manager.

DISTRIBUTION BY THE HCA CONSTRUCTION MANAGER:

HCA Equipment Manager
HCA Construction Manager
Hospital Construction Contact
Hospital Materials Manager

Item #	Vendor	Item Qty	Item Description Spaces Reqs: / PO
100248	STERIS CORPORATION	8	EXAM LIGHT, CEILING-MOUNTED - HEXALUX - 26.5 lbs. _ 54.9 ft. lbs. torque _ structural plate provided by Steris & installed by contractor 1-210/1 , 1-211/1 , 1-212/1 , 1-213/1 , 1-214/1 , 1-215/1 , 1-216/1 , 1-217/1
100912	STRYKER INSTRUMENTS- NET 30 ON POs	1	PHARMACEUTICAL WASTE MGT - CACTUS SMART SINK - 12.5"H x 15.5"W x 9.5"D _ Add 100913 for adapter _ HPG 31138 TIER 1 1-206/1
100913	STRYKER INSTRUMENTS- NET 30 ON POs	1	POWER ADAPTER - for Cactus Smart Sink - HPG 31138 TIER 1 1-206/1
101837	STORAGE SYSTEMS INC	8	DIAGNOSTIC SET, WALL MOUNTED- INTEGRATED WELCH ALLYN MFG. - 777 GREEN SERIES WALL TRANSFORMER GREEN SERIES With PANOPTIC LED OPTHALMOSCOPE, MACROVIEW BASIC LED OTOSCOPE, BP ANEROID, EAR SPECULA DISPENSER, SURETEMP PLUS THERMOMETER AND WALL BOARD 1-210/1 , 1-211/1 , 1-212/1 , 1-213/1 , 1-214/1 , 1-215/1 , 1-216/1 , 1-217/1
101952	EXERGEN CORPORATION - MEDICAL DIV	1	THERMOMETER, TEMPORAL - TAT-5000 w/ WALL MOUNT - CALIBRATED FOR CORE/ARTERIAL MEASUREMENT 1-221/1
710389	KERMA MEDICAL PRODUCTS INC	1	DIAGNOSTIC SET, WALL MOUNTED - WELCH ALLYN GREEN SERIES 777 - 34"W x 12"H _ REQUIRES AC POWER _ ANEROID BP, OPTHALMOSCOPE, OTOSCOPE, EAR SPECULA DISPENSER, SURETEMP PLUS THERMOMETER _ MFG. HPG 4932 TIER 1 1-221/1
727039	STERIS CORPORATION	1	WARMING CABINET, FULL SIZE - 24" CHAMBER w/ GLASS DOORS - 74.8"H x 30"W x 26.5"D _ 120V, 60HZ, 1P, 14 AMPS, 1680 WATTS 1-219/1

Item #	Vendor	Item Qty	Item Description Spaces Reqs: / PO
728296	**HELMER LABS, INC.**	**1**	**REFRIGERATOR, MEDS, 20 CU. FT. - HPR120-GX - 78.8"H x 29.5W x 29.5"D _ PART# 5116120-1 _ (INCL. DOOR HANDLE, ELEC. PANEL & EVAP. TRAY); CLEARANCE REQ: 8" ABOVE/3" BEHIND; GLASS DOOR; TEMP. RANGE: 2 DEGREE C TO 10 DEGREE C; 115 VOLT/60HZ/7.5 FLA;** **1-206/1**

SECTION 003100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:
   1. Geotechnical Report: Entitled "Panama City FSER Geotechnical Report", dated Sept 11, 2018 .
      a. A copy is available upon request; coordinate with Architect.
      b. A copy is available in eBuilder in the documents folder under Design / Preliminary Services Report.
   2. Existing Project Construction Documents dated 08/08/19 by BLOX
      a. A copy is available upon request; coordinate with Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 003151
COMMUNITY DEVELOPMENT AND ENGAGEMENT PROGRAM

PART 1 - GENERAL

1.01 SUMMARY

A. This Section references Community Development and Engagement information relevant to the construction of this Project.

B. At the request of the Owner, the information represents information that affects this Project and are beyond the responsibilities of the Architect and Architect's Consultants. Reference to such information herein is solely for the convenience of the Owner. Architect makes no representation, express or implied, as to the accuracy or validity of the information.

1.02 COMMUNITY DEVELOPMENT AND ENGAGEMENT

A. HCA Healthcare is dedicated to fostering a culture that reflects the communities in which we live and operate. The Design and Construction Department has established a program that shapes our contracting and procurement strategies to create opportunities for historically underrepresented businesses. We recognize the importance of supporting the growth and economic advancement of businesses of all sizes.

1. Owner's Web Site: HCA Healthcare Development Program

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 005213
OWNER-CONTRACTOR AGREEMENT FOR LUMP SUM

GENERAL

1.01 FORM OF AGREEMENT

A. The form of Agreement for this Project will be HCA AGREEMENT BETWEEN OWNER AND DESIGN BUILDER FOR WORK ON A LUMP SUM BASIS form agreement between owner and contractor for work on a lump sum basis.

B. This agreement form is part of the Contract Documents and is incorporated herein by reference and shall be construed to be a part hereof, with the same effect as if such were repeated at length herein, or physically attached hereto.

END OF DOCUMENT

END OF SECTION

SECTION 011000
SUMMARY

PART 1 - GENERAL

1.01 1.1 SUMMARY

A. Section Includes:
   1. Project information.
   2. Phased construction.
   3. Work by Owner.
   4. Work under separate contracts.
   5. Future work.
   6. Purchase contracts.
   7. Owner-furnished, Owner-installed (OFOI) products.
   8. Owner-furnished, Contractor-installed (OFCI) products.
   9. Worker conduct and appearance - work rules.
   10. Healthcare facility renovation work.
   11. Access to site.
   12. Coordination with occupants.
   13. Work restrictions.
   14. Specification and drawing conventions.
   15. Miscellaneous provisions.

1.02 PROJECT INFORMATION

A. Project Identification: Panama City FSER Expansion.
   1. Project Location: Panama City, Florida.

B. Owner: HCA Healthcare

C. Architect: Hereford Dooley Architects.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
   1. Refer to Design Documents Index

1.03 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.04 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.05 OWNER-FURNISHED, OWNER-INSTALLED (OFOI) PRODUCT

A. The specific product is not in this contract, and actual installation of the product will be made by the Owner.

B. Products will be indicated on the attached Section 01 1500 HCA Major / Minor Equipment Responsibility Matrix:
   1. N.I.C.
   2. Owner Furnished - Owner Installed
   3. Product noted as "Future"

C. Roughing-in for Owner Furnished, Owner Installed Product is provided by applicable Sections governing the type of work. Obtain rough-in requirements from Owner.

1.06 OWNER-FURNISHED, CONTRACTOR-INSTALLED (OFCI) PRODUCT

A. Install products indicated as follows:
   1. Products will be indicated on the attached Section 01 1500 HCA Major / Minor Equipment Responsibility Matrix
   2. Products as outlined in Section 01 1350 Owner Provided Prefabricated and Modular Construction
   3. "Owner Furnished, Contractor Installed".
   4. "Reuse".
   5. "Relocate".

B. Provide labor, transportation, materials, tools, appliances and utilities necessary for the following:
   1. Relocated Products:
      a. Removing installed product from the Owner's existing facility, as required.
      b. Transportation of product from Owner's facility to the job site.
   2. Receiving and storage of Owner furnished, Contractor installed product, as required.
   3. Providing materials and components for the product as necessary to install in an operating condition, but not including repairing of existing damages to the product.
   4. Modification of product only as specified under the particular item.
   5. Installation of product in this project, complete and in operating condition, including the adjusting and calibration of the product as necessary for proper operation.
   6. Testing of product.
   7. Paying of fees, licenses, and taxes in conjunction with the installation of the product.
   8. Roughing-in and final utility connections for the Owner furnished, Contractor installed product remains the work of Sections governing the specific utility.

1.07 PURCHASE CONTRACTS

A. General: Owner has negotiated purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum, unless otherwise indicated.
   1. Contractor's responsibilities are same as if Contractor had negotiated purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

B. Purchase Contracts Information:
   1. Refer to Section 00 2150 Preferred Vendor List

1.08 WORKER CONDUCT AND APPEARANCE - WORK RULES

A. General: The conduct and appearance of each worker at the jobsite is of paramount importance. The Owner reserves the right to require any worker to be reassigned to work outside the Owner's property.
   1. Privacy: Where applicable, conduct work of the Contract with the maximum effort to maintain the privacy of the Owner's operations, staff, and clientele. Do not permit workers to peer into other areas of the building visible from the work area. Invasion of privacy is a major infraction of the work rules.
   2. Conduct and Demeanor: Construction workers shall treat other construction workers, Owner's staff, clientele, and visitors (as applicable) professionally with respect and courtesy.
   3. Physical Appearance: Require each worker to dress appropriately in a clean, neat, and professional manner.
   4. Radios and Television: The use of entertainment devices including personal devices with headphones or earphones is prohibited at all times. Control the volume of communication radios and loudspeakers to avoid creating a nuisance.
   5. Tobacco Products: The use of tobacco products is prohibited.

6. Language: The use of foul language is prohibited.
7. Loud Conduct: Screaming, yelling, and unnecessary loud conduct is prohibited.
8. Physical Actions: Running, horseplay, fighting, and other unprofessional conduct is prohibited. Fighting is a major infraction of the work rules.
9. Stealing: Stealing of any material, objects, furnishings, equipment, fixtures, supplies, clothing, or other items is prohibited and a major infraction.
10. Sexual Harassment: All forms of physical and verbal sexual harassment including, without limitation: touching; whistling; sexually explicit stories, jokes, drawings, photos, and representations; exhibitionism; and all other sexually oriented offensive behavior is prohibited.
11. Roaming: Construction personnel shall not be allowed to roam, or wander about, the existing facilities.
12. Eating: Construction personnel shall not use the existing Dining Area for breakfast, lunch, or dinner.
13. Parking: Construction personnel shall only park in designated areas reserved for construction parking, refer to SECTION 01 50 00 Temporary Facilities and Controls.
14. Penalties: First infraction of the work rules shall result in a verbal warning from the Owner. Second infractions shall result in being requested to leave the Owner's property. Owner's decision in such matters shall be final with no exceptions.

B. Warnings and Dismissal: For minor infraction of the rules, the Owner may issue a warning. Only one warning will be allowed per worker, and a second infraction shall result in immediate dismissal of the worker from the Owner's property. For major infractions such as invasion of privacy, the worker shall be dismissed immediately without warning and possibly subject to criminal prosecution.

C. Notification of Workers: Clearly notify and educate each worker about these Work Rules and the requirements for worker conduct and appearance.

1.09 ACCESS TO SITE

A. General: Refer to Section 01 5000 Temporary Facilities and Controls

1.10 COORDINATION WITH OCCUPANTS

A. General: Refer to Section 01 5000 Temporary Facilities and Controls

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

1.12 PROJECT SPECIFIC REQUIREMENTS

A. GC shall turn over the IT (TDR & TEC/TSER) rooms 6 (six) weeks prior to final completion.

B. GC shall turn over the MEDS Room and Laboratory 4 (four) weeks prior to final completion so that owner can outfit spaces prior to final inspections.

C. Hot Work Permit
   1. THE GENERAL CONTRACTOR SHALL OBTAIN A HOT WORK PERMIT PRIOR TO BEGINNING ANY WELDING, CUTTING, BRAZING, GRINDING OR OTHER WORK THAT GENERATES SPARKS CAPABLE OF CAUSING COMBUSTION. REFER TO NFPA 51B AND APPENDIX A.

D. A Fire Watch or a Guard Watch will be required during the process of any Hot Work generating sparks capable of causing combustion as required by NFPA 601.

E. Smoking is prohibited on the job site at all times.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 011300
DELEGATED DESIGN REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for assemblies and construction systems provided by the Contractor as delegated design.

B. Includes prefabricated assemblies such as, but not limited to:
   1. Exterior Walls
   2. Interior Walls
   3. MEP Racks
   4. Electrical Rooms
   5. Subassemblies as provided by trades
   6. Other assemblies as requested by Owner

1.02 DEFINITIONS

A. Delegated: Means delegated by the Owner and Architect to the Contractor.

B. Design: Means the planning, coordination, and graphic and written communication of a portion of the Work, including determination and engineering of system or assembly or system organization and structure, in response to functional requirements, arrangement and performance criteria indicated in the Contract Documents.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Portions of the Contract Documents delegate the design of certain components, assemblies or systems to the Contractor, or may otherwise specify “delegated design requirements” in individual specification Sections.

B. The Contractor is to be responsible for delegated design Work, including design, engineering and performance.

C. Drawings of delegated design portions of Work are diagrammatic and are intended only to show:
   1. Design intent of finished materials, profiles, shapes and forms.
   2. Relationships between elements.
   3. Location, identification, dimension and size of components, assemblies and accessories.
   4. Schematic attachment details and diagrams of fasteners and connections.

D. Specifications for delegated design portions of the Work establish performance criteria for materials, products, systems, and methods of execution, along with minimum performance requirements for indicated portions of the Work.

E. The Architect will review informational submittals specified herein to determine whether or not the delegated component, assembly or system design complies with the following.
   1. That the Contractor’s engineering shows substantiation of the specified performance criteria.
   2. Conforms to specified performance requirements, including those subsequent modifications.
   3. Complies with the overall project design.
   4. Can be appropriately integrated into the overall design of the project.
   5. Review by the Architect does not relieve the Contractor from compliance with the requirements of the delegated component.

F. In the event of conflicts regarding the Contractor’s proposed delegated design solutions and the design intent of the Contract Documents, the decision of the Architect will be final.

1.04 PROCEDURAL REQUIREMENTS

A. Design Requirements: Proposed delegated design solutions are to demonstrate compliance with the original design intent of the Contract Documents, as determined by the Architect.
   1. Unless otherwise defined by the Contract Documents, appearance of exposed elements, including member sizes, profiles and alignment of components, are to be within dimensional limits of section profiles indicated on the Drawings, and are to be consistent throughout the Project. Do not deviate from profiles, layouts or arrangements indicated without prior written approval from the Architect.
   2. Proposed delegated design solutions that exactly follow details indicated on the Drawings do not relieve Contractor of responsibility for design and performance of delegated design portions of Work.

B. Engineering Requirements: Engineer delegated design portions of the Work to meet or exceed specified performance requirements, to satisfy the requirements of the authorities having jurisdiction, and to provide structurally sound, water and weathertight assemblies capable of withstanding the specified in-service loads without failure.

C. Additional Requirements:
   1. Fabricate, assemble and install delegated design portions of the Work to accommodate the full range of manufacturing, operating and field installation tolerances of adjacent work specified in other Sections.
   2. If required by the authorities having jurisdiction, submit shop drawings, specifications, calculations and other supporting data necessary for obtaining jurisdiction approval after they have been reviewed by the Architect and prior to beginning installation. Pay fees incurred.

1.05 INFORMATIONAL SUBMITTALS

A. General: Coordinate and process submittals for delegated design portion of Work in same manner as for other portions of Work.

B. Design Data:
   1. Submit engineering calculations demonstrating compliance with the requirements of Contract Documents and of the authorities having jurisdiction.
      a. Provide calculations legible and that incorporate sufficient cross- references to shop drawings to make calculations readily understandable and reviewable.
      b. Test reports are not acceptable as a substitute for calculations.
   2. Structural Calculations: Include the following:
      a. Analysis of framing members.
      b. Section property computations for framing members.
      c. Analysis of anchors, including anchors embedded in concrete
      d. Signature and seal of the qualified Engineer responsible for their preparation.

C. Furnish appropriate certification from licensed fabricator shop or complete detailed inspection reports signed by each inspector performing unlicensed shop inspection to the Architect before the Work affected by these inspections is delivered to the site.

1.06 QUALITY ASSURANCE

A. Engineer Qualifications: Unless stated otherwise in other sections, provide the following:
   1. Professional or Structural Engineer legally licensed and qualified to practice in the State where the project is located and experienced in and having a minimum of 5 consecutive years providing the type of engineering services indicated in the Contract Documents.
   2. Engineering services are defined as those performed for the design, fabrication and installation of components and assemblies similar in material, design, complexity and extent to those indicated in the Contract Documents for this Project.

B. Fabricator/Installer Qualifications: Firm with a minimum of 5 consecutive years' experience in the design, testing, fabrication, assembly, installation and coordination of specified components, assemblies and systems on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance. Submit evidence demonstrating the following:
   1. The ability to coordinate and work with a qualified testing agency for testing exterior building envelope assemblies utilizing the recognized test standards of the industry on projects similar in material, design, complexity and extent of this Project.
   2. The experience in managing, scheduling, coordinating, and maintaining on- time performance in conjunction with the successful projects and for the proposed project.
   3. An in-place, comprehensive quality assurance and quality control program and procedures that demonstrates how it is being applied on the project. Describe and demonstrate how the proposed comprehensive quality assurance and quality control program has been successful on other projects.
   4. The current resources, including currently employed personnel, to produce the Work to the specified requirements.
   5. The ability to produce proposal drawings, accommodate plant visits, and mockups, organization plans, project management plans and proposed schedules in conjunction with the bidding for this Project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide products, materials, components and accessories required for a complete installation and operation in the proposed design, whether or not such items are indicated in the Contract Documents.

B. Provide anchors, attachments, hardware, inserts, fasteners, clips, bracing, framework, and similar items as required to meet specified design and performance requirements, and to anchor delegated design Work to adjacent supports, or to related adjoining work, whether or not such items are indicated in the Contract Documents.

PART 3 - EXECUTION

3.01 DESIGN

A. Unless otherwise indicated or specified, maintain design intent and specified performance requirements of the Contract Documents.
   1. If certain fabrication or erection methods, minor dimensional changes and detailing adjustments to the original design in the Contract Documents are required, indicate such on submitted Shop Drawings.
   2. Prior to shop drawing submittal, obtain written approval from the Architect for proposed changes and adjustments.

B. Engage a qualified Engineer to design connection details and determine fastener types and sizes.
   1. Fasteners or connections are not to conflict with or require revision to the design profiles indicated on the Drawings or to the supporting work.
   2. Connections are not to impose eccentric loading, nor induce twisting or warping to supporting structure.
   3. Design connections to accommodate potential and actual misalignment of adjacent work within tolerances specified in other Sections.

END OF SECTION

SECTION 011500
EQUIPMENT AND ITG RESPONSIBILITY MATRIX

SECTION 01 1500
EQUIPMENT AND ITG RESPONSIBILITY MATRIX

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**			**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
1. ANESTHESIA EQUIPMENT: (ie: machines)		X	X	X	X									
2. AUDIO / VISUAL														To be coordinated via DD session between AV vendor and architect.
a. Portable										X	X	X*	X	*Vendor Installed
b. Projector										X	X	X*	X	*Vendor Installed
c. Projection Screen										X	X	X*	X	*Vendor Installed
d. Projector										X	X	X*	X	*Vendor Installed
e. Monitor & Bracket										X	X	X*	X	*Vendor Installed
f. AV Connections and Cable										X	X	X*	X	*Vendor Installed
3. AUTOMATED TRANSPORT SYSTEMS														
(Pneumatic Tube)						X	X	X	X					
4. CARTS														
a. Anesthesia		X	X	X	X									
b. Case, Surgical		X	X	X	X									
c. Cast		X	X	X	X									
d. Crash		X	X	X	X									
e. Endoscopy		X	X	X	X									
f. E.N.T		X	X	X	X									
g. Environmental Svcs		X	X	X	X									
h. Food Service		X	X	X	X									
i. Fracture		X	X	X	X									
j. Gift Shop (Hospitality)		X	X	X	X									
k. Isolation		X	X	X	X									
l. Linen		X	X	X	X									
m. Medication		X	X	X	X									
n. Miscellaneous		X	X	X	X									
o. Supply		X	X	X	X									
p. Tool		X	X	X	X									
q. Trash		X	X	X	X									
r. Utility		X	X	X	X									
s. Wrap		X	X	X	X									
t. Documentation										X	X	X	X	
5. CASEWORK														

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**				**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
a. Focal						X	X	X	X					
b. Standard Acute Care						X	X	X	X					
c. FSER Casework		X	X	X	X									Herman Miller/OFS
d. Special (Modular) Lab & Pharmacy		X	X	X	X									Herman Miller
e. Keyboards (Duplicate under furniture)						X	X	X	X					Architect/Interior Designer to specify keyboard trays per HCA's Information Systems guidelines. Keyboards to be installed by contractor for both furniture and casework.
6. CHAIRS, EXAM/TREATMENT														
a. Contour (Donor, I.V.)		X	X	X	X									
b. Dental		X	X	X	X									
c. Eye / ENT		X	X	X	X									
d. Miscellaneous		X	X	X	X									
e. Phlebotomy		X	X	X	X									
7. CHARTING SYSTEMS, PATIENT DOCUMENTATION														
a. Computerized														See Data Equipment
b. Wall-hung paper chart station						X	X	X	X*					Contractor Installed
8. CLOCKS														
a. Discrete (Battery / Plug-in)	X							X	X					
b. Interval Timers / Recorders						X	X	X	X					
c. Systems, Centralized						X	X	X	X					
d. Kronos Time & Attendance								X	X	X	X			Contractor to pull cable
9. COMMODES														
a. Fixed						X	X	X	X					
b. Portable		X	X	X	X									
10. COMMUNICATIONS EQUIP/SYSTEMS														
a. Dictation														
1. Systems, Hardwired										X	X	X	X	Contractor to pull cable
2. Voice Recognition										X	X	X	X	Contractor to pull cable
b. Doctors' Credentialing										X	X	X	X	Contractor to pull cable
c. EMS Radio (ED)		X	X	X	X									Contractor to pull cable
d. Emergency Responder Radio						X	X	X	X					Architech to Confirm with IT&S UC manager if system will be part of DAS
e. Intercom						X	X	X	X					
f. Nurse Call										X	X	X	X	Contractor to pull cable
g. Two Way Radio		X	X	X	X									
h. Telephone										X	X	X	X	Contractor to pull cable

Project:															
EQUIPMENT CATEGORY	Facility	Owner Medical Equipment					Architect Int. Designer	Contractor			Owner IT&S				Comments
	respons.	spec	pur	place	instl		spec	pur	place	instl	spec	pur	place	instl	
i. Overhead Page							X	X	X	X					
j. Transcription											X	X	X	X	Contractor to pull cable
k. Fax Machines											X	X	X	X	Contractor to pull cable
l. Picture Archive and Communication Systems (PACS)											X	X	X	X	Contractor to pull cable
1. Archive											X	X	X	X	IT&S to Coordinate w/ME
2. CD Burner											X	X	X	X	IT&S to Coordinate w/ME
3. Film Laser Printer											X	X	X	X	IT&S to Coordinate w/ME
4. CR Readers											X	X	X	X	IT&S to Coordinate w/ME
5. Patient Tracking											X	X	X	X	IT&S to Coordinate w/ME
6. Radiologist Diagnostic Workstation Adjustable Furniture											X	X	X	X	
m. Guest Paging											X	X	X	X	Contractor to pull cable
n. Registration Kiosks & Information Screens											X	X	X	X	Contractor to pull cable. Contractor responsible for anchoring to floor/wall
o. Distributed Antenna System (DAS/Cellphone Signal Boosting)											X	X	X	X	
p. Telephone Service	X														IT&S UC Mgr. notifies facility and contractor to coordinate installation w/local provider for entrance cable.
11. COMPACTORS															
a. External							X	X	X	X					
b. Departmental							X	X	X	X					
12. DATA/NETWORK EQUIPMENT															
a. PC Computer											X	X	X	X	Contractor to pull cable
c. Network Equipment											X	X	X	X	Contractor to pull cable
e. Printer											X	X	X	X	Contractor to pull cable
f. Fax											X	X	X	X	Contractor to pull cable
g. Scanner											X	X	X	X	Contractor to pull cable
h. Hand Held Scanner											X	X	X	X	
i. Copier/Printer/Fax (Table Model)											X	X	X	X	Contractor to pull cable
j. Copier/Printer/Fax (Floor Model)											X	X	X	X	Contractor to pull cable *Leased*
k. Point of Care (i-Stat, Accuchek)											X	X	X	X	Contractor to pull cable
l. RFID/RTLS (Patient, Staff, equipment tracking)											X	X	X	X	Contractor to pull cable
m. Mobile Computer Carts											X	X	X	X	
n. Router											X	X	X	X	
o. Network Switches											X	X	X	X	
p. ups (IDF/MDF)											X	X	X	X	
q. Isolation Transformers (IDF/MDF)											X	X	X	X	
r. IDF/MDF Room Temp. & Humidity Control Monitor											X	X	X	X	
s. Patient Observation Cameras (Not Security)											X	X	X	X	Contractor to pull cable

Project:															
EQUIPMENT CATEGORY	Facility	Owner Medical Equipment				Architect Int. Designer	Contractor			Owner IT&S				Comments
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
t. Internet Service	X													IT&S Mgr. notifies facility and contractor to coordinate installation w/local provider for entrance cable.
13. DIALYSIS EQUIPMENT														
a. Peritoneal		X	X	X	X									
b. Renal		X	X	X	X									
14. EQUIPMENT MANAGEMENT SYSTEMS														
(Equipment Boom)		X	X	X	X									Installed by Vendor
15. ELECTROCARDIOGRAPH EQUIPMENT		X	X	X	X									
16. ELECTROSURGICAL EQUIPMENT		X	X	X	X									
17. ENVIRONMENTAL ROOMS														
(Prefabricated)						X	X	X	X					
18. ENVIRONMENTAL SERVICES EQUIP.		X	X	X	X									
19. FIRE PREVENTION EQUIPMENT														
a. Blankets						X	X	X	X					
b. Cabinets, Extinguisher						X	X	X	X					
c. Extinguishers						X	X	X	X					
d. Systems						X	X	X	X					
20. FOOD SERVICE EQUIPMENT														
a. Grp. I (Hoods, Walk-Ins)		X	X	X	X									Contractor makes actual connection
b. Grp. II (Moveable: Ovens, Dishwasher)		X	X					X	X					Contractor makes actual connection
c. Grp. II (Smallwares: Pots, Trays, Carts)		X	X	X	X									
d. Final Equipment Placement Set in place; caulking; touchup														Work to be completed by food service vendor
e. Garbage Disposals						X	X	X	X					
f. Cash Register Networked / Tracker / Menu Boxes										X	X	X	X	Contractor to pull cable
21. FREEZERS (excluding Food Svc Equip)														
a. Chest		X	X					X	X					
b. Miscellaneous		X	X					X	X					
c. Undercounter		X	X					X	X					
d. Upright		X	X					X	X					

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**				**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
e. Walk-in/Prefabricated		X	X	X	X									Contractor makes actual connection
22. FURNISHINGS, DESIGN														
a. Accessories, Design	X													
b. Artwork / Graphics		X	X	X	X									*Vendor Installed
c. Bulletin Boards/Tack Boards/Chalkboards/Marker Boards						X	X	X	X					
d. Carpet						X	X	X	X					
e. Curtains, Cubicle			X	X	X	X								*Vendor Installed
f. Curtains, Shower			X	X	X	X								*Vendor Installed
1. Overlay			X	X	X	X								
2. Liners			X	X	X	X								
g. Furniture, General - Existing			X	X	X	X								Interior Designer to spec fabric
h. Furniture, General			X	X	X	X								*Vendor Installed
i. Signs, Exterior						X	X	X	X					
j. Signs, Interior						X	X	X	X					
1. Electronic Wayfinding										X	X	X	X	Consult with IT
k. Waste Receptacles														
1. Clinical		X	X	X	X									
2. Non-Clinical		X	X	X	X									
3. Waiting & Lobbies			X	X	X	X								
l. Window Treatment / Blinds/ Cornice Boards			X	X	X	X								Except Blinds that are internal with window units
m. Wall Protector (ie: bumper / bed / handrail/corner guards)						X	X	X	X					Specs provided by Architect/Interior Designer
n. Keyboards - in workstations, duplicate in casework						X	X	X	X					Architect/Interior Designer to specify keyboard trays per HCA's Information Systems guidelines. Keyboard to be installed by contractor for both furniture and casework.
o. Planters			X	X	X	X								
p. Plants	X													
23. FURNITURE, PATIENT ROOM														
a. Beds		X	X	X	X									
b. Cribs		X	X	X	X									
c. Mattresses		X	X	X	X									
d. Table, Overbed			X	X	X	X								
e. Cabinets, Bedside			X	X	X	X								
f. Chairs, Lounge			X	X	X	X								
g. Chairs, Side			X	X	X	X								
h. Chests			X	X	X	X								
i. Desks			X	X	X	X								

Project:															
EQUIPMENT CATEGORY	Facility	Owner Medical Equipment				Architect Int. Designer	Contractor			Owner IT&S				Comments
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
j. Dressers			X	X	X	X								
k. Wardrobes (except built-ins)			X	X	X	X								
l. Proximity PC Cabinets								X	X	X	X			
m. Egotron PC Arms										X	X	X	X	
n. CCI PC Cabinets										X	X	X	X	
o. Human Scale PC Cabinets								X	X	X	X			
p. Trash Receptacles		X	X	X	X									
24. HAMPERS, LINEN		X	X	X	X									
25. HEART-LUNG MACHINES		X	X	X	X									
26. HOODS														
a. Biohazard		X	X					X	X					
b. Fume		X	X					X	X					
c. Laminar Flow		X	X					X	X					
d. Radioisotope		X	X					X	X					
27. HOT LAB EQUIPMENT														
a. Nuclear Medicine		X	X	X	X									
b. Radiation Therapy		X	X	X	X									
28. HYPO-HYPERTHERMIA EQUIPMENT		X	X	X	X									
29. ICE MACHINES		X	X					X	X					
30. ILLUMINATORS, X-RAY FILM														
a. Motorized		X	X					X	X					
b. Recessed		X	X					X	X					
c. Surface Mounted		X	X					X	X					
31. IMAGING EQUIPMENT														
a. Computerized Axial Tomography (CT)		X	X	X	X									*Vendor Installed
b. Dental Radiography		X	X	X	X									*Vendor Installed
c. Digital Radiography		X	X	X	X									*Vendor Installed
d. Image Intensifier, Portable		X	X	X	X									*Vendor Installed
e. Magnetic Resonance Imaging		X	X	X	X									*Vendor Installed
f. Magnetic Resonance Imaging Rigging			X		X									Rigging provided by GE
g. Mammography Equipment		X	X	X	X									*Vendor Installed
h. Nuclear Camera		X	X	X	X									*Vendor Installed
i. Nuclear Medicine Accessories		X	X	X	X									
j. Radiation Therapy Equipment		X	X	X	X									*Vendor Installed
k. Radiation Therapy Accessories		X	X	X	X									
l. Radiographic Equipment		X	X	X	X									*Vendor Installed

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**				**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
m. Radiographic Equipment Accessories		X	X	X	X									
n. Single Photon Emission		X	X	X	X									*Vendor Installed
o. Ultrasound Equipment		X	X	X	X									
p. Shielding (Lead, Magnetic, RF)						X	X	X	X					
q. Vibration Testing (MRI)														Contractor responsible
r. Cath Lab		X	X	X	X									*Vendor Installed
s. PET Scanner		X	X	X	X									*Vendor Installed
t. Film Printer										X	X	X	X	
u. CD Burners										X	X	X	X	
v. CR Reader										X	X	X	X	
w. Cardiovascular PACS Hardware and Software										X	X	X	X	
x. Radiology PACS Hardware and Software										X	X	X	X	
y. Diag. & Clinical Rad PACS & CVPACS Diag. & Clinical Viewing stations										X	X	X	X	
32. IMPRINTERS AND EMBOSSERS										X	X	X	X	
33. INCINERATOR														
a. Pathological						X	X	X	X					
b. Waste - Autoclave/Shredder						X	X	X	X					
34. INFANT CARE EQUIPMENT														
a. Bassinets		X	X	X	X									
b. Incubators		X	X	X	X									
c. Neonatal Care Systems		X	X	X	X									
d. Phototherapy Equipment		X	X	X	X									
e. Warmers		X	X	X	X									
f. Observation Camera (Nicview)										X	X	X	X	
35. INSTRUMENTS, EXAM														
a. Portable		X	X	X	X									
b. Wall Mounted		X	X	X					X					
(BP units, Oto/Ophth Sets)														
c. Diagnostic Board - Wallmount		X	X	X					X					
36. INSTRUMENTS, SURGICAL		X	X	X	X									
37. INTRAVENOUS PUMPS / CONTROLLERS		X	X	X	X									
38. LAB ANALYZERS / INSTRUMENTATION		X	X	X	X									*Vendor Installed
39. LASER DEVICES														
a. Ophthalmic		X	X	X	X									
b. Surgical		X	X	X	X									

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**			**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
40. LAUNDRY SERVICE EQUIPMENT														
a. Washer														
1. Commercial		X	X					X	X					
2. Residential		X	X					X	X					
b. Dryer														
1. Commercial		X	X					X	X					
2. Residential		X	X					X	X					
41. LIGHTS														
a. Exam														
1. Fixed		X	X	X	X									Vendor installed
2. Portable		X	X	X	X									
b. Patient Headwall Lights						X	X	X	X					
c. Surgical														
1. Fixed		X	X	X	X									Vendor Installed
2. Portable		X	X	X	X									
42. LOCKERS:														
NON PUBLIC AREAS						X	X	X	X					
PUBLIC AREAS						X	X	X	X					
BENCHES IN LOCKER ROOMS						X	X	X	X					
43. MAIL ROOM EQUIPMENT		X	X	X	X									
44. MAINTENANCE TOOLS & EQUIPMENT		X	X	X	X									
45. MATERIALS HANDLING / CONTROL EQUIPMENT		X	X	X	X									
46. MEDICAL GAS / VACUUM SYSTEM														
a. Primary System (Piping)						X	X	X	X					
b. Secondary Equipment (Regulators & Flowmeters)		X	X	X	X									
47. MEDICINE CENTERS														
a. Prefabricated Narcotic Cabinet						X	X	X	X					
b. Automated Drug Distribution (PYXIS)	X									X	X	X		
Faxing Solution (Medcomm)	X									X	X	X		
A-Carts	X									X	X	X		
48. MISCELLANEOUS														
GROUPS II & III EQUIPMENT		X	X	X	X									
49. MONITORING EQUIPMENT,														

Project:															
EQUIPMENT CATEGORY	Facility	Owner Medical Equipment				Architect Int. Designer	Contractor				Owner IT&S				Comments
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
PHYSIOLOGICAL														
a. Ambulatory Systems														
1. ECG		X	X	X	X									
2. EEG		X	X	X	X									
b. Vital Signs Monitors		X	X	X	X									
c. Hardwired Bedside Monitors		X	X	X	X									*Vendor Installed. Sub to pull cable
d. Fetal Monitors		X	X	X	X									
e. Telemetry Systems		X	X	X	X									*Vendor Installed. Sub to pull cable
50. NARCOTICS LOCKERS						X	X	X	X					
51. NEUROLOGICAL EQUIPMENT														
a. Electroconvulsive Therapy Device		X	X	X	X									
b. Electroencephalographs		X	X	X	X									
c. Electromyographs		X	X	X	X									
d. Evoked Response Devices		X	X	X	X									
e. Misc. Equipment & Accessories		X	X	X	X									
52. NOURISHMENT CENTERS														
(Prefabricated)						X	X	X	X					
53. OCCUPATIONAL THERAPY EQUIPMENT		X	X	X	X									
54. OFFICE MACHINES														
a. Calculators	X													Facility Operational Expense
b. Cash Registers										X	X	X	X	
c. Miscellaneous Equipment	X													Facility Operational Expense
d. Mobile Storage Equipment (Rotary)		X	X	X	X									
55. OPHTHALMIC EQUIPMENT														
a. Control Systems		X	X	X	X									
b. Portable		X	X	X	X									
56. ORTHOPEDIC APPARATUS		X	X	X	X									
57. OVENS / RANGES / MICROWAVES/COFFE POTS														
(Other than Food Service)														
a. Fixed		X	X					X	X					
b. Coffee Pot	X													Vendor Provided, Facility Installed
58. PATIENT SERVICE SYSTEMS														
(Prefabricated Headwall)														

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**			**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
a. Column - ICU / OR / RR / ER		X	X	X	X									Vendor Installed
b. Headwall - LDRP						X	X	X	X					
c. Flatwall - ICU / ER / RR / Patient Room						X	X	X	X					
d. Headwall Accessories						X	X	X	X					
e. Anesthesia Gas Delivery Systems -						X	X	X	X					
Column Drops or Gas Boom Format														
f. Patient Lift														
1. Portable		X	X	X	X									
2. Track Format - Physical Therapy						X	X	X	X					
3. Ceiling Mounted other than in PT	X					X								Ceiling Mounted Patient Lifts are not a HCA Clinical Standard - Facility responsible for obtaining funding
59. PHYSICAL MEDICINE / REHAB EQUIP.														
a. Fixed (ie: swimming pools)						X	X	X	X					
b. Hydrotherapy		X	X					X	X					
c. Portable		X	X	X	X									
d. Computerized (Wii, Xbox)										X	X	X	X	
60. PROCEDURE SUPPORT EQUIPMENT		X	X	X	X									
(Portable, Stainless Steel)														
61. PULMONARY FUNCTION EQUIPMENT		X	X	X	X									
62. REFRIGERATORS (exclude Food Service)														
a. Countertop		X	X					X	X					
b. Mortuary		X	X					X	X					
c. Undercounter		X	X					X	X					
d. Upright		X	X					X	X					
e. Walk-in / Prefabricated		X	X	X	X									Contractor makes actual connection
63. RELIGIOUS ARTIFACTS		X	X	X	X									
64. RESPIRATORY THERAPY EQUIPMENT		X	X	X	X									
65. RESUSCITATION EQUIPMENT		X	X	X	X									
66. RODS, CURTAIN (shower)						X	X	X	X					
67. SAFES		X	X	X	X									
68. SCALES														

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**			**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
a. Autopsy		X	X					X	X					
b. Bed		X	X	X	X									
c. Chair		X	X	X	X									
d. Clinical Exam		X	X	X	X									
e. Platform		X	X					X	X					
69. SCHEDULING SYSTEMS (automated)														
a. Patient/Bed Tracker Monitor										X	X	X	X	Contractor to pull cable
1. Monitor Mounts								X	X	X	X			
2. White Board						X	X	X	X					
70. SCRUB SINKS						X	X	X	X					
71. SECURITY SYSTEMS														
a. Infant Abduction		X	X	X	X									*Vendor Installed. Sub to pull cable
b. CCTV - Campus Security										X	X	X	X	Contractor to pull cable
c. Door Access (ie: readers & locks)						X	X	X	X					
d. Intrusion Detection System						X	X	X	X					
e Metal Detection System						X	X	X	X					
f. Panic Buttons						X	X	X	X					
72. SHELVING / STORAGE EQUIPMENT														Vendor Installed
a. High Density Systems		X	X	X	X									
b. Standard / Flat Steel - New		X	X	X	X									
c. Standard / Flat Steel - Existing		X	X	X	X									
d. Wire		X	X	X	X									
e. Miscellaneous (except built-in)		X	X	X	X									
f. Built-in						X	X	X	X					
g. Point of use - bins		X	X	X	X									Sheet of 3/4" plywood to be installed by contracter for blocking
h Personal Protection Enclosure						X	X	X	X					
73. STERILE PROCESSING EQUIPMENT														
a. Generator, Steam		X	X	X	X									Vendor Installed
b. Loading / Processing Accessories		X	X	X	X									Vendor Installed
c. Sonic Cleaners		X	X	X	X									Vendor Installed
d. Steam Gun		X	X	X	X									Vendor Installed
e. Sterilziers, Countertop		X	X	X	X									Vendor Installed
f. Sterilizers, Electric / Steam		X	X	X	X									Vendor Installed
g. Washers, Cart		X	X	X	X									Vendor Installed
h. Washer, Fiberoptics		X	X	X	X									Vendor Installed
i. Washers / Decontaminators / Sanitizers		X	X	X	X									Vendor Installed. Requires minimum of 9' ceiling

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**			**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
74. STRESS TEST EQUIPMENT		X	X	X	X									
75. STRETCHERS		X	X	X	X									
76. SUPPLY ITEMS														
a. Glove Dispenser	X							X	X					Procured by facility
b. Sharps Container	X							X	X					Procured by facility
c. Emesis Dispenser	X							X	X					Procured by facility
d. Soap/Sanitizer Dispenser	X							X	X					Procured by facility
e. PPE Holders						X	X	X	X					
77. TABLES														
a. Autopsy		X	X					X	X					
b. Cysto		X	X	X	X									
c. Exam / Treatment		X	X	X	X									
d. Processing		X	X	X	X									
e. Surgical		X	X	X	X									Vendor Installed
78. TELEVISION SYSTEMS														
a. Television Sets										X	X	X	X	Contractor to pull cable & install blocking
b. Mounting Brackets								X	X	X	X			Contractor to install blocking & wall brackets
c. Television Service (Cable TV or Satelitte)	X													IT&S Mgr. notifies facility, contractor & TV vendor to coordinate installation w/local cable TV vendor for entrance cable.
79. TEMPERATURE ALARMS / RECORDERS		X	X					X	X					Blood Bank / Morgue Only
a. Temperature Tracking										X	X	X*	X	*Vendor Installed
80. TOILET ROOM DEVICES														
a. Grab Bar						X	X	X	X					
b. Paper Towel Dispensers	X							X	X					Coordinate with facility vendor
c. Sanitary Napkin Dispensers	X							X	X					Coordinate with facility vendor
d. Soap/Sanitizer Dispensers	X							X	X					Coordinate with facility vendor
e. Toilet Paper Holder	X							X	X					Coordinate with facility vendor
81. TRACK														
a. Curtain (Cubicle)						X	X	X	X					
b. Intravenous						X	X	X	X					
(including carriers & pendants)														

Project:															
EQUIPMENT CATEGORY	**Facility**	**Owner Medical Equipment**				**Architect Int. Designer**	**Contractor**			**Owner IT&S**				**Comments**
	respons.	spec	pur	place	instl	spec	pur	place	instl	spec	pur	place	instl	
82. WATER CONDITIONING SYSTEMS														
a. Deionized						X	X	X	X					
b. Distilled						X	X	X	X					
c. Reverse Osmosis						X	X	X	X					
83. WATER FOUNTAINS						X	X	X	X					
a. WATER COOLER	X													Procured by Facility
84. WHEELCHAIRS		X	X	X	X									

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 012100 - Allowances: requirements for products selected under an allowance.
   2. Section 012300 - Alternates; requirements for products selected under an alternate.
   3. Section 016000 - Product Requirements for fundamental requirements for submitting comparable product submittals for products by listed manufacturers.

1.03 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.04 ACTION SUBMITTALS

A. Substitution Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Contractor shall use the Substitution Request Form attached to this Section.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   3. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      a. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      b. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      c. Samples, where applicable or requested.
      d. Certificates and qualification data, where applicable or requested.
      e. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      f. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

g. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery. Contractor to verify if additional design time, coordination time and evaluation time will be required for substitution.
h. System/Product Cost information, including additional design/re-design compensation, including a proposal of change, if any, in the Contract Sum.
i. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
j. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will forward recommendation to Owners Representative of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 15 days of receipt of additional information or documentation, whichever is later.
5. Owner’s Representative Action: If necessary, Owner’s Representative will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner’s representative will forward acceptance or rejection of proposed substitution within 15 days of receipt of request, or 15 days of receipt of additional information or documentation, whichever is later.

1.05 QUALITY ASSURANCE

1.06 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Cause and/or Convenience:

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and/or other Design Team member’s evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.
    c. Requested substitution is consistent with the Contract Documents and will produce indicated results including Assembly System and Warranty requirements.
    d. Substitution request is fully documented and properly submitted.
    e. Requested substitution will not adversely affect Contractor's construction schedule.
    f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    g. Requested substitution is compatible with other portions of the Work.
    h. Requested substitution has been coordinated with other portions of the Work.
    i. Requested substitution provides specified warranty.
    j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION

3.01 SEE SECTION 01 2501 SUBSTITUTION REQUEST FORM

END OF SECTION

SUBSTITUTION REQUEST FORM

01 2501

TO: Hereford Dooley Architects
11 Lea Ave #601
Nashville, TN 37210

From: _____

_____

_____

Substitution Request No:_____ DATE: _____

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

☐ Pre-bid substitution.

☐ Post-bid substitution.

PROJECT SPECIFICATION

Specification Name/Number: _____

Article, Paragraph, Page Number: _____

Item/System to be Substituted: _____

REASON FOR SUBSTITUTION REQUEST

SPECIFIED PRODUCT . . .

☐ Is no longer available.

☐ unable to meet project schedule.

☐ Is unsuitable for the designated application.

☐ Cannot interface with adjacent materials.

☐ Is not compatible with adjacent materials.

☐ Cannot provide the specified warranty.

☐ Cannot be constructed as indicated.

☐ _____ Cannot be obtained due to one or more of

☐ the following:

- ☐ Strike
- ☐ Lockout
- ☐ Bankruptcy of manufacturer or supplier
- ☐ Similar occurrence

PROPOSED PRODUCT . . .

☐ Will reduce the Contract Time Is by_____days.

☐ Will reduce the Contract Sum by $_____.

☐ Is an Owner-initiated substitution Other:____

Explanation of each item marked above (attach documentation):

_____

_____

_____

EFFECT OF SUBSTITUTION

Proposed substitution affects other work or trades: ☐ No ☐ Yes (if yes, explain)

_____

_____

Proposed substitution requires dimensional revisions or redesign of architectural, structural, mechanical, electrical, plumbing, life safety, or other work:

☐ No ☐ Yes (if yes, attach data explaining revisions)

PRODUCT COMPARISON

Provide side-by-side comparison between proposed substitution and specified product to facilitate review of Substitution Request:

	SPECIFIED PRODUCT:	**PROPOSED PRODUCT:**
Manufacturer:	_____	_____
Name / Brand:	_____	_____
Catalog No.:	_____	_____
Supplier:	_____	_____
Features:	_____	Variations: _____
	_____	_____
	_____ (Attach additional sheets if necessary)	_____ (Attach additional sheets if necessary)

Local Distributor / Supplier: _____

Manufacturer's Representative: _____

Maintenance Service Available: Yes ☐ No ☐

Spare Parts Sourceand Location: _____

Warranty Available is equivalent to the specified warranty: Yes ☐ ☐ No __ Years

Describe any variation fromspecified warranty: _____

Product Manufacturing History ☐ New ☐ 2-5 yrs ☐ 6-10 yrs ☐ More than 10 yrs

SUPPORTING DATA ATTACHED (REQUIRED WHERE APPLICABLE)

☐ Point-by-point comparison of performance criteria, materials, and components of specified product with proposed substitution.

☐ Drawings ☐ Specifications ☐ Product Data ☐ Samples

☐ Tests ☐ Reports ☐ LEED Compliance ☐ Warranty

ACKNOWLEDGEMENTS: The undersigned certify that:

- **Performance**: Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product, including appearance, quality, performance, code compliance, and sustainability compliance.
- **Warranty:** Same warranty will be furnished for proposed substitution as for specified product.
- **LEED Compliance (LEED projects only):** Same contribution to LEED program.
- **Operations and Maintenance**: Same maintenance service and source of replacement parts, as applicable, are available locally for the proposed substitution.
- **No Adverse Effect**: Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- **No Adverse Time or Cost**: Cost data and time as stated above are complete. Contractor bears all costs for labor and materials associated with fully integrating proposed substitution into the Project. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.
    - Payment will be made to the Owner for changes to the project design, including Architect's and Engineer's redesign fees and engineering, detailing, special inspection, and construction costs incurred by the Owner caused by acceptance of the substitution.
    - Coordination necessary to fully integrate the proposed substitution, and any associated modifications to related or adjacent Work, have been or will be performed.
- **Dimensions and Clearances**: Proposed substitution does not affect dimensions or functional clearances.
- **Conditions of Acceptance**: The Architect's recommendation for approval, if granted, relies on data submitted and the opinion and knowledge of the Architect at the time decision is rendered. The approval is conditional in nature and subject to reevaluation and reconsideration if additional data or materials are submitted, or coordination with other work is observed to invalidate claims that substitution is equal to item originally specified.

Contractor: _____
(Name of Contractor)

Date: _____ By: _____

Subcontractor: _____
(Name of Subcontractor)

Date: _____ By: _____

Note: *Substitution requests are not part of the standard submittal process and shall not be submitted as part of Shop Drawings, Product Data, or Samples submittals. Substitution requests must be filled out completely. Unresponsive or incomplete requests will be rejected and returned without review.*

ARCHITECT'S REVIEW AND ACTION

☐ Substitution acceptance is recommended.

☐ Substitution acceptance is recommended, with the following comments: _____

_____

☐ Architect's additional services proposal attached.

☐ Resubmit Substitution Request:

☐ Provide the following: _____

☐ Provide proposal indicating amount of savings / credit to Owner

☐ Substitution acceptance is not recommended: Provide the

☐ following:_____

Architect *acknowledges its reliance upon information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to not comply with requirements of the Contract Documents, the Contractor shall be solely responsible for performance of the work in accordance with requirements of the Contract Documents.*

By: _____ Date: _____

OWNER'S REVIEW AND ACTION

☐ Substitution is accepted.

☐ Substitution is not accepted.

By: _____ Date: _____

(Owner's Representative)

END OF FORM

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Electronic document submittal service.

C. Preconstruction meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Progress photographs.

G. Coordination drawings.

H. Submittals for review, information, and project closeout

I. Requests for Interpretation (RFI) procedures.

J. Submittal procedures.

1.02 REFERENCE STANDARDS

A. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 RELATED REQUIREMENTS

A. Section 01 5719 - Temporary Environmental Controls: Requirements for construction and material procedures.

B. Section 01 6000 - Product Requirements: General product requirements.

C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

E. Section 01 9113 - General Commissioning Requirements: Requirements for construction operations, start-up, and functional testing.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT DELIVERY SERVICES

A. All documents transmitted for the purpose of administration of the Contract Documents shall be in electronic (PDF) format.
   1. It is Contractor's responsibility to submit documents in allowable format. File Transfer Protocol (FTP) sites, Dropbox, Filezilla, Procore, and/or other project management sites requiring a separate login are not acceptable methods of transmission.
   2. Hard copy paper documents shall not be accepted or reviewed, with the exception of physical samples and color selection charts.
      a. Provide only one (1) physical copy of each sample or color selection chart, or quantity as specified in individual specification sections.

B. Documents shall be transmitted via the Project's websites, as follows:
   1. eBuilder shall be utilized for transmission of all:
      a. Contract Drawings
      b. Contract Specifications
      c. Contract Revisions
   2. Mutually agreed upon interface shall be utilized for transmission/submission of all:
      a. Submittals for review/approval
      b. Reviewed/Returned Submittals
      c. Requests for Interpretation
   3. eBuilder processes shall be utilized for transmission/submission of all:
      a. Change Orders (CO)

C. Owner, Contractor, Architect, and Architect's consultants shall be granted access to the project websites. Contractor shall notify the Architect of any other project team members that may require access.
   1. Users of the service are required to have an email address, internet access, and PDF review software (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com).

D. Training: One, one-hour, web-based training session may be arranged for all participants, with representatives of the Owner's, Architect's, and Contractor's teams participating, if requested by the Project Team.

E. Project Closeout: Architect will determine when to terminate the Project's website services. Contractor shall be responsible for assembling and providing archive documents for Owner as specified in Section 017800 - Closeout Submittals.

3.02 PRECONSTRUCTION MEETING

A. Contractor will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Record minutes and distribute copies within three days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress, construction schedule, and month look ahead activities.
3. Field observations, problems, and decisions that will be required this month and next month.
4. Identification of items that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules and any potential weather delays.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to work.

E. Record minutes and distribute copies within three days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made. Any corrections to meeting minutes shall be submitted within 7 days after their issuance.

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

B. Within 10 days after joint review, submit complete schedule.

3.05 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer.

D. Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
2. Provide factual presentation.
3. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

E. Digital Photographs: In JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via email.
2. File Naming: Include project identification, date and time of view, and view identification.
3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.06 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare a RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare using software described below:
      a. Contractor shall access the RFI submission form via the mutually agreed upon interface.
      b. Contractor shall input the following information:
         1) Name of person submitting the RFI.
         2) Email Address.
         3) RFI number.
         4) RFI title.
         5) Select disciplines involved in the RFI.
         6) Upload/attach RFI PDF and its attachments into a single electronic file. PDF format is required.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section – 01 6000 - Product Requirements)
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date and requested reply date.

5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
8. If RFI content is not thorough and complete, RFI may receive no action.

F. Additional documentation: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Identify items requiring priority or expedited response.
4. Identify items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within five business days of receipt, per discipline. For the purpose of establishing the start of the mandated response period, RFIs received after 1:00 PM CST will be considered as having been received on the following regular business day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and requested in a timely manner.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Proposal Request request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with a suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within five business days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.07 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Coordinate with Contractor's construction schedule and schedule of values, and typical 14 calendar day review duration.
2. Format schedule to allow tracking of status of submittals throughout duration of construction.
3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review after being reviewed and stamped by the Contractor (submit all required items of an assembly system at the same time):
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Other information required in individual spec sections.

B. Submit to Architect via web-based submittal form for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Submit photos of samples simultaneously with submission of physical samples or color charts to the Architects office "ATTN: Submittals Department". These will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

E. If components are a part of an assembly system, Contractor shall submit all components of the assembly at the same time for an all-encompassing review, for example: UL assemblies, TCNA assemblies, NFPA 285 exterior wall assemblies, etc.

3.09 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List prior to request for Substantial Completion.

B. Submit Verification Letter on contractor's letterhead of Completed Final Correction Punch List for inclusion with, or prior to, Application for Final Payment.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated

D. Submit for Owner's benefit during and after project completion.

3.11 SUBMITTAL REQUIREMENTS

A. Electronic Documents: Submit one electronic copy in PDF format for each applicable submittal requirement. An electronically-marked up copy of the file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Copies at Project Closeout: See Section 01 7800.

C. If required, submit one sample and/or color chart, or as specified in individual specification sections, which will be retained by Architect. For products with color and finish variations, provide samples representative of the color and texture range expected in the finished installation. Electronic review comments will be provided for samples but samples will not be returned.
   1. Contractor to retain duplicate of submitted and approved samples at project site.

3.12 SUBMITTAL PROCEDURES

A. General Requirements:
   1. A single transmittal may be used for related items under the same specification section.
   2. Submit separate but complete - including product data, samples, shop drawings, etc.- packages of submittals for review and submittals for information, when included in the same specification section. Incomplete submittal packages shall not be reviewed. Products from multiple specification sections on one transmittal will not be accepted.
   3. Transmit using approved form.
      a. Use Contractor's form, subject to prior approval by Architect.
   4. Sequentially identify each item (PDF file):
      a. Sequentially number the submittal by specification section number first, then submittal section, then submittal type, and then revision. For example; 064100-001 Architectural Wood Casework Product Data, 064100-002 Architectural Wood Casework Shop Drawings, 064100-003 Architectural Wood Casework Samples, etc. Revised submittals are to reference original submittal number and a sequential numeric suffix. For example, 064100-002-1 Architectural Wood Casework Shop Drawings and if necessary 064100-002-2 Architectural Wood Casework Shop Drawings, etc.
   5. Identify: Project Name; Architect's Project Number; Contractor; and pertinent specification section name and submittal number on each submittal.
   6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow ten (10) business days after submission for Architect's review and return of submittal to the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional ten (10) business days per discipline.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for Contractor and Architect review stamps.
   10. When revised for resubmission, identify all changes made since previous submission.
   11. Distribute reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
   12. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Submit concurrently with related shop drawing submittal.
   4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.

2. A copy of the Architect's BIM model or CADD drawings of the overall floor plans and overall reflected ceiling plans will be provided to the Contractor for use only to AID in preparing shop drawings for submission. RESUBMISSION OF CONTRACT DOCUMENTS IN ANY FORM IS NOT ACCEPTABLE FOR SHOP DRAWINGS AND WILL NOT BE REVIEWED.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together simultaneously as a single electronic PDF package and, if applicable, a single physical package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Electronic Samples: Include with transmittal high-resolution image files of samples to facilitate electronic review and approval.
4. Physical Samples: If physical samples are specified, submit only one (1) physical sample or color chart as applicable for each finish or color variation, to be retained by Architect. Electronic review comments will be provided, however physical samples will not be returned to Contractor.
a. Physical Samples shall be delivered to Architect's office for review

3.13 SUBMITTAL REVIEW

A. Submittal review is only for conformance with the design concept of the Project and compliance with the information given in Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

B. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

C. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "No Exceptions Taken", or language with same legal meaning.
1) "Note Markings", or language with same legal meaning. Resubmission is not required.
2) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
2. Not Authorizing purchasing, fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.

END OF SECTION

SECTION 013250
BUILDING INFORMATION MODELING (BIM)

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes requirements for Building Information Modeling including, but not limited to, the following:
   1. Development of Construction Model(s), at Contractor's option.
   2. Development of Coordination Model(s) and Reports.

B. Contractor's Responsibility:
   1. Contractor is solely responsible for the quality and accuracy of all documentation of this Section.
   2. The intent of BIM deliverables is to avoid interference and conflicts, optimize construction sequencing, achieve greater efficiencies in cost estimating and project coordination, and ensure access for maintenance, replacement or repairs.
      a. Coordination: Contractor is solely responsible for the coordination of facility systems and equipment.
      b. Construction sequencing: Contractor is solely responsible to sequence construction activities to facilitate the fabrication and installation of systems and equipment without interference, conflicts or delays in construction, and providing adequate access to effectively maintain and replace systems and equipment.

C. Existing Documents: The following building information, obtained and developed by the Architect and/or Engineer during the design phase, may be available to the Contractor:
   1. Design Intent Model(s) (.rvt, .ifc, & .nws / .nwd)
   2. Contract Documents (.pdf)
   3. CAD Files (.dwg)

1.02 DEFINITIONS

A. As-Built Model: Building Information Model(s) developed by the Contractor that represents the installed condition of facility elements.

B. Building Information Model (BIM): A digital representation of physical and functional characteristics of a facility.

C. Construction Model: Building Information Model(s) that demonstrates and communicates the facility data necessary to procure, fabricate, schedule or construct the Project.

D. Coordination: A process implemented to ensure the efficiency and harmony of the relationship of facility elements. Typically performed in a BIM environment by evaluating interferences, also called "clash detection".

E. Coordination Model: Building Information Model(s) that demonstrates and communicates the spatial relationship of facility elements.

F. Coordination Report: A report developed to communicate and demonstrate that the facility elements have been properly coordinated and identify areas where issues may still exist.

G. Design Intent Model: Building Information Model(s) that demonstrates and communicates the creative objectives of the designer.

H. Fabrication/Shop Drawing: Drawing generated by the contractor from a Construction Model based on the contract documents that communicates the information necessary to fabricate facility elements. Fabrication/Shop Drawings typically contain one system and are intended for use of trade personnel to fabricate, assemble, and install facility elements.

I. Facility Breakdown Structure: a system-oriented hierarchical decomposition of a facility into smaller components. Typically the facility breakdown structure is based on disciplines, trades, described by Master Format.

J. Facility Asset Data: Non-graphical information attached to an object in a Building Information Model that defines various characteristics of an object.

K. Furnishings: Built-in or movable cabinets, casework, seating or other appurtenances provided by the Contractor.

L. Interference/Clash Detection: Spatial conflict between facility elements.

PART 2 – PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.01 CONTRACT DOCUMENTS AND DESIGN INTENT MODEL(S)

A. The Contract Documents will be provided to the Contractor for reference in the development of the Construction and Coordination Model(s) and Fabrication/Shop drawings. Design Intent Model(s) are available to the Contractor for reference in the development of the Construction and Coordination Model(s) and Fabrication/Shop drawings. The Contract Documents and Design Intent Model(s) communicate creative objectives of the Architect and/or Engineer and are not intended to be used for fabrication and construction of the facility in that the size, arrangement, and level of development of facility elements may not have the necessary tolerances to allow for fabrication.

B. The Contract Documents are the binding document(s) of record, the Design Intent Model(s) may be provided for reference only.
   1. Design Intent Model(s) may be obtained by the Contractor from the Architect and/or Engineer after the Contractor has signed and returned the Architect and/or Engineer provided Electronic Files Release Letter.

3.02 INSPECTION OF EXISTING CONDITIONS

A. Prior to the development of the Construction / Coordination Model(s), the Contractor shall inspect and verify accuracy of information communicated in the Contract Documents and Design Intent Model with respect to the existing conditions. The Contractor shall notify Architect if any conflicts among Contract Documents, the Design Intent Model, and existing conditions are discovered.

3.03 DEVELOPMENT OF CONSTRUCTION MODEL(S)

A. The intent of the Construction Model(s) is to communicate the necessary information to construct the facility including size, location, and arrangement of both existing to remain and new elements and to incorporate the as-built conditions.

B. At the Contractor's option, develop Construction Model(s) based upon Contract Documents, Design Intent Model(s), and verified existing conditions.

C. Construction Model(s) shall accurately reflect the geometry and details of existing and new elements within the facility.
   1. Use manufacturer or custom model elements to accurately reflect the components detailed in documents submitted for approval.
   2. Update the model elements to accurately reflect any revisions to geometry or details arising from the submittal review process.

D. Construction Model(s) are to have a consistent origin that can be referenced to a real world datum or benchmark.

E. The Construction Model(s) are to reflect necessary accesses and clearances.

F. The Construction Model(s) will include, but not be limited to, the following elements with all necessary intelligence included to produce plans, sections, elevations, riser diagrams, and schedules as applicable:
   1. Substructure: All foundations, subgrade enclosures, slabs-on-grade, and water and gas utility connections. Substructure elements shall be depicted with all necessary recesses, curbs, pads, slopes, closure pours, expansion/construction joints, and major penetrations depicted.

2. Shell: All superstructure, exterior vertical enclosures, and exterior horizontal enclosures, including a depiction of expansion/construction joints.
    a. Superstructure: All columns, primary and secondary framing members, and bracing for the roof and floor systems (including decks).
    b. Exterior Vertical Enclosures: Exterior vertical enclosures shall be depicted to the exact height, length, width and ratings (thermal, acoustic, fire) to properly reflect element types. Exterior windows, doors and grilles including hardware sets, louvers and vents, and wall appurtenances shall be depicted to represent their actual size, type and location.
3. Interiors: All interior partitions, windows, doors and grilles, louvers and vents, raised floors, and ceilings, depicted to represent their exact location, height, length, width and ratings (thermal, acoustic, fire) to properly reflect element types.
4. Services: All elevators, escalators, plumbing, HVAC, fire protection, electrical, communications, electronic safety and security, and integrated automation elements, including all major openings and penetrations, cable trays, cable bundles and pipe grouping. All clearances and insulation shall be accounted for in the model for use in interference management and maintenance access requirements. Nonpermanent items are not required to be modeled.
    a. Plumbing: All plumbing elements including plumbing piping and fixture layouts, floor and area drains, and related equipment.
    b. Heating, Ventilation, And Air Conditioning (HVAC): All heating, ventilation, and air conditioning (HVAC) elements including piping, valves, ductwork fixture lay- outs and related equipment.
    c. Fire Protection: All fire protection elements including piping, valves, and related equipment.
    d. Electrical: All electrical elements including conduit, fixture layouts and related equipment (including power for systems furniture).
    e. Communications: All communications and low voltage systems elements including conduit and related equipment.
    f. Security: All Electronic Safety and Security elements including conduit and related equipment.
    g. Integrated Automation: All integrated automation elements including conduit and related equipment.
    h. Model all elements larger than 38mm (1-1/2 inch (38 mm)) in diameter for any trade. When equal or smaller element are grouped or run in a uniform path. That group of elements shall be modeled when larger than 152mm (6 inches (152.4 mm)).
5. Equipment and Furnishings: All fixed equipment and furnishings, depicted to represent their exact location, height, length, width, configuration, materials, finishes, and mechanical and electrical requirements.
6. Special Construction and Demolition: All special construction and demolition including special construction, facility remediation and demolition
7. Sitework: All sitework elements, including site improvements, liquid and gas utilities, electrical site improvements, and site communications.

G. Construction Model(s) shall be reviewed, revised, and certified for accuracy and completeness by the Contractor prior to installation of facility elements contained within the models.

3.04 DEVELOPMENT OF COORDINATION MODEL(S)

A. Develop Coordination Model(s) that combine facility elements contained within the Construction Models with other facility elements depicted in the Design Intent Model in order to review the efficiency and harmony of the relationship of the facility elements.

B. Verify that all facility elements are properly represented within the Construction and Coordination Model(s) prior to coordination.

C. To ensure that there are no conflicts in the installation of facility elements, conduct interferences checks which include, but are not limited to, the following:

1. Substructure/Shell vs Interiors
2. Substructure/Shell vs Equipment and Furnishings provided by Contractor
3. Interiors vs Equipment and Furnishings provided by Contractor.
4. Substructure vs. Shell
5. Services vs other components:
    a. Services vs Substructure/Shell
    b. Services vs Interiors
    c. Services vs Equipment and Furnishing
    d. Services vs Site work
6. Services
    a. Plumbing vs HVAC
    b. Plumbing vs Fire Protection
    c. Plumbing vs Electrical
    d. Plumbing vs Communications
    e. Plumbing vs Electronic Safety and Security
    f. HVAC vs Fire Protection
    g. HVAC vs Electrical
    h. HVAC vs Communications
    i. HVAC vs Electronic Safety and Security
    j. Fire Protection vs Electrical
    k. Fire Protection vs Communications
    l. Fire Protection vs Electronic Safety and Security
    m. Electrical vs Communications
    n. Electrical vs Electronic Safety and Security
    o. Communications vs Electronic Safety and Security
7. ADA Accessibility

D. Coordination Model(s) shall be free of interferences prior to installation of any associated facility element.

E. Update the Coordination Model(s) to reflect changes throughout construction prior to installation of any associated facility element.

3.05 COORDINATION REPORT(S)

A. Develop Coordination Reports identifying outstanding issues after the development of the Coordination Model(s), including but not limited to:
    1. Clashes:
        a. Itemize number of clashes.
        b. Clash Category
        c. Describe clashes.
        d. Describe the resolution of clashes and other conflicts.
    2. Design changes.
    3. Differing site conditions.
    4. Hazardous or safety related issues.
    5. Assets installed and assets pending installation.

B. The report shall be organized by project specification section or by trade.

C. The issues identified within the Coordination Report are to be addressed by the Contractor in consultation with the owner's representative(s) and the Architect / Engineer prior to installation of facility elements.

D. The Contractor is solely responsible for the cost of remedying clashes that could have been discovered during the clash detection process.

END OF SECTION

SECTION 01 32 55

ELECTRONIC FILE TRANSFER AGREEMENT

By accepting, transmitting, storing, duplicating, disseminating or otherwise utilizing any electronic drawings, models or data (individually and collectively, **"Electronic Data")** which was originally generated or distributed by **HEREFORD DOOLEY ARCHITECTS** ("**Sender"**) the recipient (**"Receiving Party"**) shall be deemed to signify its assent and agreement to be bound by these Electronic Data transfer terms and Conditions (these **"Conditions"**), and shall be deemed to agree that all Electronic Data are instruments of service of Sender and that Sender shall be deemed to the author and owner of such Electronic Data and shall retain all common law, statutory law and other rights therein, including without limitation, all related copyrights.

The Receiving Party is a contractor (the **"Contractor"**) performing services and/or directly or indirectly providing goods and material related to the subject project (the "Project"). The Receiving Party acknowledges and agrees that the Sender has no contractual obligation, or any other obligation, to provide the Electronic Data to the contractor. Sender agrees to provide the Electronic Data in consideration for the undertakings of the Receiving Party. The Receiving Party agrees that the Contract Documents that Sender is contractually obligated to prepare and/or deliver are hardcopy drawings and specifications only. The Receiving Party additionally agrees that the Electronic Data are not Contract Documents (as that term is defined in or understood to mean in the Owner-Contractor Agreement), do not represent Contract Document modifications, and are not intended to be a substitute for or a supplement to the hardcopy drawings and specifications, or to necessarily represent actual physical conditions on the Project site.

Electronic Data to be furnished include work prepared by Sender. The Electronic Data were prepared by Sender's software platform. Electronic Data will be furnished in that software platform's standard format without modifications for the Contractor's convenience. One set of Electronic Data will be furnished to the Contractor. The Contractor assumes responsibility for distributing pertinent files to the subcontractors.

The Receiving Party agrees that the request to provide the Electronic Data is purely for the convenience of the Receiving Party and does not constitute the rendering of professional services. Sender has prepared the Electronic Data to facilitate the production of the Contract Documents, which are reasonably accurate and complete to the extent of the standard of professional care. The Receiving Party acknowledges that Sender does not represent the furnished Electronic Data as being accurate or complete, as being suitable for the Contractor's purpose, or as identifying or containing any issue, anomaly, omission, or concern with reference to the Project.

The Receiving Party agrees and understands that the Electronic Data, except as expressly set forth above, are not fit for any particular purpose, including but not limited to quantity take-offs; pricing; clash detection; ascertainment of construction or installation tolerances and clearances; preparation of shop drawings, coordination drawings, or fabrication drawings; construction sequencing; or the manufacture of any building component or system. As such, the Electronic Data, and the information contained in them, and the information that may have been omitted from them, shall not be used as a basis for an increase in the Contract Sum or Contract Time.

The Receiving Party acknowledges that the Electronic Data have not necessarily been developed with the assistance or specific expertise of the individual subcontractors or installers and therefore do not account for or incorporate means and methods required by individual subcontractors for their scope of the finished Work. Modifications to the information about the components included in the Electronic Data may be required and are the responsibility of the Contractor to ascertain, coordinate, and implement. All such

modifications are part of the scope of Work of this Project and shall be provided at no additional cost to Owner.

The Receiving Party further acknowledges that Sender has made no representations to the Receiving Party that the Electronic Data are suitable for any purpose other than as expressly set forth above, or will be usable by the Receiving Party's systems, infrastructure, or software. The Receiving Party also understands and agrees that the Electronic Data may be subject to anomalies, errors, viruses, malware, or other unintended defects, and that Sender has not reviewed or determined whether such defects may be present in any electronic files. Use of these electronic files is solely at the risk of the Receiving Party.

The Receiving Party agrees to release any and all claims that they may have at any time against Sender or its consultants arising out of the use of the Electronic Data by the Receiving Party or by any other individual or entity. The Receiving Party agrees to hold harmless and indemnify Sender and its consultants from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees arising from or in any way connected with the provision of the Electronic Data by Sender or the use, modification, misinterpretation, misuse, or reuse by others of the Electronic Data provided by Sender. The Receiving Party shall not use, modify, or reproduce any of the Electronic Data without first removing identifying information for Sender and its consultants that may be incorporated in the furnished Electronic Data.

The Receiving Party confirms that it will use the Electronic Data only with reference to the Project and shall not copy or distribute the Electronic Data or permit the Electronic Data to be copied or distributed by others, except for use on this Project. The Receiving Party shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms and conditions of this Agreement, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by this Agreement, assumes toward the Owner and Sender. The Receiving Party Contractor assumes responsibility for the breach of this Agreement by any Subcontractor to whom the Contractor distributes the Electronic Data.

The Receiving Party agrees that they are authorized to bind the company indicated below to the obligations of this Agreement, and understands that Sender is relying upon this representation in agreeing to enter into this Agreement. In addition to any rights that Sender may have against the company, the Receiving Party agrees that Sender shall have rights personally against the Receiving Party if this apparent authority is questioned or disputed by the company in any way.

END OF SECTION

SECTION 01 33 24
STRUCTURAL SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural submittals include shop drawings, diagrams, illustrations, schedules, performance charts, nomenclature charts, samples, brochures and other data prepared by the Contractor or any subcontractor, manufacturer, supplier, fabricator, or distributor and which illustrate some portion of the Project.

1.02 RELATED SECTIONS

A. Division 1 Sections

1.03 SUBMITTAL PROCEDURES

A. Submittals shall be accompanied by a transmittal letter with the following information:

1. Project name.
2. Contractor's name.
3. Date submitted.
4. Description of items submitted; identify Work and product by Specification Section.
5. Number of drawings and other pertinent data.

B. Provide blank space on each submittal for the Architect/Structural Engineer's review stamp.

C. The type and number of submittals for each item shall be in accordance with Section 01 30 00.

D. Contractor shall direct specific attention on the submittal to any deviation from the Construction Documents.

1.04 CONTRACTOR RESPONSIBILITY

A. Contractor shall make all submittals in advance of installation or construction to allow the Architect/Structural Engineer sufficient time for review.

B. Contractor shall review all submittals and shall stamp and sign each sheet of shop drawings and product data and sign each sample to certify compliance with requirements of Construction Documents. SUBMITTALS RECEIVED WITHOUT THE CONTRACTOR'S STAMP OF REVIEW WILL BE RETURNED TO THE CONTRACTOR FOR REVIEW AND RESUBMITTAL.

C. Contractor shall understand that the submittal of the required documents does not constitute compliance with the requirements of the Construction Documents; only submittals reviewed by the Architect/Structural Engineer constitute compliance.

D. It is the Contractor's responsibility to furnish equipment, materials, and labor for the Project which meets the requirements of the codes and authorities quoted as well as the Construction Documents. Proprietary items specified herein only establish a minimum functional and aesthetic standard and it is incumbent upon the Contractor to ascertain conformance of these proprietary items or any proposed substitution with the codes and authorities.

E. By reviewing, approving and submitting shop drawings, product data, or samples, Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, member sizes catalog numbers, and similar data and that he has checked and coordinated shop drawings with the requirements of the Project and of the Construction Documents.

F. Work requiring shop drawings, whether called for by the Construction Documents or requested by the Contractor, shall not commence until the Architect/Structural Engineer has reviewed the submission. Work may commence if the Contractor verifies the accuracy of the

Architect/Structural Engineer's corrections and notations and complies with them without exception and without requesting change in Contract Sum or Contract Time.

1.05 ARCHITECT / STRUCTURAL ENGINEER REVIEW

A. Architect/Structural Engineer will review submittals with reasonable promptness.

B. Architect/Structural Engineer's review or corrections refer only to the general arrangement and conformance of the subject of the submittals with the design concept of the Project and with the information given in the Construction Documents. Under no conditions should the Contractor consider the review to include the dimensions, quantities, and details of the items nor the approval of an assembly in which the item functions.

C. Architect/Structural Engineer's review shall not relieve the Contractor from responsibility for errors or omissions in the submittals.

D. Architect/Structural Engineer's review of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Construction Documents unless the Contractor has directed specific attention to the deviation at the time of submission and the Architect/Structural Engineer has given written approval to the specific deviation.

E. Architect/Structural Engineer's review of submittals shall not be construed as authorizing any change in the Contract Sum or Contract Time.

1.06 SHOP DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with Project name and number; identify each element of drawings by reference to sheet number and detail of Construction Documents.

B. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

C. Identify field dimensions; show relationship to adjacent or critical features of Work or products.

D. A copy of the marked structural shop drawings with the Architect/Structural Engineer's review stamp is to be maintained at the job site.

1.07 PRODUCT DATA

A. Submit only pages that are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information that is not applicable.

C. Provide manufacturer's preparation, assembly, and installation instructions.

1.08 SAMPLES

A. Submit full range of manufacturer's standard finishes, except where more restrictive requirements are specified, indicating colors, textures, and patterns.

B. Submit samples to illustrate functional characteristics of products, including parts and attachments as required by Architect/Structural Engineer.

C. Approved samples that are of proper size may be incorporated in Work.

D. Label each sample with identification.

E. Field Finishes: Provide full samples at Project, at location acceptable to Architect/Structural Engineer, as required by individual Specification Section. Install each sample complete and finished. Acceptable finishes in place may be retained in completed Work.

1.09 RESUBMITTALS

A. When submittals are returned to the Contractor with the Architect/Structural Engineer's corrections the Contractor shall make the required corrections. Upon request, resubmit one corrected set.

B. Contractor shall direct specific attention on the resubmittal to all revisions including those requested by the Architect/Structural Engineer on previous submission.

1.10 DISTRIBUTION

A. Distribute reproductions of shop drawings, copies of product data, and samples which bear the Architect/Structural Engineer's review stamp to job site file, Record Documents file, subcontractors, suppliers, other affected contractors, and other entities requiring information.

B. Work shall be in accordance with and performed from the reviewed drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 33 24

SECTION 013513
HOSPITAL PROJECT PROCEDURES

PART 1 – GENERAL

1.01 REFERENCE STANDARDS

A. NFPA 101-2012 - Life Safety Code; 2012.

1.02 SUMMARY

A. This Section includes environmental control specific to occupied medical care facilities.

1.03 PUBLISHED REGULATIONS

A. Abide by published hospital regulations and amendments, including those that may be issued during the Contract. Particular attention is called to regulations pertaining to circulation, noise, sanitation, safety, security, and behavior.

1.04 OWNER'S REPRESENTATIVE

A. Abide by directions of Owner's Representative in matters affecting operation, safety, and security of Hospital, patients, and visitors.

B. Abide by directions of Hospital Fire Marshal in matters pertaining to fire safety and preventative measures.
   1. Immediately implement oral instructions by local Fire Marshal. Confirmation or explanation of oral instructions will be made by Owner by written notice or at next scheduled progress meeting.

C. Instruct personnel employed by Contractor, including subcontractors and their employees, to abide by published regulations, and directives of Owner's Representative and Fire Marshal.

1.05 ENVIRONMENTAL CONTROLS

A. Noise Control: Execute Work as quietly as practicable to avoid unnecessary disturbance of patients.
   1. Complaints duly registered by Owner of unacceptable noise levels is cause for implementation of special precautions and methods of operation, as directed by Owner, to reduce noises to acceptable levels.
   2. Owner is sole judge of noise level tolerability.
   3. Submit "Noise Schedule" as soon as practicable indicating type of demolition and other noise-inducing construction operations showing dates, times, and duration of such work.

B. Temporary Partitions: Provide 1-hour fire-rated temporary partitions and door openings.

1.06 PERSONNEL IDENTIFICATION

A. Employees of Contractor and subcontractors are required to wear Owner approved numbered identification badges while on Hospital premises.
   1. Conspicuously fix identification badges to outer garments above elbow level.
   2. Contractor or subcontractor personnel not complying with this requirement will be denied access to Hospital or will be escorted off premises by Hospital security guards.

1.07 CONSTRUCTION PERSONNEL PARKING

A. Contractor and sub-contractor employees are prohibited from parking their vehicles on premises.

B. Parking is allowed only in areas designated by Owner. Receive permit or instructions prior to parking on site.

1.08 NORMAL LIMIT OF OPERATIONS

A. Normal limit of operations is confined within Limits of Work Area as designated on Drawings.
   1. Owner will prohibit Hospital employees, patients, and visitors from using these areas.

B. Allow access to Owner, Architect, and other personnel performing work within limits of operation.

1.09 PERIODIC OPERATIONS OUTSIDE LIMITS OF OPERATION

A. Use of certain loading berths, passageways, elevators, and other areas outside of defined limits of operation will be granted on intermittent basis as required and requested in advance. Owner will judge, and approve in advance, proper time and extent of such use.

B. Limit requests for use of berths, corridors, elevators, and other spaces to hour-by- hour basis and approved in advance by Owner.

C. Comply with designated travel paths, staging areas, dumpster locations, and other restricted items indicated on Drawings.

1.10 SCHEDULING

A. Schedule arrangements for work that will involve interference with normal Hospital functioning, particularly in occupied patient areas, or adjacent areas, five working days in advance with Owner to provide for minimum of disruption and inconvenience.
   1. Owner will schedule and approve interferences to minimize disruption to normal Hospital functioning.

1.11 WORKING HOURS AND OVERTIME NOTIFICATION

A. Notify Owner and receive permission for work outside of normal daytime working hours either within or outside limits of operation.

B. If in Owner's judgment, any item of work is being unreasonably delayed and interfering with progress of other dependent work through no fault of Owner, overtime work may be ordered at Contractor's expense.

C. Owner may direct Contractor to perform overtime work not originally required by Contract. When overtime work is requested for convenience, additional payment to Contractor will be made for premium time only.

1.12 TORCH-CUTTING AND WELDING PERMITS

A. Welding: Neither welding nor arc-welding will be permitted without appropriate permit from Hospital Fire Marshal.
   1. Hospital has right to stop work at any time if it is determined that unsafe conditions exist.
   2. Correct unsafe conditions as directed by local Fire Marshal and obtain approval of such corrections prior to commencing further work.
   3. Provide electrical power directly from panel box for use by arc-welding equipment. Ascertain that electrical panel has capacity to support welding operations without negative impact on Hospital electrical loads. Do not use Hospital outlets for power sources.
   4. Use of single-phase transformer welding equipment is not permitted.
   5. No welding will be permitted when critical procedures are taking place in adjacent areas, coordinate with Owner.

B. Fire Protection: Keep required exit corridors and passageways clear and unobstructed.
   1. Remove flammable materials to location not closer than 35 feet (1066.8 cm) from welding operations.
   2. Instruct workmen to location of nearest fire alarm.
   3. Completely cover fixed flammable items with fire-resistant blankets.
   4. Existing smoke detectors and fire sprinkler systems shall remain operational throughout Project. If potential false alarms are anticipated during specific construction operations, detectors may be covered during that specific operation with proper notifications and concurrence of local jurisdiction but must be cleared and operable at end of each working day.

PART 2 - PRODUCTS

2.01 EXISTING UNATTACHED EQUIPMENT

A. Existing unattached equipment scheduled for salvage or reuse will be removed from work area by Owner prior to start of construction.

PART 3 - EXECUTION

3.01 EXISTING ATTACHED EQUIPMENT

A. Disconnect and remove existing attached equipment which has been tagged and marked for salvage and reuse by Owner. Remove such equipment in largest possible sections convenient for handling.

B. Disconnect and cap services and utilities serving removed equipment and perform necessary patching.

C. Deliver Owner-tagged and -marked equipment to designated storage areas within Owner's property.

D. In addition to existing attached equipment which has been tagged and marked for salvage and reuse, disconnect and remove following items affected by new construction and store at Owner-designated locations.
   1. Hi-temperature alarm thermostats.
   2. Recorder and door hardware from controlled temperature rooms.
   3. Television set support brackets.
   4. Gooseneck faucets and foot control valves from sinks.
   5. Fire and smoke dampers.
   6. Volume dampers.
   7. Generators (complete).
   8. Vacuum, air, and oxygen outlets.
   9. Terminal reheat units.
   10. Adjustable over-bed light fixtures.
   11. Diffusers and registers.
   12. Pneumatic thermostats.
   13. Fire alarm systems.
   14. Security and alarm systems.
   15. Door and cabinet hardware.
   16. Solid core wood doors (3 feet (91.44 cm) and wider, natural finish).
   17. Mirror and shelf units, toilet accessories.
   18. Nurse call and intercom systems.

E. Remove all other equipment not tagged or specified and remove from site. Sale of Contractor-salvaged items will not be permitted on-site. Comply with applicable regulations for disposal of hazardous materials.

3.02 CLEAN-UP

A. Keep premises free from accumulation of waste materials or rubbish. Remove trash daily.

B. Leave existing toilet rooms in clean and sanitary conditions daily.

3.03 INTERIM LIFE SAFETY MEASURES (ILSM)

A. Definition:
   1. Interim Life Safety Measures (ILSM) = A series of eleven administrative actions required to temporarily compensate for the hazards posed by existing NFPA 101-2012 Life Safety Code or current version adopted by jurisdiction deficiencies or construction activities.

B. Policies
   1. Implementation of ILSM shall be required in or adjacent to all construction areas and throughout buildings with existing LSC deficiencies.

2. ILSM shall apply to all personnel (including construction workers) and shall be implemented upon project development and be continuously enforced through project completion.
3. The ILSM shall consist of the following actions:
    a. Ensuring free and unobstructed exits. Personnel receive additional training when alternative exits are designated. Buildings or areas under construction must maintain escape routes for construction workers at all times. Means of exiting construction areas are inspected daily.
    b. Ensuring fire alarm and unobstructed access to emergency services and for fire, police, and other emergency forces.
    c. Ensuring fire alarm, detection, and suppression systems are in good working order. A temporary but equivalent system shall be provided when any fire system is impaired. Temporary systems must be inspected and tested monthly.
    d. Ensuring temporary construction partitions are smoke tight and built of noncombustible or limited combustible materials that will not contribute to the development or spread of fire.
    e. Providing additional fire-fighting equipment and training personnel in its use.
    f. Prohibiting smoking according to EC.5 throughout the organization's buildings, and in and adjacent to construction areas.
    g. Developing and enforcing storage, housekeeping, and debris removal practices that reduce the building's flammable and combustible fire load to the lowest feasible level.
    h. Conducting a minimum of two fire drills per shift per quarter.
    i. Increasing hazard surveillance of buildings, grounds and equipment, with special attention to excavations, construction areas, construction storage, and field offices.
    j. Training personnel to compensate for impaired structural or compartmentalization features of fire safety.
    k. Conducting organization-wide safety education programs to promote awareness of LSC deficiencies, construction hazards and ILSM.
4. Plant Operations shall report to the Environment of Care Committee the nature and extent of upcoming construction activities or situations in which there are existing NFPA 101-2012 Life Safety Code or current version adopted by jurisdiction deficiencies (See Attachment A).
5. The Environment of Care Committee shall then determine which of the eleven ILSM are appropriate to be put in place during the project or term of deficiency.
6. If time does not permit the Environment of Care Committee to approve the ILSM to be initiated prior to start of project, Plant Operations shall initiate the appropriate ILSM immediately. The report shall be submitted for approval at the next scheduled Environment of Care Committee meeting.
7. Means of exiting construction areas shall be inspected daily and documented. (See Attachment B).
8. Hazard Surveillance of buildings, grounds and equipment with special attention to excavations, construction areas, construction storage and field offices shall be conducted no less frequently than weekly and documented (See Attachment C).
9. Once a construction project is complete or a LSC deficiency has been resolved, Plant Operations shall report to the Environment of Care Committee and they in turn, shall approve the discontinuation of ILSM.

END OF SECTION

ATTACHMENT A

Report of construction activities and/or situations in which there are Existing NFPA 101 2012 Life Safety Code or current version adopted by jurisdiction deficiencies to Safety Committee.

Date: _____

Facility: _____

Describe nature and extent of construction activities and/or situations in which there are existing NFPA 101 2012 Life Safety Code or current version adopted by jurisdiction deficiencies (include length of time estimated for project):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Considerations:

1. Will exits in project area be obstructed? ( )Yes ( )No
   If yes, what plans are in place to provide alternate egress?

_____

_____

_____

2. If alternate exits must be designated or if other fire safety features are impaired, who will be responsible to train personnel?

_____

_____

3. Will access to the emergency services of the facility be obstructed? ( )Yes ( )No
   If yes, how will traffic be rerouted?

_____

_____

4. If the fire alarm system is impaired, is there a temporary, but equivalent system provided?
( )Yes ( )No

5. Will temporary construction partitions need to be erected? ( )Yes ( )No
If so, who will be responsible to see that they are smoke tight and built of non-combustible or limited combustible materials that will not contribute to the development or spread of fire?

_____

_____

_____

6. Who will, be responsible to see that additional fire fighting equipment is available for personnel in construction areas?

_____

_____

7. Do significant code deficiencies exist or does a construction project significantly affect a life safety system? ( )Yes ( )No

If so, fire drills must be conducted a minimum of two per shift per quarter. Who will be responsible to see that these are performed?

_____

_____

8. Who will be responsible to review ICBM with construction foreman/supervisor?

_____

_____

Decision of Safety Committee:

The following ILSM shall be initiated for the duration of the construction project and/or existence of deficiencies:

Aappropriate measures

( ) a. Ensuring free and unobstructed exits. Personnel receive additional training when alternative exits are designated. Buildings or areas under construction must maintain escape routes for construction workers at all times. Means of exiting construction areas are inspected daily.

( ) b. Ensuring free and unobstructed access to emergency services and for fire, police and other emergency forces.

( ) c. Ensuring fire alarm, detection and suppression systems are in good working order. A temporary but equivalent system shall be provided when any fire system is impaired. Temporary systems must be inspected and tested monthly.

( ) d. Ensuring temporary construction partitions are smoke tight and built of noncombustible or limited combustible materials that will not contribute to the development or spread of fire.

( ) e. Providing additional fire-fighting equipment and training personnel in its use.

( ) f. Prohibiting smoking according to EC.5 throughout the organization's buildings and in and adjacent to construction areas.

( ) g. Developing and enforcing storage, housekeeping and debris removal practices that reduce the building's flammable and combustible fire load to the lowest feasible level.

( ) h. Conducting a minimum of two fire drills per shift per quarter.

( ) i. Increasing hazard surveillance of buildings, grounds and equipment with special attention to excavations, construction areas, construction storage and field offices.

( ) j. Training personnel to compensate for impaired structural or compartmentalization features of fire safety.

( ) k. Conducting organization-wide safety education programs to promote awareness of LSC deficiencies, construction hazards and ILSM.

_____

_____ _____

Signature of Plant Operations Director Date

ATTACHMENT B

Interim Life Safety Checklist for Means of Egress

* Means of egress in construction area shall be inspected daily.

Facility: _____

Date	Location of Construction Site	Signature of Employee Performing Inspection

Project Facility Name
Project Description
HCA Project #

Company Name
Architect Project #
Issue Date

ATTACHMENT C

INTERIM LIFE SAFETY MEASURES CHECKLIST

1.	Do all exits provide free and unobstructed egress? If not, describe	____Yes_____No
2.	Do buildings or areas under construction maintain escape routes for construction workers?	____Yes_____No
3.	Have personnel received training if alternative exits have been designated or if any other fire safety features are impaired?	____Yes_____No
4.	Is there free and unobstructed access to the emergency departments/services and for emergency forces?	____Yes_____No
5.	If the fire alarm system is impaired, is there a temporary, but equivalent system provided?	____Yes_____No
	Is there appropriate posting in the department to notify employees that an interim life safety fire plan is in place? If not, describe:	____Yes_____No
6.	Are additional fire drills being performed (at least 2 per shift/quarter)?	____Yes ____No
7.	Are temporary construction partitions smoke tight and built of noncombustible or limited combustible materials that will not contribute to the development or spread of fire? If not, describe:	____Yes ____No
8.	Is additional fire fighting equipment available for personnel in construction area? If not, describe:	____Yes_____No
9.	Is there evidence of smoking in or adjacent to all construction areas? If so, describe:	____Yes_____No
10.	Does the storage, housekeeping and debris removal indicate that the flammable and combustible fire load has been reduced to the lowest level necessary for daily operations? If not, describe:	l____Yes_____No

Other comments:_____

Date:_____ Time: _____

Person conducting the surveillance:
_____

Facility:_____Site observed: _____

SECTION 013533
INFECTION CONTROL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The intent of this section is to outline the process for the Owner's Infection Control Risk Assessment (ICRA) and other related procedures that shall be provided by the Contractor during construction, renovation, maintenance, or other construction-related activities within the healthcare facility to minimize the risk of infection to patients, staff, visitors, and Contractor's personnel. Contractor shall note that:
   1. The responsibility of providing a safe and contained work environment shall be borne by the Contractor, with guidance and approval by the Owner's representative and the facility's ICRA Team.
   2. Contractor's familiarity of all applicable codes and facility standards as related to infection control, including Facility Guidelines Institute (FGI), ASHE (HFCG), and all applicable code requirements by Authority Having Jurisdiction (AHJ), is paramount to minimize risk of infection on this Project.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements
B. Section 01 5000 - Temporary Facilities and Controls.
C. Section 01 5719 - Temporary Environmental Controls.
D. Section 01 6000 - Product Requirements.
E. Section 01 7000 - Execution and Closeout Requirements.
F. Section 01 7800 - Closeout Submittals.

1.03 1.3 DEFINITIONS

A. Containment: The process of isolating a contaminated area from the rest of the facility. Depending on the work to be done and the equipment required, airlocks, pass throughs, and equipment rooms may be necessary. Full containment may require that negative pressure be maintained inside the containment area.
   1. Containment requiring activities include, but are not limited to, the following:
      a. Demolition and removal of walls, floors, ceilings and other building finish materials.
      b. Demolition of plumbing, mechanical and electrical systems and equipment.
      c. Finish operations such as sanding, painting and application of special surface coatings.
      d. Any construction activity that can generate dust.

B. Containment Area: The construction activity area, adjacent staging and storage areas, passages for construction personnel to access the project site, and delivery and removal of supplies and waste. It includes the entire volume of the project area including ceiling spaces above and adjacent to the construction area. Containment areas are determined by the Owner's representative and ICRA Team.

C. Infection Control Risk Assessment (ICRA): An interdisciplinary process that focuses on reducing risk from infection throughout facility planning, design, and construction (including renovation) activities.

D. ICRA Team: This is a multidisciplinary panel comprised of facility personnel with expertise in infection control, direct patient care, risk management, facility design, construction and construction planning, ventilation, safety, and epidemiology, as circumstances dictate.

E. Infection Control Risk Mitigation Recommendations (ICRMRs): ICRMRs are written plans which describe the specific methods by which transmission of airborne and waterborne biological contaminants will be avoided during construction as well as during commissioning, when HVAC and plumbing systems and equipment (e.g., ice machines, steam sterilization systems) are started/restarted.

F. ICRA Work Permit: Form, approved by ICRA Team and issued to Contractor prior to commencing any Work, used to communicate the required infection control interventions (ICRMRs) to be followed by the Contractor throughout construction.

G. Protection Area: The designated project limits, areas adjacent to containment area, including stories above or below, either occupied or used for passage, and areas connected to construction areas by mechanical system intake, exhaust and ductwork. Protection areas shall be determined by Owner's representative and ICRA Team.

1.04 REFERENCE STANDARDS

A. ASHE (HFCG) - Health Facility Commissioning Guidelines; 2010.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

C. Facility Guidelines Institute (FGI) - Guidelines for Design and Construction of Hospitals.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate with the facility's ICRA Team, and other relevant departments to schedule and plan activities that may impact infection control measures. Notify the ICRA Team of any deviations from ICRA or ICRMRs and obtain approval from Owner's representative and ICRA Team if any changes to the plan are necessary.

B. Owner's, or Owner's Representative's, Responsibilities:
   1. Determine that the Containment and Protection Areas are properly defined and adequately enclosed by the Contractor.
   2. Issue a Statement of Requirements in both graphic and written form to communicate the above, based upon an evaluation of the construction area and the impact of the project on patient care.
   3. Approve all barriers and enclosures constructed by the Contractor.
   4. Coordinate construction access with ICRA Team and Contractor.

C. Contractor’s Responsibilities:
   1. Comply with applicable codes and referenced controls using installation procedures and methods that satisfy code requirements and referenced infection control procedures.
   2. Determine specific means and methods of achieving and maintaining control of airborne and waterborne contaminants during construction.
   3. Propose work plan and procedures for control of airborne and waterborne contaminants.
   4. Submit Contractor’s work plan for control of contamination for review in advance of performing any construction activities. Follow procedures established for product shop drawing submittals.
      a. Submit work plan to ICRA Team with copies distributed to Owner and Architect on form approved by Owner. Commonly used forms include the ASHE (HFCG)“Matrix of Precautions for Construction, Renovation, and Operations".
      b. Contractor shall possess am approved copy of ICRA Work Permit, signed by Owner's representative, prior to proceeding with the Work.
      c. Provide and maintain all dustproof enclosures, measurement devices, warning signs and warning lighting to protect the patients, the healthcare staff, and the public. Contractor shall remain responsible for compliance with all contamination control requirements throughout Project.

d. Require all construction personnel, including all subcontractors and any other visitors to Project site, to review infection control procedures, and document understanding by using sign-in method. Provide a copy of attendee sign-in sheet to ICRA Team and Owner's representative.

D. Preinstallation Meeting: Conduct a pre-construction ICRA conference at Project site prior to starting any construction activity. Verify and comply with applicable governing regulations and requirements from Owner, Owner's insurance, ICRA Team, Authority Having Jurisdiction, and requirements in Section 013000 - Administrative Requirements.
   1. Require attendance of all parties directly effecting Work of this section, including, but not limited to:
      a. Contractor, including Project Manager and on-site Superintendant.
      b. Representation of Major Subcontractors.
      c. ICRA Team representative(s).
      d. Owner's Representative(s).
      e. Architect or Architect's Representative(s).
   2. Review methods and procedures related to Infection Control Risk Assessment (ICRA) including, but not limited to, the following:
      a. Review infection control policy's purpose and procedures.
      b. Review Infection Control Risk Mitigation Recommendations (ICRMRs).
      c. Conduct walkthrough of Project site identifying any project-particulars as it relates to ICRA.
   3. Provide copies of Preinstallation meeting minutes to all attendees, including Owner's representative and ICRA Team.

1.06 SUBMITTALS FOR INFORMATION

A. See Section 01 3000 - Administrative Requirements for submittal procedures. All submittals of this section shall be reviewed by Owner's representative and ICRA Team.

B. Product Data: Include technical characteristics, material descriptions, furnished specialties and accessories, rated capacities, and capabilities of individual components for achieving containment.

C. Shop Drawings: Submit drawings and construction details of temporary barriers, and descriptions of procedures to be used to achieve and maintain control of construction-related airborne contaminants.

D. Daily construction logs: Assemble daily logs, in format acceptable to Owner, of all ICRA-related construction activity. Submit on a monthly basis, or shorter period as directed by Owner's representative or as applicable for Project.

E. Test Reports: Indicate ventilation system compliance with specified requirements for performance, if required by ICRMRs.

1.07 QUALITY ASSURANCE

A. Monitoring: If required by ICRMRs, Contractor shall continuously monitor air pressure and other related HVAC performance for conformity with specified ICRA requirements. Maintain daily log documenting compliance.

B. Documents at Project Site: Maintain at project site one copy of approved ICRMRs and ICRA Work Permit, including all barrier shop drawings and other related product data, procedures, and ICRA compliance documentation, at all times during construction.

1.08 FIELD CONDITIONS

A. Ambient Conditions: All ventilation requirements, if required by the ICRMRs, shall be maintained throughout construction, including, but not limited to: required components and equipment, capacity, filtration, air changes, pressure relationships, and directional flow.

PART 2 PRODUCTS

2.01 PRODUCTS - GENERAL

A. Products identified in this section are recommended as appropriate to satisfy ICRA and ICRMRs, and are to be utilized only as approved by ICRA Team or Owner's representative. Other products or manufacturers than those listed may be submitted for approval, but it is the Contractor's responsibility to provide effective documentation that adequately supports substitution. See Section 01 6000 - Product Requirements.

B. TEMPORARY BARRIERS

C. See Section 01 5000 - Temporary Facilities and Controls for typical temporary barrier wall construction. Other products of this section may be used as approved by Owner's representative and ICRA Team.

D. Prefabricated Barrier Walls:
   1. Products:
      a. Edge Guard, Inc.; Adjustable Panels with HEPA Filtered Discharge Port:www.edge-guard.com.
      b. Starc Systems, Inc.; RealWall Negative Air Panels: www.starcsystems.com.
      c. Substitutions: See Section 016000 - Product Requirements.

E. Portable Prefabricated Enclosures: A heavy-duty vinyl enclosure and adjustable, spring-loaded top frame to accommodate variabilities in ceiling height; provide ceiling mechanism for snug fit that will not damage ceiling panels. If required by the approved ICRMRs, furnish enclosures with an inspection window, pressure differential porthole for a HEPA-filtered vacuum device suitable for project conditions, and manometer.
   1. Products:
      a. Fiberlock Technologies, Inc.; Kontrol Kube: www.fiberlock.com.
      b. Mintie Technologies, Inc.; ECU Ceiling Cavity: www.alliance-enviro.com.
      c. ZipWall LLC; Zipwall Dust Barrier System: www.zipwall.com.
      d. Substitutions: See Section 016000 - Product Requirements.

F. Polyethylene Sheet: Internally reinforced fire-retardant polyethylene laminate sheet, NFPA 701compliant, minimum 6 mil (0.1524 mm) thickness, sealed with fire-retardant tape at joints and penetrations above the ceiling.
   1. Products:
      a. Reef Industries, Inc.; Griffolyn Type-55 FR: www.reefindustries.com.
      b. Viaflex; Dura Skrim 2FR: www.viaflex.com.
      c. Substitutions: See Section 016000 - Product Requirements.

2.02 EQUIPMENT

A. If required by the approved ICRMRs, provide all necessary equipment and related construction to achieve, and continuously monitor status of, negative pressures and other ventilation system requirements, as described by Facility Guidelines Institute (FGI) and ASHE (HFCG).

B. See Division 23 for related mechanical equipment, as required.

2.03 ACCESSORIES

A. Adhesive-Faced Contamination Control Mats: Sanitary walk-off mat consisting of multi-layered, disposable, 2 mil (0.0508 mm), non-allergenic, non-odorous, polyethylene sheets with non-drying solid adhesive and anti-microbial germicide.
   1. Products:
      a. American Floor Mats; Clean Room Sticky Mats: www.americanfloormats.com.
      b. Liberty Industries, Inc.; Tacky Mat 800030: www.liberty-ind.com.
      c. Texwipe; CleanStep Adhesive Mats: www.texwipe.com.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Fire-retardant tape: for sealing polyethylene sheet joints and penetrations.

1. Products:
    a. Americover; 377 FRPE Blue Fire Retardant Tape: www.americover.com.
    b. Surface Shields; Seam Tape FR: www.surfaceshields.com.
    c. Substitutions: See Section 016000 - Product Requirements.

C. Personal Protective Equipment (PPE): Provide all code-required personal protective equipment (e.g. face masks, respiratory gear, coveralls, head and shoe coverings, etc.) for all construction personnel present at job site at all times during construction.

PART 3 EXECUTION

3.01 INFECTION CONTROL RISK ASSESSMENT (ICRA) PROCESS

A. General:
1. Infection Control Risk Assessment (ICRA) Team: The ICRA shall be conducted by a panel organized by the Owner, with expertise in infection control, direct patient care, risk management and construction phasing, ventilation, safety, and epidemiology. The Contractor shall provide assistance to the Owner in determining the findings of the ICRA Team and best methods to achieve required results.
2. ICRA Team shall develop tools for analysis of Infection Control Risk Assessments. Commonly used tools include the ASHE (HFCG)“Matrix of Precautions for Construction, Renovation, and Operations."
3. Continuous Updates: The ICRA Team shall provide updated documentation of the risk assessment, together with updated mitigation recommendations, throughout construction.
4. Monitoring: The Contractor shall provide monitoring of the effectiveness of the applied ICRMRs during the course of the project.

B. ICRA Considerations: The ICRA shall address, but not be limited to, the following:
1. Number, location, and type of airborne infection isolation and protective environment rooms.
2. Location(s) of special ventilation and filtration, such as emergency department waiting and intake areas.
3. Air-handling and ventilation needs in surgical services, airborne infection isolation and protective environment rooms, laboratories, local exhaust systems for hazardous agents, and other special areas.
4. Water systems to limit waterborne and other opportunistic pathogens.
5. Consideration of required finishes and surfaces.

C. Construction: When conducting the ICRA and developing ICRMRs, building and site areas anticipated to be affected by construction shall be addressed, including consideration of the following:
1. The impact of disrupting essential services to patients and employees.
2. Determination of the specific hazards and protection levels for each designated area.
3. Location of patients by susceptibility to infection and definition of risks to each.
4. Impact of potential outages or emergencies and protection of patients during planned or unplanned outages, movement of debris, traffic flow, cleanup, and testing and certification of installed systems.
5. Assessment of external as well as internal construction activities.
6. Location(s) of known hazards.

D. Infection Control Risk Mitigation Recommendations (ICRMRs):
1. ICRMR Preparation: The infection control risk mitigation recommendations shall be prepared by the ICRA Team and shall address, but not be limited to, the following:
    a. Patient proximity to construction activities and potential need for patient relocation.
    b. Standards for barriers and other protective measures required to protect adjacent areas and susceptible patients from airborne contaminants.
    c. Temporary provisions or phasing for construction or modification of heating, ventilating, air conditioning, and water supply systems.

d. Protection from demolition.
e. Measures to be taken to train hospital staff, visitors, and construction personnel.

2. Project Requirements: The Owner shall ensure that construction-related ICRMRs, as well as ICRA-generated design recommendations, are incorporated into the project requirements and ICRA Work Permit.

3.02 EXAMINATION

A. Examine containment area(s) and protection area(s), with Owner's representative present, for compliance with ICRMRs.

3.03 PREPARATION

A. Before commencing any demolition or construction, a complete review of all airborne contaminant control policies shall be conducted. The Owner's representative and ICRA Team shall confirm that that area is ready for Work to commence by distribution of approved ICRA Work Permit to Contractor.

B. An ICRA Team representative shall periodically monitor conditions in the vicinity of Project in protection areas. Whenever unsafe conditions are observed, Contractor shall be notified to correct conditions immediately to avoid Work stoppage.
1. All Work shall be stopped immediately whenever a hazardous containment control deficiency exists on the Project.
2. The Contractor shall take immediate action to correct all deficiencies.

C. Installation

D. Install temporary barriers and other infection control products and materials, in accordance with ICRA, ICRMRs, approved ICRA Work Permit, Facility Guidelines Institute (FGI), ASHE (HFCG), and manufacturer's written instructions, at locations directed by Owner's representative, ICRA Team, and as indicated on Drawings.
1. Contractor is responsible for determining when an enclosure or barrier is required to safeguard any protection area; however, the Contractor shall provide barriers where indicated and whenever requested by Owner's representative or ICRA Team.

E. Construct a temporary barrier whenever Work is performed outside of the containment area. Where typically-constructed temporary barrier is not practical, such as spaces above ceilings, construct a barrier consisting of fire-retardant polyethylene sheet, sealed to structure and at all joints and penetrations with fire-retardant tape.
1. At Contractor’s option, a prefabricated barrier or portable enclosure may be used.
2. At no time shall any construction equipment or materials be stored outside the containment area.
3. Any dust or debris tracked outside of construction area shall be cleaned up immediately. Contractor shall have the necessary personnel and equipment to keep adjacent protection areas clean at all times.

3.04 FIELD QUALITY CONTROL

A. Immediately repair all barrier defiencies noted by any persons at Project site, including but not limited to, AHJ or other code official, Owner's representative, ICRA Team, facility staff, or other construction personnel. Document repair or any other ICRA-related barrier construction activity in daily logs.

B. If required by ICRMRs and ICRA Work Permit, continuously monitor status of negative pressures and other ventilation system requirements throughout construction period. Contractor shall immediately stop work and correct defiencies in system if ventilation is noncompliant; document such repairs in the daily log.

3.05 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Upon completion of Work activities, clean work areas including all environmental surfaces, high horizontal surfaces, and flooring materials. Temporary ICRA barriers shall remain in place during all Work, including during cleaning activities.

C. Verify ventilation systems are clean, operational, and meet original airflow and air exchange design specifications.

D. Obtain approval from ICRA Team and Owner's representative prior to removal of temporary barriers and downgrading of ICRA precautions.

E. All temporary barrier removal activities must be completed in a manner that prevents dust release outside of the containment area. If dust could be generated by deconstruction of barriers, utilize a polyethylene sheet barrier to temporarily enclose area.

3.06 CLOSEOUT ACTIVITIES

A. Submit all documentation related to ICRA compliance, including daily construction logs, to Owner along with closeout submittals. See Section 01 7800 - Closeout Submittals.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Manufacturers' field services.

J. Defect Assessment.

1.02 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2024.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.03 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 5000 - Temporary Facilities and Controls

D. Section 01 5719 - Temporary Environmental Controls: Requirements for construction and material procedures.

E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.04 DEFINITIONS

A. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location of the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. 2. Certificates may be recent or previous test results on material or product but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.07 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform specified testing.

1. 1. Owner reserves the right to engage an independent testing agency to perform tests, inspections, and prepare test reports for any portion of Work performed by the Contractor.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.

D. See Section 01 4533 Code Required Special Inspections and Procedures.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Owner, Architect, and Consultants will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials, as necessary.

D. Notify Owner, Architect, and Consultant fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction of the Project.

F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

H. Obtain Owner, Architect, and Consultant's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect and Consultants will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.

2. Make corrections as necessary until Architect's approval is issued.

I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. See also section 01 4 33 Code Required Special Inspections and Procedures.

C. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

D. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

E. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

F. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

G. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment, and other recommended requirements as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 014200
REFERENCES

PART 1 - GENERAL

1.01 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract, without any implied meaning extending the Architect's responsibility into the Contractor's area of Contractor coordination, supervision, or means and methods of construction as outlined in the Conditions of the Contract.
   1. In no situation will an approval by Architect release Contractor from responsibility to fulfill requirements of the Contract Documents.

C. “Authorities Having Jurisdiction” (AHJ): Means the agencies, either individually or collectively, charged by statute with administration and enforcement of the requirements of building codes and other regulations at the Project location.

D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

E. “General Requirements”:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if any) and other Division 01 General Requirement Sections, apply to all sections of the work.
   2. The provisions or requirements of Division 01 Sections apply to entire Work of the Contract and where so indicated, to other elements which are included in the Project.

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. “Installer”: Means the Contractor or other entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation at the Project site, including preparation, erection, installation, application, construction, re-installation, and similar operations required for execution of the Work.
   1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
   2. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.02 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.03 ABBREVIATIONS AND ACRONYMS

A. Abbreviations and acronyms are identified on the Drawings or in the specific appropriate specification sections.

B. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits.
   2. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 014523
TESTING AGENCY SERVICES

PART 1 GENERAL

1.01 SELECTION AND PAYMENT

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection except testing and inspections required in testing and balancing of HVAC systems specified.

B. Employ and pay for the services of an independent testing laboratory to perform testing for testing and balancing of HVAC systems as specified.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. If retesting by the Owner's testing agency is required, costs to the Owner, including travel costs, set-up charges and other associated expenses to accomplish retesting, will be deducted from the Contract Sum by Change Order.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 TESTING AND INSPECTION

A. See individual specification sections for testing required.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

END OF SECTION

SECTION 01 45 24
STRUCTURAL SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section summarizes the responsibility of the Contractor and the Special Inspector in the performance of the special inspections required in the Construction Documents.

B. Neither the observation of the Architect/Structural Engineer in the administration of the contract, nor tests/inspections by the Special Inspector, nor approvals by persons other than the Architect/Structural Engineer shall relieve the Contractor from his obligation to perform the Work in accordance with the Construction Documents.

1.02 RELATED SECTIONS

A. Section 01 33 24 - Structural Submittals.

B. Section 01 40 00 - Quality Requirements.

1.03 REFERENCES

A. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

B. American Council of Independent Laboratories – Recommended Requirements for Independent Laboratories Qualifications.

1.04 SELECTION AND PAYMENT

A. Owner will employ and pay for the structural testing/inspection services that are required by the Construction Documents.

B. Contractor shall pay for any additional structural testing/inspection required for Work or materials not complying with Construction Documents due to negligence or nonconformance.

C. Contractor shall pay for any additional structural testing/inspection required for his convenience.

1.05 STRUCTURAL TESTING/INSPECTION REQUIREMENT SUMMARY

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings for the required tests/inspections.

1.06 STRUCTURAL ENGINEER REVIEW

A. Structural Design Group, Inc., 220 Great Circle Road, Suite 106, Nashville, Tennessee 37228 will review the Work of the Special Inspector.

PART 2 MATERIALS - NOT USED

PART 3 EXECUTION

3.01 STRUCTURAL PRECONSTRUCTION MEETING

A. A structural preconstruction meeting may be conducted at the construction site by the Structural Engineer to discuss quality issues. The parties involved may be the Architect, Contractor, Special Inspector, appropriate subcontractors, suppliers, and detailers.

3.02 SPECIAL INSPECTOR'S RESPONSIBILITIES

A. Cooperate with the Contractor and provide timely service.

B. Upon arriving at the construction site, sign in and notify the Contractor of presence.

C. Select the representative samples that are to be tested/inspected.

D. Perform tests/inspections as outlined in Construction Documents, the applicable codes, and as directed by the Structural Engineer.

E. Report results of tests/inspections in accordance with the Construction Documents and the Building Code. Work and materials not complying with Construction Documents shall be immediately reported to the Contractor and Structural Engineer.

F. Leave copies of field notes with the Contractor prior to leaving the construction site. Field notes shall include the message given to the Contractor, date, time of message, name of Contractor's representative informed, type and location of Work or materials tested/inspected, whether the work or materials complies with Construction Documents and name of the Structural Testing/Inspection Agency's representative.

G. Report and distribute results of tests/inspections promptly in the form of written reports as directed by the Structural Engineer.

H. Special Inspector shall not alter requirements of Construction Documents, approve or reject any portion of the Work, or perform duties of the Contractor.

I. Submit written confirmation at end of construction that, to the best of their knowledge, the structural Work conforms to the Construction Documents.

3.03 CONTRACTOR'S RESPONSIBILITIES

A. Provide copy of Construction Documents to the Special Inspector.

B. Arrange the preconstruction meeting to discuss quality issues.

C. Notify the Special Inspector sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

D. Cooperate with Special Inspector and provide access to Work.

E. Provide samples of materials to be tested in required quantities.

F. Furnish copies of mill test reports when requested.

G. Provide storage space for Special Inspector’s exclusive use, such as for storing and curing concrete testing samples.

H. Provide labor to assist the Special Inspector in performing tests/inspections.

3.04 OPTIONS

A. If the Structural Testing/Inspection Agency is located at such a distance from the Project that travel expenses will be a consideration, or if the amount of sampling performed is minor, and by mutual agreement of the Architect/Structural Engineer and Contractor, the Contractor may be requested to take samples and forward them to the Structural Testing/Inspection Agency for testing/inspection.

END OF SECTION 01 45 24

SECTION 014533
CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

D. Manufacturers' field services.

E. Fabricators' field services.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Soil investigation data.

B. Section 01 2100 - Allowances: Allowance for payment of testing services.

C. Section 01 3000 - Administrative Requirements: Submittal procedures.

D. Section 01 4000 - Quality Requirements.

E. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authority having jurisdiction.

1.04 DEFINITIONS

A. Code or Building Code: ICC (IBC), International Building Code, Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements and specifically, Chapter 17 - Special Inspections and Tests.

B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

C. Special Inspection:

1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.05 REFERENCE STANDARDS

1.06 ASTM A615/A615M - STANDARD SPECIFICATION FOR DEFORMED AND PLAIN CARBON-STEEL BARS FOR CONCRETE REINFORCEMENT; 2022.

1.07 ASTM C31/C31M - STANDARD PRACTICE FOR MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD; 2024.

1.08 ASTM C172/C172M - STANDARD PRACTICE FOR SAMPLING FRESHLY MIXED CONCRETE; 2017.

1.09 ASTM E329 - STANDARD SPECIFICATION FOR AGENCIES ENGAGED IN CONSTRUCTION INSPECTION, TESTING, OR SPECIAL INSPECTION; 2023.

1.10 ASTM E736/E736M - STANDARD TEST METHOD FOR COHESION/ADHESION OF SPRAYED FIRE-RESISTIVE MATERIALS APPLIED TO STRUCTURAL MEMBERS; 2019 (REAPPROVED 2023).

1.11 ASTM E2174 - STANDARD PRACTICE FOR ON-SITE INSPECTION OF INSTALLED FIRESTOP SYSTEMS; 2020A.

1.12 ASTM E2393 - STANDARD PRACTICE FOR ON-SITE INSPECTION OF INSTALLED FIRE RESISTIVE JOINT SYSTEMS AND PERIMETER FIRE BARRIERS; 2020A.

1.13 ASTM E2570/E2570M - STANDARD TEST METHODS FOR EVALUATING WATER-RESISTIVE BARRIER (WRB) COATINGS USED UNDER EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) OR EIFS WITH DRAINAGE; 2007 (REAPPROVED 2019).

1.14 ICC (IBC) - INTERNATIONAL BUILDING CODE; MOST RECENT EDITION ADOPTED BY AUTHORITY HAVING JURISDICTION, INCLUDING ALL APPLICABLE AMENDMENTS AND SUPPLEMENTS.

1. Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage.

B. ICC (IBC)- International Building Code.

1.15 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures. Electronically submit all reports in PDF format; internet links to reports are not acceptable.

B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
   1. Submit agency name, address, and telephone number, names of full-time registered Engineer and responsible officer.

C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:
   1. Submit agency name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
   2. Submit certification that Testing Agency is acceptable to AHJ.

D. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit copies of report to Architect, Owner, Contractor, and to the AHJ as required.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.
      d. Date and time of special inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of special inspection.
      h. Date of special inspection.
      i. Results of special inspection.

j. Compliance with Contract Documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

E. Test Reports: After each test or inspection, promptly submit copies of report to Architect, Owner, Contractor, and to AHJ as required.
1. Include:
a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test or inspection.
h. Date of test or inspection.
i. Results of test or inspection.
j. Compliance with Contract Documents.

F. Manufacturer's Field Reports: Submit reports to Architect and AHJ if required.
1. Submit report within 10 days of observation to Architect for information.

1.16 SPECIAL INSPECTION AGENCY

A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code, AHJ, or Construction Documents.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.17 TESTING AND INSPECTION AGENCIES

A. Owner may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code, AHJ, or Construction Documents.

1.18 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:
1. Independent firm specializing in performing testing and inspections of the type specified in this section.

B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
3. Provide special inspections as required by code, AHJ, and Contract Documents.

3.02 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:

1. Test samples submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Owner, Architect, and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
6. Perform additional tests and inspections required by Owner or Architect.
7. Attend preconstruction meetings and progress meetings.
8. Submit reports of all tests or inspections specified, or as required by codes, AHJ, or Contract Documents.

B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.03 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to work to be tested or inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
   c. To facilitate tests or inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory prior to expected time for operations requiring testing or inspection services as per job specific administrative requirements.
5. If required by Owner, arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

I. Removal of utilities, facilities, and controls.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

B. Section 01 5500 - Vehicular Access and Parking.

C. Section 01 5719 - Temporary Environmental Controls: Requirements for construction and material procedures.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.04 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes until final acceptance of Work.

B. Existing facilities may not be used, unless approval is in writing by Owner.

C. New permanent facilities may be used, coordinate with Owner.

D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.05 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office and site personnel at time of project mobilization.

1.06 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.07 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCING

A. Construction: Commercial grade wood fence for visual screening.

B. Provide 6 foot (182.88 cm) high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. For freestanding ER (FSER) projects, Contractor may choose to use chain link fencing in lieu of wood with the addition of vinyl graphic screens to block visibility from neighbors and street. Coordinate exact graphic layout with local hospital.

1.09 ACCESS TO SITE

A. Project on vacant site or in an unoccupied building being renovated and there are no Owner-occupancy requirements.
   1. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project

B. Owner will occupy portions of an existing site or building.
   1. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
   2. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   3. Confine constructions operations to work in areas indicated on drawings.
   4. Allow for Owner occupancy of site and use by the public.
   5. Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times.
   6. Do not use drives and entrances for parking or storage of materials.
   7. Schedule deliveries to minimize use of driveways and entrances.
   8. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
   9. Coordinate use of premises under direction of Owner.
   10. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.
   11. Move any stored Products, under Contractor’s control, which interfere with operations of the Owner or separate contractor.
   12. Obtain and pay for the use of additional storage or work areas needed for operations.
   13. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.10 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.11 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and 5/8" Type-X Gypsum Board with sound attenuation batts with closed joints and sealed edges at intersections with existing surfaces.

1.12 INFECTION CONTROL RISK ASSESSMENT (ICRA)

A. Coordinate ICRA with HCA facility representative based on HCA corporate policies and procedures. See Infection Control Procedures Section 01 3533.

1.13 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate and abide with Owner's security program.

1.14 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

F. Provide two parking spaces for Owner use.

G. Provide two parking spaces for Architect use.

1.15 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.16 PROJECT IDENTIFICATION

A. See Section 01 5813 Temporary Project Identification and Directional Signage for additional requirements.

B. Provide project identification sign of design, construction, and location indicated in Construction Documents.

C. Erect on site at location indicated.

D. No other signs are allowed without Owner permission except those required by law.

1.17 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 8 persons.

C. Locate offices a minimum distance of 30 feet (914.4 cm) from existing and new structures

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet (60.96 cm). Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015719
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide and maintain sufficient humidity control and heating, ventilation, and cooling control for construction and installation as per manufacturers recommendations.

B. Construction procedures to promote adequate indoor air quality after construction.

1.02 PROJECT GOALS

A. See Section 01 3533 Infection Control Procedures for particular requirements.

B. Environmental Control: Provide manufacturer requirements for installed, and during the installation of, products, materials, and assembly systems.

C. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Establish condition of existing ducts and equipment prior to start of alterations.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

D. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

A. Section 01 3533 Infection Control Procedures

B. Section 01 4000 - Quality Requirements: Testing and inspection services.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Indoor Air Quality Management Plan: Describe, in detail, measures to be taken to promote adequate indoor air quality during construction.
   1. Identify potential sources of odor and dust.
   2. Identify construction activities likely to produce odor or dust.
   3. Identify areas of project potentially affected, especially occupied areas.
   4. Evaluate potential problems by severity and describe methods of control.
   5. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
   6. Describe cleaning and dust control procedures.
   7. Describe coordination with commissioning procedures.
   8. Describe measures specific for Healthcare projects, including, as applicable, plan for issues related to moisture, particulates, VOCs, outdoor emissions, tobacco, noise and vibration, and infection control.

1.05 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. Provide and maintain temporary or permanent humidity control and heating, ventilation and cooling control for the installation process including curing and drying of materials, products, and assembly systems as per manufacturer. Environmental controls shall be based upon the most stringent or restrictive manufacturer recommendations, requirements, and ranges for products, product installation and assembly systems.

D. Protect installed construction from adverse effects from humidity or temperature ranges as per manufacturer recommendations and requirements. Select equipment that will not have harmful effects for the installation or completed installations, products, or assembly systems.

E. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

F. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

G. HVAC equipment and supply air ductwork may be used for ventilation during construction:
1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
3. Do not use return air ductwork for ventilation unless absolutely necessary. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

H. Do not store construction materials or waste in mechanical or electrical rooms.

I. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
1. Inspect duct intakes, return air grilles, and terminal units for dust.
2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
3. Clean tops of doors and frames.
4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
5. Clean return plenums of air handling units.
6. Remove intake filters last, after cleaning is complete.

J. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

END OF SECTION

SECTION 015813
TEMPORARY PROJECT IDENTIFICATION AND WAYFINDING SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Temporary project identification sign.

B. Related Requirements:
   1. Section 01 50 00 “Temporary Facilities and Controls”.
   2. Section 06 10 53 “Miscellaneous Carpentry”.

1.02 ACTION SUBMITTALS

A. Shop Drawings: Show text and graphics layout for signs. Provide message list, typestyles, graphic elements, and layout for sign at a scale of not less than 1 1/2 inches (12.7 mm) per foot.

B. Sign plan to be submitted to HCA facility representative for approval prior to fabrication

1.03 QUALITY ASSURANCE

A. Design exterior sign and structure to withstand 50 miles (80.47 kilometers)/hr (80 km/hr) wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Division 06 Section "Miscellaneous Carpentry.”
   1. Sign: 3/4-inch thick, A-B grade EXT - APA plywood sheet.
   2. Posts: Pressure treated 4-inch by 4-inch No. 2 yellow pine.
   3. Braces: Pressure treated 2-inch by 4-inch No. 2 yellow pine.

C. Paint sign panels and applied graphics as follows:
   1. Exterior Signage:
      a. Exterior Latex Primer.
         1) Exterior Latex Semi-Gloss.

2.02 FABRICATION –

A. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit the installation of unauthorized signs.

B. Engage an experienced sign painter to apply graphics for Project identification signs. Generally the sign shall indicate project name, Owner's name, Contractor's name and Architect's name and logo.

C. Prepare temporary signs to provide directional information to construction personnel and visitors.

D. Construct signs of exterior-type high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
   1. Project Identification Sign: 8-feet wide by 4-feet high.

2. Temporary Signs: Size as required to accommodate actual text.

E. Project Identification Sign Text and Graphics: Include the following:
   1. Name of Project.
   2. Name of Owner.
   3. Name of Contractor.
   4. Name of Architect.

F. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

2.03 PROJECT WAYFINDING SIGNS

A. Temporary Signs: Provide signs as required to inform public and individuals seeking entrance to Building or entrances to Departments, Restrooms or other facilities distributed by work.
   1. Provide temporary, directional signs for construction personnel and visitors.
   2. Relocate as Work progress requires.

B. Painted informational signs of same colors and lettering as facility standards; size lettering to provide legibility at 30-foot distance.

C. Sign plan to be submitted to HCA Facility Representative for approval prior to fabrication.

PART 3 - EXECUTION

3.01 GENERAL

A. Project identification sign shall be located as shown on the Drawings or as directed by the Architect.

B. Contractor may install their own separate job sign with the approval of the Owner and Architect, and in location as directed.

3.02 INSTALLATION

A. Excavation: In firm, undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for posts to diameters and spacing required to accommodate signs.

B. Project identification sign and wayfinding, Contractor's job sign, and Architect's job signs shall each be installed and erected in a substantial manner.

C. Signs shall be installed with the bottom edge a minimum of 3'-0" above the ground.

D. Posts shall be set at a minimum of 3'-0" into the ground and each post braced with 2 x 4 lumber braces to resist anticipated wind loads.

E. Install signposts and sign panels plumb, level, and square and in proper planes with other work.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 00 2150 - Preferred Vendors and Manufacturers List: Owner's preferred vendors list.

B. Section 01 1000 - Summary: Description of the project, including any products that are to be removed or relocated, and identification of any Owner-supplied products.

C. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

D. Section 01 4000 - Quality Requirements: Product quality monitoring.

E. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

A. Applicable Industry Standards for products specified.

1.04 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.05 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.06 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select products that have been tested as an assembly system and are compatible with adjacent products, even if previously selected products were also options.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.08 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. See Section 014000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, asbestos, formaldehyde.

D. PRODUCT OPTIONS

E. Owner's Manufacturer Preferences: As specified in individual specification sections, preference shall be given to products by manufacturers listed in Section 002150 - Preferred Vendors and Manufacturers List.

F. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

G. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

H. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Prevent contact with material that may cause corrosion, discoloration, or staining.

O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

D. VOC restrictions for product categories listed below under "DEFINITIONS."

E. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 5719 - Temporary Environmental Controls: Procedures and testing.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.
   4. Composite wood.
   5. Products making up wall and ceiling assemblies.
   6. Thermal and acoustical insulation.
   7. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Stone.
   2. Concrete.
   3. Clay brick.
   4. Metals that are plated, anodized, or powder-coated.
   5. Glass.
   6. Ceramics.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Field engineering and surveying for laying out the work.

F. Cleaning and protection.

G. Starting and adjusting of systems and equipment.

H. Correction of the Work.

I. Demonstration and instruction of Owner personnel.

J. Closeout procedures, including Contractor's Correction Punch List, Substantial Completion, Final Acceptance, and Warranties.

K. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 015000 - Temporary Facilities and Controls

E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

F. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

G. Section 01 9113 - General Commissioning Requirements: Contractor's responsibilities in regard to general commissioning.

H. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
   2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm, or if applicable, restrict work to specified hours defined in Section 011000 - Summary , whichever is more stringent.
   3. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am, or if applicable, restrict work to specified hours defined in Section 011000 - Summary , whichever is more stringent.

I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
   1. Pest Control Service: Weekly treatments.

J. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

K. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. See Section 011000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.08 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request:
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner, Architect, and Construction Manager. Label with manufacturer's name and model number.
   5. Submit testing, adjusting, and balancing records.
   6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks, construction codes, and deliver keys and card keys to Owner. Advise Owner's personnel of changeover in security provisions.
   3. Complete startup and testing of systems and equipment.
   4. Perform preventive maintenance on equipment used prior to Substantial Completion.
   5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training information as specified in Section 017900 - Demonstration and Training.
   6. Advise Owner of changeover in utility services.
   7. Contractor shall participate with Owner in conducting inspection and walkthrough with local emergency responders.
   8. Terminate and remove temporary facilities from Project site , along with mockups, construction tools, and similar elements.

9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Observation: Submit a written request for observation to determine Substantial Completion prior to the date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will with proceed with observation or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after observation or will notify Contractor of items, either on Contractor's list or additional items identified by the Owner or the Architect, that must be completed before certificate will be issued.
   1. Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for final completion.

1.09 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment
   2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report.
   5. Submit final completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfilled requirements.
   1. Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect, Owner, Manufacturer Representative, Sub-contractors, and Installers four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 inch (127000 mm) locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
   2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See Section 01 1000 for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth a transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch (6.35 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate with requirements of Section 019113 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify Architect and Owner seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 017 900 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment for the entire Project, or for the designated portion of the Project.
   1. Clean areas and circulation pathways to be occupied by Owner prior to final completion before Owner occupancy.

B. Complete repair (adjustments, balancing, testing) and restoration operations before requesting inspection for certificate determination of Substantial Completion (for the entire Project or for a designated portion of the Project).

C. Use cleaning materials that are nonhazardous.

D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

G. Clean filters of operating equipment.

H. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains and drainage systems. .

I. Clean site; sweep paved areas, rake clean landscaped surfaces.

J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Owner will occupy all the building as specified in Section 01 1000.

F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 017123
FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field engineering services by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: for examination, preparation, and general installation procedures.

1.03 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

1.04 ADMINISTRATIVE REQUIREMENTS

A. A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 017000 - Execution and Closeout Requirements.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and Owner of all discrepancies of which Contractor is aware.

E. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

F. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with shop drawings and Contract Documents requirements.

3.02 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. See Section 01 7900 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.

B. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

E. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

F. Section 02 4100 - Demolition.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid waste typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse construction waste material in some manner on the project site.

K. Salvage: To remove waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled, Reclaimed, and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - (NOT USED)

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: HCA tracks recyclable waste products on certain projects. During the first quarter of construction, an automatic process will be forwarded to the Contractor from Ebuilder for those projects were tracking of recycled waste is required.
   1. Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

HCA Waste Management Plan - Form A - Instructions

Bidders are required to complete and submit a WMP- Form A. This is the initial job site plan of action and will be used to evaluate project award. It is mandatory for the bidding Contractor to provide all of the following information regarding construction and demolition debris management on the project. This must be completed prior to any material removal from the site.

Follow these procedures to maximize recycling at your job site:

1	Separate and recycle wood, cardboard, metal, drywall, and other recyclable materials.	☐
2	Ensure that all containers and recycling dumpsters are convenient and clearly labeled.	☐
3	Train new personnel on recycling container location and which materials are recyclable.	☐
4	Move mixed C&D debris and recycling containers close to each other making it convenient to recycle.	☐
5	Store materials to prevent loss from damage.	☐
6	Check recycling and mixed C&D containers daily for mis-sorted materials.	☐
7	Provide training to people who are mis-sorting recyclable materials.	☐
8	Identify large quantities of waste that are not being recycled, and have DMC evaluate options for marketing the material.	☐

Action Items:

A	Complete this WMP - Form A and post on-site.	☐
B	Commit subcontractors to recycle in Subcontractor Agreement.	☐
C	Keep subcontractors and workers aware of and informed on the C&D Debris Management Program.	☐
D	Require individuals to properly sort recyclables and hold them responsible for mis-sorted loads.	☐
E	Track and promote diversion results.	☐

Complete the following (3) sheets of the WMP- Form A and submit with proposal.
*** Note: Failure to submit WMP- Form A in a timely manner may be cause for HCA to render the bid nonresponsive.**

HCA Waste Management Plan - Form A - Recyclable Materials (Sheet 1)

Material Type	Condition of Material*	On-site Handling	Hauling Procedures	Final Destination
Example: Asphalt/Concrete	large chunks	stockpile for crushing	haul for on-site use	hospital site for use as backfill
Asphalt/Concrete				
Brick/Masonry/Tile				
Building Materials **				
Carpet & Pad				
Cardboard				
Ceiling Tile				
Concrete				
Drywall				
Field Office Waste				
Paint				
Plastic Film, Sheeting, Wrap				
Scrap Metal				
Aluminum				
Copper				
Steel				
Other Metals				
Unpainted Wood & Pallets				
Window Glass				
Other				

* Check with recycler & hauler for any specifications regarding the required condition/s of material (e.g. size restrictions, packaging, other variab

** Doors, windows, fixtures, shingles, lumber, insulation, sheetgoods, etc.

Signed: _____ Date: _____

Note: Failure to submit WMP- Form A in a timely manner may be cause for HCA to render the bid nonresponsive.

HCA Waste Management Plan - Form A - Project Details (Sheet 2)

Project: _____ **Date:** _____

1. Estimated Project Waste

Total Quantity	Total Cost/Ton	Percentage to be Diverted from Landfill*

2. Describe methods for avoiding contamination of recyclables

3. Waste Management Meetings to be held

Pre-Construction _____

Monthly _____

Other _____ Description _____

* Contractor must submit bid for 95% recycling unless bid is accompanied by written documentation regarding reason for lower recylcing rate.

Note: Failure to submit WMP- Form A in a timely manner may be cause for HCA to render the bid nonresponsive.

HCA Waste Management Plan - Form A - Estimated Costs (Sheet 3)

EXAMPLE

Projected Diversion Activities - Construction & Demolition Materials

A	B	C	D	E	F	G	H
Material Type	**Quantity Estimate (tons)**	**Estimated % to be Recycled**	**Destination**	**Transportation**	**Handling/ Transport Costs**	**Projected Revenue or Tip Fee Savings**	**Total Cost or Savings**
concrete	5000	60%	stockpile on site	20cy truck	=($6+$11-$13)*B6*60%	=$12*B6*60%	=G6-F6
concrete	5000	60%	stockpile on site	20cy truck	$ 18,000	$ 96,000	$ 78,000
					Cost to crush & transport	Savings by not landfilling	Savings by not landfilling, less cost to crush

Cost to landfill = $12/ton
Cost to crush concrete = $6
Cost to transport concrete = $11
Cost of delivered crushed stone = $13
Percentage of crushable concreted = 60%

Total net cost (+) or savings (-) from diversion activities $_____

Note: Failure to submit WMP- Form A in a timely manner may be cause for HCA to render the bid nonresponsive.

HCA Waste Management Plan - Form A - Estimated Costs (Sheet 3) **EXAMPLE**

Projected Diversion Activities - Construction & Demolition Materials

A	B	C	D	E	F	G	H
Material Type	**Quantity Estimate (tons)**	**Estimated % to be Recycled**	**Destination**	**Transportation**	**Handling/ Transport Costs**	**Projected Revenue or Tip Fee Savings**	**Total Cost or Savings**

Total net cost (+) or savings (-) from diversion activities $_____

Note: Failure to submit WMP- Form A in a timely manner may be cause for HCA to render the bid nonresponsive.

HCA Waste Management Plan - Form B

EXAMPLE

Start Date: _____ **End Date:** _____ **Total # Months:** _____

											Cost for Option 1	Cost for Option 2		
A	B	C	D	E	F	G	H	I	J	K	M	O	Q	S
Material	**Generated Debris**		**Recycled Debris (%)**		**Salvage/ Reuse Debris (%)**		**Landfilled Debris (%)**		**Total Diverted Debris**		**Cost to Landfill All C&D Debris**	**Cost to Landfill Non-Diverted Material**	**Cost to Recycle, Salvage or Reuse**	**Total Savings (Cost of Option 1-2)**
	Est	**Actual**	**Est**	**Actual**	**Est**	**Actual**	**Est**	**Actual**	**Est (D+F)**	**Actual Tonnage**	**Actual**	**Actual**	**Actual**	**Actual**
	from Form A	tons	from Form A	%	from Form A	%	from Form A	%	from Form A	(E+G)	$/Ton	$%	$	$
Example: Asphalt/Concrete	130	159	60%	80%	0%	5%	40%	25%	=(B11*D11)+(B11*F11)	=(C11*E11)+(C11*G11)	=C11*12	=(C11*I11)*32	=(6+11-13)*C11*(E11+G11)	=M11-O11-Q11
Example: Asphalt/Concrete	130	159	60%	80%	0%	5%	40%	25%	78	135	$ 5,088	$ 1,272	$ 676	$ 3,140
Example: Metal	55	69	80%	85%	0%	0%	20%	25%	(B13*D13)+(B13*G13)	=(C13*E13)+(C13*G13)	=C13*12	=(C13*I13)*32	=(12-70)*C13*(E13+G13)	=M13-O13-Q13
Example: Metal	55	69	80%	85%	0%	0%	20%	25%	44	59	$ 2,208	$ 552	$ (3,402)	$ 5,058
Brick/Masonry/Tile														
Building Materials*														
Carpet & Pad														
Cardboard														
Ceiling Tile														
Concrete														
Drywall														
Field Office Waste														
Paint														
Plastic Film, Sheeting, Wrap														
Scrap Metal														
Aluminum														
Copper														
Steel														
Other Metals														
Unpainted Wood/Pallets														
Window Glass														
Other (describe)														
Other (describe)														
Total									0	0.00	$0.00	$0	0	$ 8,198

Cost to landfill = $12/ton
Cost to crush concrete/handle metal = $6
Cost to transport concrete/metal = $11
Cost of delivered gravel = $13
Revenue from sale of metal = $70/ton

Note this is a negative **COST** as the revenue from the sale of the metal exceeds the cost($70/ton>$12/ton), so it represents revenue, not a cost

* Doors, windows, fixtures, shingles, lumber, insulation, sheetgoods, etc.

Note: Contractor must transfer WMP Form A estimates to Form B to demonstrate the cumulative amount of waste generated and diverted.
Diversion percentages account for the amount and type of materials kep out of the landfill to date.
Attach proof of disposal or diversion. For example: haul tickets, landfill records, recycling receipts, bill of sale.

Contractor Signature:

_____ Date: _____ Affidavit: _____

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

D. Number of Final Copies:
   1. Submit one PDF electronic file with organized and annotated directories of all record Drawings, Specifications, Field Changes, jobsite reports, contract modifications, supplemental instructions, testing reports, O&M Manuals, submittals, warranties, and all other miscellaneous record documents to Architect for approval with claim for final Application for Payment.
   2. Deliver one (1) electronic copy (PDF or other format as approved by Owner) of all record documents to the facility at Final Completion.
   3. Upload one (1) electric copy (PDF or other format as approved by Owner) to Owner’s preferred document storage (eBuilder in Documents folder Closeout / As Built).

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF CLOSE OUT DOCUMENTS –

A. Electronic File Organization: Assemble operation and maintenance data into a digital format for use by the Owner’s personnel, ensuring data is organized in the same sequence as the specification sections, and appropriately labeled with the section titles and numbers.

B. Multiple Systems: For systems that involve more than one specification section, create separate folders or files for each system, clearly identified and organized for easy navigation.

C. File Format: The operation and maintenance manual shall be provided in a widely accessible electronic format, such as PDF, with high resolution images, and clear, legible text. The document should be searchable, with bookmarks or hyperlinks for easy navigation.

D. Cover Identification: The first page of each file should serve as a cover page. Include the title “OPERATION AND MAINTENANCE INSTRUCTIONS,” the title of the Project, and a description of the subject matter of the contents.

E. Project Directory: Include a section at the beginning of the manual with a directory that contains the title and address of the Project, as well as the names, addresses, and contact information (telephone numbers and email) of the Architect, Consultants, Contractor, and subcontractors, including names of responsible parties.

F. Tables of Contents: Provide a Table of Contents for the entire manual, with hyperlinks to each section and sub-section. If the manual is divided into multiple volumes, include a Table of Contents in each volume with a clear indication of the current volume. Each section listed should match the structure of the specification and be organized by system and product.

G. Dividers and Section Identifiers: Within the electronic document, use bookmarks or separate files for each product and system. Each section should be clearly labeled, with an introductory description of the product and its major components immediately following the section identifier.

H. Text and Documentation: All operation and maintenance data should be provided in digital text format (e.g., PDF, DOCX, or similar) or as manufacturer's digital documentation (scanned or digital manuals). Where applicable, use hyperlinks for additional resources or cross-referencing. Ensure all text is legible and formatted for ease of reading.

I. Drawings: All drawings should be included as high-resolution scanned images or vector files (e.g., PDF, DWG). Where applicable, the drawings should be embedded within the text file or linked to as separate files. Larger drawings should be scaled or separated into multiple files for easy viewing, and all drawings should be searchable with relevant metadata.

J. Arrangement of Contents: The digital manual should be organized into the following parts, with appropriate folders, files, and subfolders:

K. Project Directory: An initial file or section listing the contact details for all project stakeholders.

L. Table of Contents: A fully clickable or navigable Table of Contents for the entire manual, with individual sections identified and linked.

M. Operation and Maintenance Data: Organized by system, then by product category. Each system's data should be provided in a clear, consistent order:
   1. Source Data: Manufacturer's data, including specifications and installation instructions.
   2. Product Data, Shop Drawings, and Other Submittals: Include all relevant submittals, such as shop drawings, warranty information, and testing data.
   3. Operation and Maintenance Data: Information on system operation, maintenance schedules, troubleshooting, and service instructions.
   4. Field Quality Control Data: Testing reports, inspections, and any field quality control documentation.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Cover: Identify each file with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

F. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

G. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 9113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word preferred.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS – (NOT USED)

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Do not start training until Functional Testing is complete, unless otherwise specified.

D. Provide training in minimum two-hour segments.

E. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

F. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

G. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

H. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 018002
FLORIDA BUILDING CODE PRODUCT APPROVALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Refer to Division 01 Section “Substitution Procedures” for product substitutions as they relate to this section. Note: Products part of a system cannot be substituted, the entire assembly system must be substituted in order to comply with tested assemblies.

1.02 SUMMARY

A. Section includes: Florida Building Code (FBC) Product Approval Requirements
   1. The intent of this Section is to inform Contractors and Subcontractors that all exterior systems and components of the building shall meet or exceed Florida Building Code or Miami Dade county NOA requirements and have valid Florida Building Code Number(s) at the time of substantial completion; therefore, there is a need to review product approval expiration dates with the construction schedule. Florida Product Approved Assemblies/Systems shall conform to building type requirements, wind speed requirements, importance factor, exposure category, seismic loads, blast loads, large missile impact requirements and small missile impact requirements and any federal, state and local requirements and Authorities Having Jurisdiction.
   2. All exterior systems and products shall be included but not limited to the following: Roofing Assembly Systems such as roof membranes, roof shingles, roof tiles, roofing underlayments, roofing substrates, adhesives, lightweight concrete deck, roof hatches, roofing accessories, roofing attachments, flashings, copings, fascias, and fasteners; curtain wall assembly systems, storefront assembly systems, window assembly system including framing, glass/glazing, attachments, flashings, fasteners and accessories; other exterior skin assembly systems or products such as EIFS, stucco, metal cladding, stone cladding as well as other products and attachments for items such as doors, door frames, entrance door assembly systems, sliding doors assembly systems, overhead coiling doors, louvers, vents, screen walls, screen enclosures, attachments, anchors and all other exterior systems and components of a building.
   3. All exterior assembly systems and products shall be submitted with FBC FL numbers, expiration date and all other requirements listed in Division 01 Section “Submittal Procedures.”

B. Copies of the Florida Product Approvals are included as referenced in individual technical section or on the drawings as well as a Product Approval Schedule specific to this Project.

C. This Specification shall be supplemented by Miami Dade county NOA.

D. This Specification shall be supplemented by any more stringent applicable federal, state, and local building codes, guidelines, regulations, and standards adopted in the immediate geographic area of the Project; insurance rating organization; including all other Authorities Having Jurisdiction.

E. Agency for Health Care Administration (AHCA) Requirements:
   1. General:
      a. All exterior openings (including doors, windows, skylights, and louvers) shall be installed as per submitted and approved Notice of Acceptance (NOA) / Product Approval Numbers, installation details, and substrata conditions. Any deviations from the approved NOA's / Product Approval Numbers and their installation details shall be submitted to AHCA for further review and approval. Only tested assemblies shall be permitted. See instructions for labeling hereinbelow.
   2. Labels:

a. Contractor shall provide and install NOA/Product Approval Labels on all exterior units. AHCA requires one permanent label per bay. A bay is defined as "jamb to jamb." The label shall be:
    1) Metallic.
    2) Affixed permanently to the frame by rivets or permanent adhesive.
    3) Located on the interior lower right corner of each bay, whenever possible.
b. At minimum, the label text shall include the manufacturer's name, city, state, and the statement "Product Approved."
    1) The label may be applied by the system manufacturer or the glazing contractor and may include the wording "Label Applied by Glazing Contractor."

PART 2 PRODUCTS

2.01 PRODUCTS

A. Structural Components (wood connector/anchor, truss plates, engineered lumber, railings, coolers-freezers, concrete admixtures, material, insulation forms, plastics, deck-roof, wall, sheds, other, concrete lintels, truss joists, clips, fasteners…)

B. Panel Wall Assembly Systems (siding, soffits, E.I.F.S., storefronts, curtainwalls, wall louvers, glass block, membrane, greenhouse, synthetic stucco, other, air barriers, skylights, glazing, accessories, attachments, fasteners, adhesives, …)

C. Door Systems (wood doors, metal doors, aluminum entrance, metal frames, glazing, swinging, sliding, sectional, roll-up, automatic, other)

D. Window Systems (aluminum, glazing, single hung, horizontal slider, casement, double hung, fixed, awning, pass-through, projected, mullion, wind breaker, dual action, other)

E. Roofing Assembly Systems/Products (Asphalt shingles, underlayments, roofing fasteners, non-structural metal roof, built-up roofing, Roofing tile, modified bitumen roofing, single ply roofing, roofing tiles, roofing insulation, waterproofing, wood shingles/shakes, other, accessories, attachments, fasteners, adhesives,)

F. Shutter Systems (Accordion, storm panels, roll-up, equipment, other, accessories, attachments, fasteners,)

G. Refer to individual specification section and drawings for products for references of FBC Product or Miami Dade NOA approval.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 16
DEMOLITION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Removal and disposal of designated pavements, concrete, curbs, culverts, utilities and other structures.

1.02 RELATED WORK

A. Section 31 11 00: Clearing and Grubbing
B. Section 31 22 13: Site Excavation

1.03 QUALITY ASSURANCE

A. Contractor Qualifications: Minimum of 5 years experience in demolition of comparable structures.
B. Requirements of Regulatory Agencies:
   1. Comply with requirements of codes.
   2. Comply with requirements of local Public Health Authority.
   3. Comply with local utility companies and/or utility districts.

1.04 SUBMITTALS

A. Certificates of severance of utility services.
B. Permit for transport and disposal of debris.
C. Demolition procedures and operational sequence for review by Owner's Representative

1.05 JOB CONDITIONS

A. Protection:
   1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect structures, and utilities remaining intact.
   2. Protect designated trees and plants from damage.
B. Maintaining Traffic:
   1. Ensure minimum interference with roads, street, driveways, sidewalks, and adjacent facilities.
   2. Do not close or obstruct streets, sidewalks, alleys or passageways without permission from authorities having jurisdiction.
   3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare adjacent areas to prevent injury, movement or settlement of structures which are to remain.
B. Arrange for, and verify termination of utility services to include removing meters and capping lines.
C. Remove items scheduled to be salvaged for Owner, and place in designated storage area.

3.02 DEMOLITION

A. Remove concrete pavement, base, curbs, gutters, sidewalks, driveways, etc. And dispose of as follows:
   1. Dispose of items which are not more than two feet below subgrade elevation.

2. Break items more than two feet below subgrade elevation into sizes not to exceed twelve inches in maximum dimension and leave in place, unless it interferes with succeeding items of construction.
3. Stockpile ballast; gravel other pavement materials when required.

B. Coordinate removal and relocation of power poles, traffic signal poles, street lighting, telephone lines and site lighting, with the local electric utility.
C. Remove existing water services, sanitary sewer and storm drainage pipe and structures as indicated and as necessary to facilitate new construction.
D. Remove old foundations, cisterns, etc., which may be encountered within the building area.

3.03 DEBRIS REMOVAL

A. Promptly remove demolition debris from site.
B. Obtain permission from applicable regulatory authority for disposal of debris to waste disposal site.
C. Do not store or burn materials on site.

END OF SECTION

SECTION 030516
UNDERSLAB VAPOR BARRIER - STEGO

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Test Data: Submit report of tests showing compliance with specified requirements.

D. Samples: Submit samples of underslab vapor barrier to be used.

E. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m2 Pa)), maximum.
   2. Complying with ASTM E1745 Class A.
   3. Thickness: 15 mils (0.4 mm).
   4. Tensile Strength: 70 lbf/in, minimum
   5. Puncture Resistance: 2,250 grams, minimum
   6. Product:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches (150 mm).

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

G. Coordinate vapor barrier with underground ventilation system.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 01 Sections

B. Section 03 05 16 - Underslab Vapor Barrier.

C. Section 03 20 00 - Concrete Reinforcement.

D. Section 03 30 00 - Cast-in-Place Concrete.

1.02 REFERENCES

ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

ACI 301 – Standard Specifications for Structural Concrete.

ACI 318 – Building Code Requirements for Structural Concrete.

ACI 347 – Guide to Formwork for Concrete.

ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Submit manufacturer’s data for:

1. Expansion/Isolation Joint Filler.
2. Waterstops.

1.04 DESIGN OF FORMWORK

A. Design of formwork, shoring, and reshoring and its removal is the Contractor's responsibility.

B. Design of formwork, shoring, and reshoring shall conform to ACI 117, ACI 301, ACI 318, and ACI 347.

C. Design formwork in a manner such that existing or new construction is not overloaded.

D. Formwork shall be designed by an engineer licensed in the Project state.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Material: Wood, plywood, metal, fiberglass or a combination of these, with sufficient strength to prevent distortion.

B. Form Definitions

1. Standard Forms: No form-facing material required. Standard forms are acceptable everywhere except for Architectural Concrete elements.

2.02 FORMWORK ACCESSORIES

A. Formwork Accessories: Commercially manufactured products, including ties and hangers. Do not use nonfabricated wire form ties.

2.03 FORM RELEASE AGENT

A. Form release agent shall not bond with, stain, nor adversely affect concrete surfaces.

2.04 EXPANSION / ISOLATION JOINT FILLER

A. Expansion / Isolation Joint Filler: ASTM D1751, asphalt impregnated premolded fiberboard, 3/8-inch thick by full thickness of slab or joint, unless indicated otherwise in the Structural Drawings.

2.05 CONSTRUCTION JOINTS

A. Slabs On Ground: Steel plate dowel (1/4" thick) such as manufactured by PNA Construction Technologies, Inc., Greenstreak Group, Inc., or approved equal.

1. Plate Thickness: 1/4-inch thick for slabs up to 6 inches in thickness; 3/8-inch for slabs over 6 inches and up to 8 inches in thickness; 3/4-inch thick for slabs over 8 inches in thickness and up to 12 inches in thickness.

2.06 WATERSTOPS

A. Waterstops at construction joints and contraction joints indicated in the Structural Drawings shall be sized to suit the joints.

B. Waterstops: Preformed, non-expansive, plastic adhesive waterstops such as Synko-Flex, manufactured by Henry Company, or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Erect formwork in accordance with ACI 301 and ACI 347.

B. Finished work shall comply with tolerances of ACI 117.

C. Provide 3/4-inch chamfer at all formed corners.

3.02 FOUNDATION ELEMENTS

A. Sides of grade beams, foundation walls, and turned-down slabs shall be formed, and earth cuts as forms are not acceptable.

B. Form foundation elements if soil or other conditions are such that earth trench forms are unsuitable.

C. Maintain minimum coverage of reinforcing steel as indicated in Structural Drawings.

3.03 FORM PREPARATION

A. Seal form joints to prevent leakage.

B. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed.

C. Before reinforcement is placed, coat contact surfaces of form with form release agent in accordance with manufacturer's recommendations. Do not allow excess form release agent to accumulate in forms or come in contact with concrete surfaces against which fresh concrete will be placed.

3.04 INSERTS AND EMBEDMENT ITEMS

A. Install and secure in position required inserts, embeds, hangers, sleeves, anchors, and nailers.

B. Locate anchor bolts/rods in position in accordance with approved setting drawings and secure to prevent displacement during concrete placement.

3.05 PROVISIONS FOR OTHER TRADES

A. Install openings in concrete formwork to accommodate work of other trades. Determine size and location of openings and recesses from trades requiring such items. Obtain approval from Structural Engineer for openings not shown in Structural Drawings.

B. Accurately place and securely support items built into forms.

3.06 CONSTRUCTION JOINTS

A. Slabs On Ground: Install steel plate dowels in accordance with manufacturer's recommendations. Place plate dowels at mid-depth of slab (+/-1/4-inch), unless noted otherwise in the Structural Drawings.

B. Framed Construction:

1. Install construction joints in accordance with ACI 318.
2. Obtain Architect/Structural Engineer's prior approval for use and location of joints.
3. Provide 1½-inch deep key-type construction joints at end of each placement for framed slabs, beams, walls, and footings. Bevel forms for easy removal.
4. Remove loose particles and latency from surface prior to placing the next lift. Chip the surface to a depth sufficient to expose sound concrete.

3.07 FORMWORK REMOVAL

A. Remove formwork carefully in such manner and at such time as to ensure complete safety of structure. Do not remove formwork, shoring, or reshoring until members have acquired sufficient strength to support their weight and the load thereon safely.

B. For conventionally reinforced framed slabs, formwork shall remain in place for a minimum of 5 days after concrete placement.

3.08 FINISHES OF FORMED SURFACES

A. Standard Form Finish: Patch tie holes and defects. Chip or rub off fins exceeding ¼ inch in height. Leave surface with the texture imparted by the forms.

END OF SECTION 03 10 00

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 03 10 00 – Concrete Forming and Accessories.

C. Section 03 30 00 – Cast-in-Place Concrete.

1.02 REFERENCES

ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

ACI 301 – Standard Specifications for Structural Concrete.

ACI 315 – Details and Detailing of Concrete Reinforcement.

ACI 318 – Building Code Requirements for Structural Concrete.

ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete Reinforcement.

ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

AWS D1.4 – Structural Weld Code - Reinforcing Steel.

AWS D12.1 – Recommended Practices for Welding Reinforcing Steel Metal Inserts, and Connections in Reinforced Concrete Construction.

CRSI – Manual of Standard Practice.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Shop Drawings:

1. Notify Structural Engineer prior to detailing reinforcing steel shop drawings.
2. Indicate size, spacing, location and quantities of reinforcing steel and wire fabric, bending and cutting schedules, splice lengths, stirrup spacing, supporting and spacing devices. Detail reinforcing steel in accordance with ACI 315 and CRSI Standards.
3. Written description of reinforcement without adequate sections, elevations, and details is not acceptable.
4. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

C. Submit manufacturer's data for tension and compression splicers.

1.04 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.05 STORAGE AND PROTECTING

A. Store reinforcing steel above ground so that it remains clean. Maintain steel surfaces free from materials and coatings that might impair bond.

PART 2 PRODUCTS

2.01 MATERIALS

A. Deformed Reinforcing Steel: ASTM A615, refer to Structural Drawings for grade (Grade 60 minimum).

B. Welded Steel Wire Reinforcement: ASTM A1064.

2.02 ACCESSORY MATERIALS

A. Annealed Steel Tie Wire: 16½ gage minimum.

B. Bar Supports: Plastic-tipped steel Class I bar supports conforming to CRSI Specifications. Concrete brick may be used to support reinforcement to obtain proper clearance from earth.

2.03 SPLICERS

A. Tension Splicers: Capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.

B. Compression Splicers: Mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

2.04 DOWEL ADHESIVE

A. Adhesive conforming to Simpson AT-XP (IAPMO-UES ER-263), Simpson SET-XP (ICC-ES ESR-2508), DeWalt/Powers Pure110+ (ICC-ES ESR-3298), DeWalt/Powers DeWalt AC200+ Adhesive (ICC-ES ESR-4027), Hilti HIT-HY 200 Safe Set Fast Cure Adhesive (ICC-ES ESR-3187), Hilti HIT-RE 500 V3 SAFE Set Adhesive (ICC-ES ESR-3814). Minimum Embedment = 12 times anchor diameter, UNO.

PART 3 EXECUTION

3.01 FABRICATION

A. Fabricate reinforcing steel in accordance with ACI 318 and CRSI standards.

B. Bend bars cold. Do not heat or flame cut bars. No field bending of bars partially embedded in concrete is permitted, unless specifically approved Structural Engineer and checked by Testing and Inspection Agency for cracks.

C. Weld only as indicated. Perform welding in accordance with AWS D1.4 and AWS D12.1.

D. Tag reinforcing steel for easy identification.

3.02 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles and coatings.

B. Place, support, and secure reinforcement against displacement in accordance with ACI 318 and CRSI standards. Do not deviate from alignment or measurement.

C. Place concrete beam reinforcement support parallel to main reinforcement.

D. Locate welded wire reinforcement in the top third of slabs. Overlap mesh one lap plus two inches at side and end joints.

E. Furnish and install dowels or mechanical splices at intersections of walls, columns and piers to permit continuous reinforcement or development lengths at such intersections.

F. Maintain cover and tolerances in accordance with ACI and CRSI Specifications, unless indicated otherwise on Structural Drawings.

G. Reinforcement shall be adequately supported in the forms to prevent displacement by concrete placement or workers. Bundled bars should be tied or otherwise fastened together to maintain their position, whether vertical or horizontal.

H. Wet-setting of reinforcement in concrete is not permitted.

3.03 SPLICES

A. Do not splice reinforcement except as indicated on Structural Drawings.

B. Tension couplers may be used and installed in accordance with manufacturer's recommendations.

3.04 DOWELS IN EXISTING CONCRETE

A. Install dowels and dowel adhesive in accordance with manufacturer’s recommendations at locations noted by EOR.

B. Minimum embedment length into the existing concrete shall be 12 bar diameters, unless noted otherwise.

END OF SECTION 03 20 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 03 10 00 – Concrete Forming and Accessories.

C. Section 03 20 00 – Concrete Reinforcement.

D. Section 03 62 00 – Non-shrink Grout.

1.02 REFERENCES

A. The publications listed below form a part of this specification. The publications are referenced to within the text by the basic designation only.

ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.

ACI 301 – Specifications for Structural Concrete.

ACI 305.1 – Specification for Hot Weather Concreting.

ACI 306.1 – Standard Specification for Cold Weather Concreting.

ACI 308.1 – Specification for Curing Concrete.

ACI 311.6 – Specification for Testing Ready Mixed Concrete

ACI 311.7 – Specification for Inspection of Concrete Construction

ACI 318 – Building Code Requirements for Structural Concrete.

ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.

ASTM C33 – Standard Specification for Concrete Aggregates.

ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

ASTM C94 – Standard Specification for Ready-Mixed Concrete.

ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

ASTM C150 – Standard Specification for Portland Cement.

ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

ASTM C469 – Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.

ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

ASTM C595 – Standard Specification for Blended Hydraulic Cements

ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

ASTM C920 – Standard Specification for Elastomeric Joint Sealants

ASTM D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Submit the concrete mix designs. Include the following:

1. Documentation of mix design proportions complying with ACI 301.
2. Type and quantities of materials including admixtures
3. Slump
4. Air content
5. Water/cement ratio
6. Fresh unit weight
7. Aggregates sieve analysis
8. Design compressive strength
9. Location of placement in structure
10. Method of placement
11. Method of concrete curing
12. Method of protection of concrete
13. Seven-day and 28-day compressive strengths

C. Mix design submittals not conforming to the above will be rejected.

1.04 QUALITY ASSURANCE

A. The ready-mixed concrete plant shall be certified for conformance with the requirements of the National Ready Mix Concrete Association.

B. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

C. The procedures used in sampling shall include the use of every precaution that will assist in obtaining samples that are truly representative of the nature and condition of concrete sampled.

D. Concrete sampling shall be performed as the concrete is delivered from the mixer to the conveying vehicle used to transport the concrete to the forms.

E. Sample the concrete by collecting two or more portions taken at regularly spaced intervals during discharge of the middle portion of the batch. The elapsed time shall not exceed 15 min. between obtaining the first and final portions of the composite sample. Take the samples so obtained within the time limit of 15 min. and combine them into one composite sample for test purposes. In any case do not obtain samples until after all of the water and any admixtures have been added to the mixer. Do not obtain samples from the very first or last portions of the batch discharge. Sample by repeatedly passing a receptacle through the entire discharge stream or by completely diverting the discharge into a sample container. Regulate the rate of discharge of the batch by the rate of revolution of the drum and not by the size of the gate opening.

F. Start tests for slump, temperature, and air content within 5 min after obtaining the final portion of the composite sample and complete these tests expeditiously. Start molding specimens for strength tests within 15 min. after fabricating the composite sample. Expeditiously obtain and

use the sample and protect the sample from the sun, wind, and other sources of rapid evaporation, and from contamination.

PART 2 PRODUCTS

2.01 CONCRETE MIX DESIGN

A. Establish concrete mix design proportions in accordance with Article 4.2.3 of ACI 301.

B. Concrete Strength: See Structural Notes in Structural Drawings.

C. Slump

1. Design concrete with a slump between four and ten inches.
2. If a slump greater than five inches is desired, use a water reducer.

D. Water/Cementitious Materials Ratio (w/cm): See Structural Notes in Structural Drawings.

E. Entrained Air Content: See Structural Notes in Structural Drawings.

F. Fresh Unit Weight

1. Normal weight concrete: Fresh unit weight of 137 to 148 pcf.

2.02 MATERIALS

A. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.

B. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.

C. Obtain aggregate from single source.

D. Obtain each type of admixture from single source from single manufacturer.

E. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and recommendations, published by the manufacturer of such materials are included in and are a part of these Specifications.

2.03 CEMENT

A. Cement: Type I Portland Cement – ASTM C150.

B. Cement: Type IL Portland Limestone Cement – ASTM C595.

2.04 FLY ASH

A. Fly Ash: Class C or Class F – ASTM C618. When fly ash is used, the quantity shall be a minimum amount of 15 percent and a maximum amount of 25 percent by weight of the total cementitious materials, unless otherwise specified.

2.05 AGGREGATE

A. Fine Aggregate: Fine aggregate complying with ASTM C33. Natural sand is preferred to manufactured sand.

B. Fine Aggregate in slabs: The gradation of fine aggregate in concrete mix designs for floor slabs shall meet the requirements in the Table below:

Sieve Designation	Percent Passing	
	Normalweight Aggregate	Lightweight Aggregate
3/8 in.	100	100

No. 4	85 to100	85 to100
No. 8	80 to 90	–
No. 16	50 to 75	40 to 80
No. 30	30 to 50	30 to 65
No. 50	10 to 20	10 to 35
No. 100	2 to 5	5 to 20

C. For normalweight concrete, the weight of fine aggregate in the mix proportion shall not exceed 50 percent of the total weight of fine plus coarse aggregate.

D. Coarse Aggregate: Washed gravel or crushed stone conforming to ASTM C33. When a single size or combinations of two or more sizes of coarse aggregates are used, the final grading shall conform to the grading requirements of ASTM C33, unless otherwise specified or permitted.

1. Unless governed by the maximum size as specified in Section 2 below, the largest practical-size coarse aggregate shall be used. Except for topping slabs 3-in. thick or less the largest size of coarse aggregate in normalweight concrete shall be a nominal ¾-in. and the largest size of coarse aggregate in lightweight concrete shall be a nominal ½-in. For topping slabs that are 3-in. thick or less the maximum size of coarse aggregate shall be 3/8 inch.

2. The nominal maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

2.06 WATER

A. Water: Potable water

2.07 AIR ENTRAINING AGENT

A. Air Entraining Agent: Air entraining agent shall conform with ASTM C260. For normalweight concrete air entrainment shall not be used in flatwork to receive a hard steel-troweled finish.

2.08 WATER REDUCER

A. Water Reducer: Water reducing agent shall conform with ASTM C494.

2.09 ACCELERATORS

A. Accelerators: Non-chloride accelerators shall conform with ASTM C494.

2.10 RETARDERS

A. Retarders: Retarders shall conform with ASTM C494.

2.11 CHLORIDE

A. Chlorides: Chlorides of any form shall not be used in concrete.

2.12 CURING COMPOUND

A. Curing Compound: Vertical Surfaces Only – A water-based, VOC-compliant concrete curing agent, hardener, and dustproofer that complies with ASTM C309.

2.13 CONTRACTION JOINT SEALANT

A. Contraction Joint Sealant: Semi-rigid flexible epoxy joint filler.

PART 3 EXECUTION

3.01 GENERAL

A. Prepare place of deposit, mix, convey, and place in accordance with ACI 301 and ACI 304. If concrete is pumped, use a 5-inch minimum hose diameter, except for placement of metal pan stair treads where a 2-inch minimum hose is permitted.

B. Wet forms before placing concrete.

C. Deposit concrete continuously and as near as practical to final position.

D. Deposit concrete in one layer or in multiple layers. Do not place fresh concrete against concrete that would result in cold joints.

E. Do no flowing of concrete with vibrators.

F. Do not place concrete over columns or walls until concrete in columns and walls has reached final setting.

G. For cast-in-place floor systems place concrete for beams, girders, brackets, column capitals, haunches, and drop panels at same time as concrete for adjacent slabs.

H. Place and finish concrete members to comply with tolerances in ACI 117.

I. Do not use aluminum equipment in placing and finishing concrete.

J. Normalweight concrete for slabs to receive a hard-troweled finish shall not contain an air-entraining admixture or have a total air content greater than 3 percent.

K. Wet-setting of dowel reinforcement, steel embeds, DBA anchors, anchor bolts, etc. into previously placed concrete is not permitted. All required inserts, embeds, dowels, hangers, sleeves, anchor bolts/rods, anchors, and nailers shall be installed and secured in position before concrete placement.

3.02 SLABS-ON-GROUND

A. Place concrete for slabs-on-ground on properly prepared granular subbase with vapor barrier.

B. Place thickened slabs for partitions integral with floor slabs.

3.03 WATER REDUCERS

A. Water reducers are to be added at dosage recommended by the manufacturer. The slump of the concrete shall be one to four inches at the time the water reducers are added. Do not permit fresh concrete containing superplasticizers to come in contact with fresh concrete not containing superplasticizers.

3.04 ADDITION OF WATER AT JOB SITE

A. Water may be added at the jobsite if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded. All concrete delivery trucks will have actual batch weight tickets available that clearly indicate the quantity of water that may be added at the jobsite that will not exceed the maximum water/cement ratio.

3.05 TIME LIMIT

A. Deposit concrete within one and one-half hours after batching.

3.06 VIBRATION

A. Consolidate concrete by vibration. Consolidate concrete around reinforcement, embedded items, and into corners of forms. Use immersion-type vibrators with nonmetallic heads for consolidating concrete around epoxy-coated or zinc and epoxy dual-coated reinforcing bars.

B. Do not use vibrators to move concrete in a manner that will result in segregation.

C. Spacing of immersion vibrator insertions shall not exceed 1-1/2 times the vibrator's radius of action in concrete being consolidated.

3.07 WEATHER PROVISIONS

A. Do not place concrete while rain, sleet, or snow is falling unless protection is provided. Do not allow precipitation to increase mixing water or to damage concrete surface.

B. Perform cold weather concreting in accordance with ACI 306. Concrete temperatures at delivery shall meet the requirements of Section 4 in ACI 301. Do not place concrete in contact with surfaces less than 35°F. Unless otherwise specified, this requirement shall not apply to reinforcing steel.

C. Perform hot weather concreting in accordance with ACI 305. Unless otherwise specified, concrete temperature as placed shall meet the requirements of Section 4 of ACI 301. If temperature of reinforcement, embedments, or forms is greater than 120°F, use a fine mist of water to moisten and cool hot surfaces. Remove standing water before placing concrete.

D. Protect concrete from drying and excessive temperature for the first seven days. Protect fresh concrete from wind.

3.08 CONTRACTION JOINTS

A. Obtain Architect/Structural Engineer's approval for location of contraction joints. Do not use contraction joints in framed floors or composite slabs, unless noted in Structural Drawings.

B. Unless noted otherwise in the architectural or structural drawings, provide contraction joints in slabs-on-ground to form a regular grid with a maximum spacing as noted in the Structural Drawings. The long dimension of the grid shall not exceed 1.5 times the short dimension of the grid. Contraction joints may be saw cut if cut within 24 hours after placement of concrete. Saw cuts shall be a depth equal to one-fourth the slab thickness by one-eighth inch wide. Alternately, contraction joints may be provided by preformed plastic strip inserts.

3.09 CONSTRUCTION JOINTS

A. Obtain Architect/Structural Engineer's approval for location of construction joints.

B. Remove laitance and thoroughly clean and dampen construction joints before placement of fresh concrete.

C. Unless specified in the drawings, locate and detail construction joints to following requirements:

1. Locate construction joints within middle third of spans of slabs, beams, and girders. When a beam intersects a girder within this region, offset joint in girder a distance equal to or greater than twice width of beam;
2. Locate joints in walls and columns at underside of slabs, beams, or girders and at tops of footings or slabs; and
3. Make joints perpendicular to main reinforcement.

D. Provide keyways where indicated in the Construction Documents. Unless otherwise specified, longitudinal keyways indicated in Contract Documents shall be a minimum of 1-1/2 in. deep in joints in walls and between walls and slabs or footings.

E. Provide construction, expansion, and contraction joints where indicated in Contract Documents. Submit for acceptance details and locations of construction, expansion, and contraction joints differing from those indicated in Contract Documents.

F. Design formwork to accommodate waterstop materials. Locate waterstop in construction joints where indicated in Contract Documents. Use waterstop with a maximum practical length to create minimum number of splices.

G. Use an approved bonding agent applied in accordance with the manufacturer's requirements or portland-cement grout of the same proportions as the mortar in the concrete; or roughen the surface in an approved manner that exposes coarse aggregate and does not leave laitance, loosened aggregate particles, or damaged concrete at surface.

3.10 CONCRETE FINISHES

A. Finish Concrete in accordance with ACI 301.

B. After form removal, give each formed surface the specified finish. If the Architectural and Structural drawings do not specify a finish, provide a SF-1.0 finish on concrete surfaces not exposed to view and a SF-2.0 finish on concrete surfaces exposed to view.

Surface Finish 1.0 (SF1.0)
1. No formwork facing material is specified
2. Patch voids larger than 1-1/2 in. wide or 1/2 in. deep
3. Remove projections larger than 1 in.
4. Tie holes need not be patched
5. Surface tolerance Class D as specified in ACI 117
6. Mockup not required

Surface Finish 2.0 (SF2.0)
1. Patch voids larger than 3/4 in. wide or 1/2 in. deep
2. Remove projections larger than 1/4 in.
3. Patch tie holes
4. Surface tolerance Class B as specified in ACI 117
5. Unless otherwise specified, provide mockup of concrete surface appearance and texture

C. If a Rubbed Finish is specified in the Architectural or Structural drawings, produce the smooth-rubbed finish no later than the day following formwork removal. Wet the surface and rub it with an abrasive such as carborundum brick until uniform color and texture are produced. If insufficient cement paste can be drawn from the concrete itself by the rubbing process, use a grout made with cementitious materials from the same sources as used for in-place concrete.

D. If a finish is not otherwise specified for the unformed surfaces the following finishes shall apply (Refer to Section 5 of ACI 301 for requirements of each finish):

1. Scratch finish—For surfaces intended to receive bonded cementitious or setting beds
2. Float finish—For walks; steps; and for surfaces intended to receive waterproofing, roofing, insulation, or sand-bed terrazzo
3. Trowel finish—For interior floors
4. Broom finish—For parking slabs and exterior surfaces, including slabs, ramps, walkways, and steps, light broom finish for exterior balconies.

E. Finish slabs to the following flatness and levelness tolerances:

1. F_F35/F_L25 minimum overall for composite of all measured values and F_F24/F_L15 minimum for any individual floor section.
2. Slabs to receive seemless flooring: F_F45/F_L30 minimum overall for composite of all measured values and F_F30/F_L20 minimum for any individual floor section.
3. FF and FL values for slabs to receive any equipment, whether contractor furnished or owner supplied, are to be coordinated with manufacturer's requirements or at a minimum have F_F45/F_L30 overall for composite of all measured values and F_F30/F_L20 minimum for any individual floor section.

4. Architect/Structural Engineer will identify which sections of slabs are to be tested for flatness and levelness.

    a. F_L values are applicable only if testing is performed within 72 hours of concrete placement, before tensioning of tendons, and before removal of formwork. F_L values are not applicable to unshored systems.

    b. F_F values are applicable to all types of slab construction and are not subject to any time constraints.

3.11 CURING

A. Begin curing procedures in accordance with Section 5 of ACI 301 immediately following the commencement of the finishing operation. If bleed water sheen is not visible on surface of concrete after strikeoff and initial bull floating, provide initial curing by means of fogging or application of evaporation retarder until final curing method is applied. Do not use fogging in cold weather concreting.

B. After the initial curing outlined in A., apply the curing procedure as specified below. Apply curing in a manner that prevents marring, marking, or discoloration of finished surface. The moist cure method below refers to ACI 301 (Specifications for Structural Concrete) and ACI 308.1 (Specification for Curing Concrete). The moist cure method is described in detail in these documents and the provisions of the curing method specified shall be adhered to. In addition, ACI 308 (Guide to External Curing of Concrete) may be used as a reference guide.

C. Cure concrete in accordance with ACI 308. Keep the concrete surface moist. Place burlap, burlene, or similar vapor barrier on the surface. Maintain moist concrete surface for a minimum three days.

D. For formed surfaces, unless otherwise specified, if formwork is loosened or removed so that concrete surface is exposed to ambient air less than 5 days from concrete placement continue curing by either continuous fogging, ponding, continuous sprinkling, or a membrane-forming curing compound as described above and in ACI 301 and ACI 308.

E. Maintain concrete temperature to prevent freezing of concrete and to ensure strength development. Unless otherwise specified, duration of thermal protection shall be at least 3 days.

F. Maintain curing measures until the concrete has reached a minimum of 70 percent of the specified 28-day strength compressive strength, fc', but not less than 3 days.

3.12 CUTTING CONCRETE

A. Obtain Architect/Structural Engineer's written approval prior to cutting concrete for installation of other work.

3.13 PATCHWORK AND REPAIRS

A. Repair tie holes and other surface defects in formed finishes unless otherwise specified. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing.

B. Notify Architect/Structural Engineer of any defective areas (other than tie holes) in concrete to be patched or repaired. Unless otherwise specified or permitted, repair surface defects by the following method. Outline repair area with a 1/2 in. deep saw cut and remove defective concrete down to sound concrete. Leave chipped edges perpendicular to the saw-cut surface or slightly undercut. Do not feather edges. Dampen the area to be patched plus 6 in. around the patch area perimeter. Prepare scrub coat mix using one-part portland cement and one-part sand by loose volume with water. Thoroughly brush scrub coat into the surface. When the scrub coat begins to lose water sheen, apply patching mortar (for concrete exposed to view, mortar shall match adjacent concrete color) and thoroughly consolidate mortar into place. Strike

off mortar, finishing flush to the final surface. Leave the patch undisturbed for 1 hour before finishing. Keep the patch damp for 7 days.

3.14 CONTRACTION JOINT AND CRACK SEALANT

A. Remove dirt and debris from joints. Joints shall be dry and free from all substances that inhibit bond. Install sealant to prevent three-sided bonding.

B. Coordinate filling contraction joints and cracks with Architectural flooring specifications.

END OF SECTION 03 30 00

SECTION 03 62 00

NON-SHRINK GROUT

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

1.02 REFERENCES

ACI 351.4-14 – Specification for Installation of Cementitious Grouting between Foundations and Equipment Bases.

ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

1.03 REFERENCE STANDARDS

All work related to Non-Shrink Grout shall conform to all requirements of ACI 351.4-14, "Specification for Installation of Cementitious Grouting between Foundations and Equipment Bases," published by the American Concrete Institute, Fannington Hills, Michigan, except as modified by these Contract Documents.

1.04 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.05 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

PART 2 PRODUCTS

2.01 GROUT

A. Flowable, non-shrink, non-metallic, packaged hydraulic cement grout that conforms to ASTM C1107.

B. Compressive Strength: 6,000 psi minimum at 28 days.

2.02 WATER

A. Water: Clean, potable water.

PART 3 EXECUTION

3.01 HANDLING

A. Store and protect from moisture and contamination.

3.02 PREPARATION

A. Remove foreign materials including mud and dirt from areas to be grouted.

B. Use forms to contain grout. Forms shall be set at a distance from the edge of the baseplate on all sides equal to at least the thickness of the grout bed, and no less 1.5-in.

3.03 MIXING

A. Mix grout to its fluid, self-leveling consistency in accordance with manufacturer's recommendations. Mix grout in a paddle-type mortar mixer; do not mix by hand.

B. Mixing of grout, surface preparation of concrete substrate, placement, thermal control, and curing of grout shall conform to the manufacturer's instructions.

C. Do not retemper grout. Do not exceed manufacturer’s maximum limit on water content or use at a consistency that produces free bleeding.

3.04 PLACEMENT

A. Consolidate to provide grout uniformity. Do not vibrate grout.

B. Mix grout to its fluid, self-leveling consistency, and place under base plate in a flowable state.

3.05 PROTECTION

A. Protect grout and areas to be grouted from excessive heat and cold in accordance with manufacturer's Specifications. Protect grout from excessive drying shrinkage resulting from wind or direct sunlight. Protect areas grouted from excessive vibrations.

END OF SECTION 03 62 00

SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 03 20 00 – Concrete Reinforcement.

C. Section 03 30 00 – Cast-in-Place Concrete.

D. Section 04 20 00 – Unit Masonry.

1.02 REFERENCES

TMS 602 – Specification for Masonry Structures.

ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement

ASTM C90 – Standard Specification for Loadbearing Concrete Masonry Units.

ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).

ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.

ASTM C270 – Standard Specification for Mortar for Unit Masonry.

ASTM C404 – Standard Specification for Aggregates for Masonry Grout.

ASTM C476 – Standard Specification for Grout for Masonry.

ASTM C1019 – Standard Test Method for Sampling and Testing Grout.

ASTM C1314 – Standard Test Method for Compressive Strength of Masonry Prisms.

ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

ASTM D2287 – Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in Structural Drawings for additional submittal requirements.

B. Submit coarse grout mix design.

C. Shop Drawings: Submit for masonry reinforcement complying with Section 03 20 00.

D. Submit procedures for construction of masonry walls to be filled with coarse grout. Procedures should include low lift grouting as applicable to Project.

1.04 QUALITY ASSURANCE

A. Masonry construction and materials shall conform to all the requirements of TMS 602, except as modified by the requirements of the Construction Documents.

B. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store materials in a dry condition to protect from elements and prevent contamination, deterioration, or damage due to moisture, temperature changes, contaminants, corrosion, and other causes.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY

A. Specified Compressive Strength, f'm: See Structural Notes in the Structural Drawings.

2.02 CONCRETE MASONRY UNITS

A. Concrete masonry units: Comply with ASTM C90.

B. Weight: Lightweight.

C. Net Area Compressive Strength of unit: As listed in Table 2 of TMS 602 required for the specified f'm.

D. Face Dimensions: 16" long x 8" high nominal, unless indicated otherwise.

E. Special shapes: Where indicated on the Drawings.

F. Fire Rating: Where indicated in the Architectural Drawings, provide concrete masonry units that comply with the specified fire ratings.

2.03 MORTAR

A. Mortar: Type M or Type S in accordance with ASTM C270. Refer to Structural Drawings for locations.

B. Do not use admixtures that contain chlorides.

2.04 COARSE GROUT

A. Coarse Grout: In accordance with ASTM C476.

B. Compressive Strength: See Structural Notes in the Structural Drawings.

C. Slump: 8 and 11 inches.

D. Do not use admixtures that contain chlorides.

2.05 WATER

A. Water: Clean potable water free of deleterious substances.

2.06 REINFORCEMENT

A. Horizontal and Vertical Reinforcing Bars: Comply with Section 032000.

2.07 HORIZONTAL JOINT REINFORCEMENT

A. Horizontal Joint Reinforcement: Manufactured with longitudinal, parallel, deformed side wires in accordance with ASTM A951 and of the size specified in the Structural Drawings. Cross wires shall be No. 9 gage, plain, in accordance with ASTM A82, unless noted otherwise in Structural Drawings.

B. Provide as a minimum, one side wire for each face shell of hollow masonry units. Provide additional side wires or eye sections for adjustable wall ties as specified for multiwythe wall construction.

C. Ladder type reinforcement shall be used in walls with vertical reinforcement.

D. Finish: Hot-dipped galvanized in accordance with ASTM A153, Class B-2.

E. Provide prefabricated corner and tee section accessories.

2.08 CONTRACTION JOINT MATERIAL

A. Contraction joint material:

1. Rubber shear keys complying with ASTM D2000, M2AA-805 and with a minimum durometer hardness of 80, or
2. PVC shear keys complying with ASTM D2287, Type PVC 654-4 and with a minimum durometer hardness of 85.

PART 3 EXECUTION

3.01 PREPARATION

A. Cold weather masonry construction shall comply with TMS 602, Section 1.8, Paragraph C when either of the following conditions exist:

1. The ambient air temperature falls below 40 degrees Fahrenheit, or
2. The temperature of masonry units is below 20 degrees Fahrenheit.

B. Hot weather masonry construction shall comply with TMS 602, Section 1.8, Paragraph D when either of the following conditions exist:

1. The ambient air temperature exceeds 100 degrees Fahrenheit, or
2. The ambient air temperature exceeds 90 degrees Fahrenheit with a wind velocity greater than 8 mph.
3. When the ambient temperature exceeds 115 degrees Fahrenheit, or exceeds 105 degrees Fahrenheit with a wind velocity greater than 8 mph, implement the requirements of Article 1.8 D.1.a and shade materials and mixing equipment from direct sunlight.

3.02 CONCRETE MASONRY UNIT PLACEMENT

A. Use dry masonry units. No frozen or wet units shall be used.

B. Discard cracked, chipped, and spalled masonry units.

C. Lay hollow units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, pilasters, and in walls where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not to be grouted, spread out full mortar bed including area under cells.
4. Maintain joint widths indicated, except for minor variations to maintain joint alignment. If not indicated, lay walls with 3/8 inch joints.
5. Buttering corners of joints, deep or excess furrowing of mortar joints is not permitted.

D. Lay units in running bond, unless noted otherwise in the Structural Drawings.

E. Fully bond external corners of concrete masonry.

F. Where non-loadbearing masonry partitions extend to underside of floor, roof deck or structural system, stop masonry short 3/8 inch to ½ inch to allow for live load deflection. Fill gap with soft joint filler.

3.03 GROUT PLACEMENT

A. Execute placement of grout in accordance with TMS 602, Section 3.5.

B. Place coarse grout in maximum 5’-4” lifts, unless intermediate bond beams are present or approved in writing by the architect/structural engineer. In the case of intermediate bond beams in the wall, the maximum lift should be equal to the bond beam spacing.

C. Do not fill reinforced cells with mortar.

3.04 MOVEMENT JOINTS

A. Place expansion joints at locations indicated in the Structural Drawings.

1. Do not run any horizontal reinforcing through expansion joints.

B. Place contraction joints at locations indicated in the Structural Drawings.

1. Install contraction joint material.
2. Do not run horizontal reinforcement through contraction joints, except reinforcement in bond beams at floor and roof levels shall be continuous across contraction joints.

3.05 REINFORCEMENT

A. Place reinforcing bars as indicated in the Structural Drawings and in accordance with TMS 602, Section 3.4.

3.06 HORIZONTAL JOINT REINFORCEMENT

A. Place horizontal joint reinforcement in the horizontal mortar beds at spacings noted in the Structural Drawings and noted below.

B. For masonry below grade, space horizontal joint reinforcing at 8 inches vertically.

C. Place horizontal joint reinforcement above lintels and below sills at openings. Extend two feet beyond opening.

D. Joint reinforcement shall be continuous. Lap joint reinforcement a minimum of 8 inches.

3.07 ERECTION BRACING

A. Design, provide, and install temporary erection bracing during construction as required to stabilize erected masonry until complete structural system is constructed.

3.08 CLEANING AND POINTING

A. Dry brush masonry surfaces before mortar has set hard to remove mortar crumbs and accumulation.

B. Clean masonry with commercial brick cleaner approved by brick manufacturer. Protect other work from cleaning materials.

C. Cut out defective mortar and repoint.

3.09 PROTECTION OF FINISHED WORK

A. During erection cover top of wall, projections, and sills with strong waterproof membrane at end of each day's work.

1. Extend and secure cover a minimum of 24 in. down both sides.

B. Do not apply uniform floor or roof loading for at least 12 hours after placing masonry columns or walls.

C. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.

END OF SECTION 04 22 00

SECTION 042613
MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Flashings.

F. Installation of lintels.

G. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2024b.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

D. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.

E. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

H. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

L. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

M. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

N. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.

C. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high; include mortar and accessories and structural backup in mock-up.

B. Locate where directed.

C. Mock-up may not remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.07 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 6 inches (150 mm).
   2. Non-Loadbearing Units: ASTM C129.
      a. Hollow block.
      b. Lightweight.

2.02 BRICK UNITS

A. Manufacturers:
   1. Refer to Building Elevations.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture to match Architect's sample.
   2. Nominal Size: As indicated on drawings.
   3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M Type S.
   1. Colored Mortar: Premixed cement as required to match Architect's color sample.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

C. Hydrated Lime: ASTM C207, Type S.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.04 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa) yield strength, deformed billet bars; galvanized.

B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.

1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).
4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch (3.8 mm) diameter.
5. Manufacturers:
    a. Hohmann & Barnard, Inc: www.h-b.com/#sle.

C. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.
1. Manufacturers:
    a. ITW Commercial Construction North America; Teks Select Series: www.ITWBuildex.com/#sle.

2.05 FLASHINGS

A. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
1. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet with 8 mil (0.20 mm) of butyl adhesive and a removable release liner.
    a. Manufacturers:
        1) STS Coatings, Inc: www.stscoatings.com/#sle.
        2) VaproShield, LLC: www.vaproshield.com/#sle.
        3) York Flashings; York 304: www.yorkflashings.com/#sle.

B. Factory-Fabricated Flashing Corners and Ends: Stainless steel.
1. Manufacturers:
    a. Mortar Net Solutions; CompleteFlash: www.mortarnet.com/#sle.

C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
1. Manufacturers, Synthetic Rubber Products:
    a. Mortar Net Solutions; BTL-1 Butyl Sealant: www.mortarnet.com/#sle.

D. Termination Bars: Stainless steel; compatible with membrane and adhesives.
1. Manufacturers:
    a. Mortar Net Solutions; Termination Bars: www.mortarnet.com/#sle.

E. Drip Edge: Stainless steel; compatible with membrane and adhesives.
1. Manufacturers:
    a. Mortar Net Solutions; Metal Drip Edges: www.mortarnet.com/#sle.

F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

A. Preformed Control Joints: Neoprene material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Weeps:
1. Type: Polyester mesh.
2. Color(s): As selected by Architect from manufacturer's full range.

D. Cavity Vents:
1. Type: Polyester mesh.

2. Color(s): As selected by Architect from manufacturer's full range.

E. Multicomponent Cavity Wall Drainage System: Combination mortar diverter, flashing and weep system.
   1. Membrane Type: Thermoplastic vinyl.
   2. Drip Edge: Stainless steel.
   3. Termination Bar: Stainless steel
   4. System Unit Length: 5 feet, 6 inches (1676 mm).
   5. Manufacturers:
      a. Mortar Net Solutions; TotalFlash Panel: www.mortarnet.com/#sle.

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
   1. Masonry below grade and in contact with earth; Type S.
   2. Exterior, non-loadbearing masonry; Type S.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476; consistency as required to fill volumes completely for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

3.03 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar as work progresses.

D. Interlock intersections and external corners.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.04 WEEPS/CAVITY VENTS

A. Install weeps in veneer walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer walls at 32 inches (800 mm) on center horizontally below shelf angles and lintels and at top of walls.

3.05 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches (150 mm).

F. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches (400 mm) on center vertically and 36 inches (900 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

G. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches (400 mm) on center vertically and 24 inches (600 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

H. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.07 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up at least 1 inch (25.4 mm), minimum, to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
   1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
   2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer’s directions.
   3. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.
   4. Anchor vertical leg of flashing into backing with a termination bar and sealant.
   5. Apply cap bead of sealant on top edge of self-adhered flashing.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

E. Support flexible flashings across gaps and openings.

F. Lap end joints of flashings at least 6 inches (152 mm), minimum, and seal watertight with flashing sealant/adhesive.

3.08 LINTELS

A. Install loose steel lintels over openings.

B. Maintain minimum 8 inch (____ mm) bearing on each side of opening.

3.09 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.

D. Form expansion joint as detailed on drawings.

3.10 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm in 3 m) and 1/2 inch in 20 ft (13 mm in 6 m) or more.

D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm in 1 m) and 1/4 inch in 10 ft (6 mm in 3 m); 1/2 inch in 30 ft (13 mm in 9 m).

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

3.11 CUTTING AND FITTING

A. Cut and fit for pipes, conduit, and junction boxes. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 05 31 00 – Steel Decking.

1.02 REFERENCES

AISC – Steel Construction Manual, 15th Edition.

AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

AISC 341 – Seismic Provisions for Structural Steel Buildings.

AISC 360 – Specification for Structural Steel Buildings.

AISC – Specification for Structural Joints Using ASTM A325 or A490 Bolts prepared by the Research Council on Structural Connections.

AWS D1.1 – Structural Welding Code.

AWS A5.1 – Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.

AWS A5.5 – Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding.

AWS A5.17 – Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.

AWS A5.20 – Carbon Steel Electrodes for Flux Cored Arc Welding.

SSPC – Steel Structures Painting Manual.

ASTM A6 – Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

ASTM A36 – Standard Specification for Carbon Structural Steel.

ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength.

ASTM A490 – Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 KSI Minimum Tensile Strength.

ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

ASTM A563 – Standard Specification for Carbons and Alloy Steel Nuts

ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium Vanadium Structural Steel.

ASTM A673 – Standard Specification for Sampling Procedure for Impact Testing of Structural Steel

ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

ASTM A992 – Standard Specification for Structural Steel Shapes.

ASTM A1085 – Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)

ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM F436 – Standard Specification for Hardened Steel Washers.

ASTM F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-Ksi Yield Strength.

ASTM F1852 – Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

ASTM F2280 – Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

1.03 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Shop Drawings:

1. Contact Structural Engineer's Construction Administrator prior to detailing structural steel shop drawings.
2. Shop drawings shall be submitted in the format of a sheet size that is easily read when printed.
3. Shop drawings shall clearly indicate the profiles, sizes, ASTM Grade, spacing and locations of structural steel members, including connections, attachments, anchorages, framed openings, sizes and types of fasteners, method of tightening fasteners, cambers, and the number, type and spacing of the stud shear connectors and headed studs.
4. Beam sizes shall be shown on the erection drawings (plans).
5. Submit shop drawings for review.
6. Reproduction of Structural Drawings for shop drawings is not permitted. Electronic drawing files will not be provided to the Contractor.

C. Maintain at construction office written welding procedures for each type of welded joint used in accordance with AWS D1.1.

D. Submit certification that the fabricator meets the required qualifications and ultrasonic testing reports for complete penetration welds. If fabricator has an independent testing agency inspect fabrication as required by these specifications, submit the name and qualifications of the independent testing agency.

E. Upon request, submit the erection sequence and procedures to be used by the steel erector.

F. Submit certification that the erector meets the required qualifications.

1.04 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.05 STORAGE

A. Store materials off ground to permit easy access for inspection and identification. Store steel members and packaged items in a manner that provides protection against contact with deleterious materials.

1.06 FABRICATOR'S QUALIFICATIONS

A. Steel fabricator shall meet the requirements in the Structural Quality Assurance Plan in the Structural Drawings.

1.07 ERECTOR'S QUALIFICATIONS

A. Steel fabricator shall meet the requirements in the Structural Quality Assurance Plan in the Structural Drawings

B. Erector shall be experienced in erecting structural systems similar in complexity to this Project as evidenced by 10 completed projects.

C. Erector shall have a minimum of 5 years experience in the erection of structural steel or is an AISC Certified Advanced Steel Erector.

D. For qualification of welders, refer to the Structural Quality Assurance Plan in the Structural Drawings.

PART 2 PRODUCTS

2.01 ANCHOR RODS

A. Anchor Rods: Headed rod or a threaded rod with a heavy hexagonal nut and plate washer welded to the bottom of the threaded rod conforming to ASTM F1554.

B. Nuts and Washers: Two hexagonal nuts and two plate washers conforming to ASTM A36 for each anchor rod assembly.

2.02 ROLLED STEEL SHAPES, PLATES, AND BARS

A. Rolled Steel Shapes, Plates, and Bars: ASTM A36; ASTM A572, Grade 50; or ASTM A992 as indicated by the Structural Drawings. ASTM A572, Grade 50 may be substituted for ASTM A992.

2.03 SQUARE, RECTANGULAR AND ROUND STEEL HOLLOW STRUCTURAL SECTIONS (HSS)

A. Hollow structural sections:

1. Rectangular and Square: ASTM A500 Grade C, 50 ksi minimum yield strength
2. Round: ASTM A500 Grade C, 50 ksi minimum yield strength

2.04 PIPE STEEL STRUCTURAL SECTIONS

A. Pipe Structural Sections: ASTM A53, Gr. B, 35 ksi minimum yield strength.

2.05 NON-HIGH-STRENGTH FASTENERS

A. Non-High-Strength Bolts: ASTM A307, Grade A, 60 ksi minimum, where noted on the Structural Drawings.

B. Hardened Steel Washers: ASTM F436.

2.06 HIGH-STRENGTH FASTENERS

A. High-Strength Bolts: ASTM A325 or ASTM A490 as noted on the Structural Drawings. 3/4-inch minimum diameter.

B. Hardened steel washers shall conform to ASTM F436.

C. Spline-Type Tension Control Bolts: ASTM spline-type tension control bolts with plain hardened washers and suitable nuts are an acceptable alternate design bolt assembly.

D. Do not use load indicating washers.

2.07 EXPANSION ANCHORS

A. Expansion Anchors: See Structural Notes.

2.08 SCREW ANCHORS

A. Screw Anchors: See Structural Notes.

2.09 HEADED STUDS

A. Headed Studs: shall conform to the requirements of AWS D1.1. Provide studs with the diameter shown on the Structural Drawings.

2.10 WELD ELECTRODES

A. Weld Electrodes: AWS A5.1, A5.5, A5.I7, or A5.20 E-70 series low hydrogen electrodes.

B. Properly store electrodes to maintain flux quality.

2.11 PAINT

A. Oxide Primer: AISC Specifications, Code of Standard Practice, and SSPC Steel Structure Painting Manual, unless indicated otherwise.

B. Paint Primer: Free of lead and chromate and comply with State and Federal volatile organic compound (VOC) requirements.

C. Paint Primer: Compatible with finish coating.

2.12 GALVANIZE

A. Galvanized Coating: ASTM A123.

B. Galvanize Bolts, Nuts, and Washers: ASTM A153 when used to connect steel members that are specified to be galvanized.

C. Expansion Anchors, Adhesive Anchors, or Screw Anchors: Where specified to be galvanized, anchors shall be mechanically galvanized in accordance with ASTM B695, Class 65, Type I.

PART 3 EXECUTION

3.01 GENERAL

A. Fabricate and erect structural steel in accordance with AISC Specifications and Code of Standard Practice.

B. Notify Architect/Structural Engineer and Structural Testing/Inspection Agency at least 48 hours prior to structural steel fabrication and erection.

3.02 ANCHOR ROD SETTING

A. Provide templates for setting anchor rods. Position anchor rods by using templates with two nuts to secure in place prior to placement of concrete.

B. Do not erect steel where anchor rod nuts will not have full threads.

3.03 CONNECTIONS

A. Provide a minimum of two fasteners at each bolted connection.

B. Ensure fasteners are lubricated prior to installation.

C. Provide high-strength bolted connections in accordance with AISC Specifications for Structural Joints using ASTM A325 or A490 Bolts.

D. Provide connections for expansion and contraction where steel beams connect to concrete walls or concrete columns and at expansion joints. Secure nuts on bolts against loosening. (Dent threads with a chisel.)

3.04 FASTENER INSTALLATION

A. Bolts shall be installed in holes of the connection and brought to snug tight condition. Tighten connection progressing systematically from the most rigid part to the free edges of the connection to minimize relaxation of the bolts.

B. High-strength bolts installed shall have a hardened washer under the element turned in tightening.

C. Installation and tightening of bolts shall conform to the AISC Specifications for Structural Joints.

3.05 EXPANSION ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation and the ICC ESR report for the particular anchor used.

B. Minimum Embedment: See Structural Notes on Drawings.

3.06 SCREW ANCHOR INSTALLATION

A. Install in accordance with manufacturer's recommendation and the ICC ESR report for the particular anchor used.

B. Minimum Embedment: See Structural Notes on Drawings.

3.07 HEADED STUDS

A. Headed studs shall be installed in accordance with AWS D1.1 with the resulting in-place length after burn-off as shown on the Structural Drawings.

B. Do not locate headed studs closer than 1-1/4 inches from the edge of embedded steel member to the centerline of the stud.

C. Remove ceramic arc shields after welding studs.

3.08 WELDING

A. Comply with AWS D1.1. Use prequalified weld procedures.

B. Provide end returns where fillet welds terminate at ends or sides. Returns shall be continuous for a distance of not less than two times the nominal size of the weld.

C. Complete penetration joints shall be backgouged to sound metal before the second side is welded or have 1/4-inch root opening with 3/16 x 1 inch backing bar. Access holes are required. Filling access holes is not required.

D. Remove all slag and weld splatter from deposited weld metal.

3.09 SPLICING

A. Splice members only where indicated unless authorized in writing by Structural Engineer.

B. Provide shim plates at bottom flange splice at continuous beam splices with different depths.

3.10 CUTTING

A. Do not use flame cutting to correct errors unless authorized in writing.

B. Re-entrant corners shall have a minimum radius of one inch and be free of notches. Notches and gouges resulting from flame cutting shall be finished to a smooth appearance.

3.11 MILL SCALE

A. Remove loose mill scale.

3.12 BOLT HOLES

A. Cut, drill, or punch holes perpendicular to metal surfaces. Do not enlarge holes by burning. Drill or punch holes in bearing plates. Remove burrs.

3.13 PAINTING

A. Paint steel that is not encased in concrete, plaster, or sprayed fireproofing. Do not shop paint in areas to be field welded, contact surfaces of slip critical connections, or areas to receive special finishes.

B. Field paint as required steel that has been welded or that is unpainted after connections have been tightened.

3.14 GALVANIZING

A. Galvanize shelf angles that support the exterior building veneer, for example brick shelf angles.

B. Galvanize environmentally exposed steel, for example mechanical equipment supports.

C. Touch-up welds and abrasions in galvanized members in accordance with ASTM A780.

END OF SECTION 05 12 00

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

B. Section 05 12 00 – Structural Steel Framing.

1.02 REFERENCES

AISI – Specifications for the Design of Cold-Formed Steel Structural Members.

AWS D1.1 – Structural Welding Code.

AWS A5.5 – Specifications For Low Alloy Steel Covered Arc-Welding.

SDI 31 – Design Manual for Composite Decks, Form Decks, and Roof Decks

SDI RDCH1 – Roof Deck Construction Handbook

SDI DDMO3 – Diaphragm Design Manual, Third Edition

ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM A1008 – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel-Framing Connections.

1.03 SUBMITTALS

A. Notify the Structural Engineer prior to detailing shop drawings.

B. Submit detailed shop drawings showing layout and types of deck panels, weld sizes, weld patterns and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

C. Submit manufacturer’s information including section properties, deck gage, material yield strength, etc. for each type of steel deck required. The submittal shall demonstrate that the deck complies with the minimum section and material properties indicated in the structural notes and this Specification.

D. Submit supporting documentation and manufacturer’s information for deck that does not comply with the minimum section and material properties specified. Deck shall be designed for the design criteria outlined herein and the submittal shall be stamped and signed by an Engineer licensed in the project state.

E. Upon request, submit mill certification that the steel supplied meets these Specifications.

F. Upon request, submit written welding procedures.

G. Submit manufacturer's certification of compliance with supplementary framing, sump pans, cant strips, curb openings, special jointing and other accessories.

1.04 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

B. Welders shall be certified by AWS for the welding process involved.

C. Fire Rated Assemblies: For steel decking that is a part of a specified fire rated assembly, identify steel deck bundles with labels bearing the U.L. mark.

1.05 STORAGE

A. Store materials off ground to permit easy access for inspection and identification. Store steel members and packaged items in a manner that provides protection against contact with deleterious materials.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide steel deck sheets of three spans minimum wherever possible.

2.02 DECK ATTACHMENT

A. Use E-60 series electrodes conforming to AWS A5.5.

B. Provide weld washers for material thinner than 22 gage.

C. Provide screws conforming to ASTM C1513.

2.03 ROOF DECK

A. Roof Deck: Steel sheets, minimum yield strength of 33,000 pounds per square inch, ASTM A653, Grade 33 or higher, deck types and gages as indicated on Drawings.

B. Finish: Galvanized, G90 coating.

C. End and Side Laps: 2-inch flush, nested unless otherwise indicated or specified.

D. Vented deck: Provide vented deck for the lightweight insulating concrete system in accordance with Section 1917 of the Florida Building Code.

PART 3 EXECUTION

3.01 GENERAL

A. Installer must examine the areas and conditions under which metal decking is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Steel deck shall be installed in accordance with the approved shop drawings, requirements of the Steel Deck Institute, the manufacturer's recommendations, and any applicable regulatory, safety guidelines.

3.02 PLACEMENT

A. Place steel deck units on supporting steel framework and adjust to final position before permanently fastening. Install deck units and accessories in accordance with manufacturer's recommendations and the Drawings, and as specified herein.

3.03 CUTTING

A. Cut holes in deck indicated by the Drawings. Other holes required shall be supplied by those requiring them. Obtain written authorization for additional holes and cutting not indicated on erection drawings.

3.04 WELDING

A. Perform welding in accordance with AWS Structural Welding Code.

B. Install weld washers for deck thinner than 22 gage.

3.05 CONCENTRATED LOADS

A. Concentrated loads suspended from the steel deck shall not exceed 50 pounds. No more than one suspended load shall be located in the sheet width in any span.

3.06 DECK SUPPORTS

A. Fasten deck to steel framework at ends and at each intermediate support by welding according to manufacturer's specifications unless indicated otherwise on structural drawings or otherwise specified herein. Do not weld deck in place until all bolted and welded connections for the structural frame are complete. A minimum of one floor over the area to be decked is to be bolted and welded prior to welding deck in place.

3.07 ROOF DECK

A. Place roof deck in straight alignment. Lap ends of sheets two inches.

B. Attach side laps of roof deck with screws spaced at a maximum of 24 inches on center for spans greater than 4 feet unless shown otherwise on the Drawings.

C. Weld roof deck in place by welding with 5/8-inch puddle welds spaced 12 inches on center at each support, unless shown otherwise by the Drawings.

D. Where screws are required in the drawings, screw fasteners shall extend through the steel connection a minimum of three exposed threads.

END OF SECTION 05 31 00

SECTION 05 41 00
COLD-FORMED EXTERIOR STEEL STUD FRAMING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections.

B. Section 09 22 16 - Non-Structural Metal Framing.

1.02 REFERENCES

AISI S100-07 – North American Specification for the Design of Cold-Form Steel Structural Members.

AISI S200-07 – North American Standard for Cold-formed Steel Framing – General Provisions.

ANSI Z49.1 – Safety in Welding, Cutting, and Allied Processes.

ASTM A653 – Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

AWS D1.3 – Structural Welding Code: Sheet Steel.

SSMA – Steel Stud Manufacturers Association Product Technical Information.

1.03 DESIGN REQUIREMENTS

A. Design of the following is the sole responsibility of the Contractor:

1. Cold-formed exterior steel studs including tracks, bridging, and window or door framing.
2. Any required temporary and permanent restraint/bracing.

B. Cold-formed exterior steel stud framing shall be designed by a Structural Engineer licensed in the Project state. Design criteria includes, but not limited to, the following:

1. Deflection of steel studs shall not exceed the following:

   EIFS = L/360

   Metal Panel = L/240

   Masonry Veneer = L/600

2. Wind pressure for Components and Cladding as indicated in the Structural Drawings.

C. Cold-formed steel design, fabrication and erection shall conform to AISI S100 and AISI S200.

D. Stud depth, layout and configuration of cold-formed exterior steel studs shall be compatible with the plans, sections, and details of the Construction Documents.

E. Exterior studs shall not be designed to be braced at the top by the bottom of a structural steel beam unless the delegated design also includes stud bracing/kickers to the floor diaphragm if it occurs at a floor, or at the top of an adjacent steel beam if it occurs at the roof.

1.04 SUBMITTALS

A. Refer to Structural Quality Assurance Plan in the Structural Drawings for additional submittal requirements.

B. Shop Drawings

1. Shall include but not necessarily be limited to the following:

   a. Plans, cross-sections, or elevations as necessary to adequately depict component locations.

b. Framing details at wall openings including jamb members, headers, sills, and connections.

c. Connection details showing screw types and locations, weld lengths or other fastener requirements.

d. Bracing locations and details. Any required bracing to the primary structure that is not shown in the Construction Documents shall be specifically identified.

2. Design loads.

3. Shall be sealed by an Engineer licensed in the Project state.

C. Submit manufacturer's product information clearly describing quality, performance and finish for steel studs.

D. Submit manufacturer and Installer qualifications.

1.05 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

B. Manufacturer shall have a minimum of three years documented experience in the manufacturing of products required by the Construction Documents.

C. Installer shall have a minimum of three years documented experience.

1.06 MOCKUP

A. Provide a minimum of one mockup of exterior wall framing sufficient in size to illustrate various construction conditions and as directed by the Architect. Construct mock-up to include, but not be limited to, the following components:

1. Stud framing, including runners, bridging, outlet box framing and other farming accessories. Include interior and exterior corner conditions, and intersections with interior rated stud walls.

2. Typical window frame, door frame and expansion joint.

3. Insulation, sheathing and vapor retarder.

B. The approved sample will serve as the standard of quality, as well as for coordination with related components.

C. Leave approved mock-up ready to receive exterior insulation and finish system mock-up.

D. Do not place mock-up to remain as a part of the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Studs and accessories which are 97, 68, or 54 mils gage shall meet the requirements of ASTM A446, Grade D with a minimum yield of 50,000 psi. Studs and accessories which are 43 mils shall meet the requirements of ASTM A446, Grade A with a minimum yield of 33,000 psi.

B. Studs and accessories shall have a G60 galvanized coating meeting the requirements of ASTM A525.

2.02 ACCESSORIES

A. Bridging: 1-1/2-inch deep by 54 mils minimum.

B. Strap Bracing: Minimum of 1-1/2-inch wide by 43 mils unless noted otherwise.

C. Tracks: Deep leg type, unpunched, same gage, size, and finish as studs with minimum 43 mils thickness.

D. Compensation Tracks / Slip Tracks: Deep leg type with a flange width of 2½ inches. Track shall be same nominal depth as stud/track with allowance for slip of standard deep leg track. Minimum 68 mils.

E. Plates, Gussets, Clip Angles: Minimum 68 mils. Clip angles shall be a minimum of 2 inches x 2 inches.

F. Self-drilling, Self-tapping Screws: Hot-dip galvanized conforming to values given in the referenced SSMA document.

G. Anchorage Devices:

1. Powder Actuated Fasteners shall be manufactured from AISI 1062 or AISI 1065 steel austempered to a minimum core hardness of 50-54Rc and possess the following properties:

   Tensile strength = 270,000 psi

   Shear strength = 162,000 psi

   All fasteners shall meet the requirements of ASTM B-633-78.

   Fasteners shall be a minimum 9/64-inch diameter.

   Fasteners shall be galvanized.

   Fastener minimum design values shall be in accordance with manufacturer's recommendations.

2. Expansion anchors shall be stud type, and shall be galvanized. Expansion anchors shall be a minimum of 3/8-inch diameter with 2-1/2-inch embedment into concrete unless noted otherwise in the Drawings.

H. Welding: AWS D1.3-8 Structural Welding Code-Sheet Metal (field welding of material shall not be permitted for 20 gage material or thinner).

I. Acoustical Sealant: USG, or approved equal.

J. Sizes and thicknesses are minimum acceptable, regardless of load. Actual sizes shall be determined by Steel Stud manufacturer in accordance with loads given in the Structural Notes. Minimum listed size shall not be construed to be the actual designed component size.

K. Primer for Synthetic Rubber Tape: HP-250, Carlisle Corporation.

L. Synthetic Rubber Tape: Sure-Seal SecurTAPE, Carlisle Corporation.

1. Width: 7 inches.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove dust and other foreign material from concrete slab edge by brooming and wiping to provide a clean surface to receive rubber tape and primer.

3.02 ERECTION

A. General:

1. Framing components shall be cut squarely for attachment to perpendicular members or, as required, for angular fit against abutting members.

2. Erect framing plumb, level, and square.

3. Studs shall be plumbed, aligned, and securely attached to the flanges or web of both the upper and lower tracks.

4. Fastening of components shall be with self-drilling screws or welds. Wire tying of components shall not be permitted. Touch-up field welds and scratched or damaged finish to studs with zinc rich paint.
5. Splices in framing components shall not be permitted other than in runner tracks.
6. Runner tracks shall be securely anchored to the supporting structure.

B. Studs Spacing: Stud manufacturer shall determine stud spacing at interior and corner zones to resist Component and Cladding Loads given in the Structural Notes. Stud spacing shall not exceed 16 inches, center-to-center, regardless of design loads.

C. Stud Tracks: Before installing stud tracks for exterior walls, apply primer and synthetic rubber tape longitudinally under stud tracks to seal runner to floor.
1. Anchor stud tracks to floor with powder-driven fasteners or expansion anchors sized and spaced to resist the design loads. Spacing shall not exceed 12-inches or 24-inches (center-to-center) for powder-driven fasteners or expansion anchors, respectively.
2. Attach flange of stud to track with screw(s) through each flange, as required to resist the design loads. Screws shall not be smaller than #8.

D. Door Openings: Install multiple studs (no less than 2 studs regardless of design loads) each side of door openings as shown on the approved Shop Drawings.
1. Install headers between door jambs at top of doors as shown on the approved Shop Drawings.
2. On top of headers, install runners to receive bottom ends of studs over door openings.

E. Window Openings: Install multiple studs (no less than 2 studs regardless of design loads) each side of window openings as shown on the approved Shop Drawings.
1. Install headers and sills between window jambs shown on the approved Shop Drawings.
2. On top of headers and bottom of sills, install runners to receive short studs.
3. Where shown on the Architectural Drawings, attach wood blocking to stud framing with 1/2-inch diameter galvanized bolts 12 inches on-center. Coordinate attachment of window system to blocking/stud framing prior to erection of metal stud framing.
4. Where indicated on the Structural Drawings (for example, at windows over 8 feet wide and at cantilevered parapets), attach studs / track to structural steel reinforcement with self-drilling screws.

F. Corners: Construct using a minimum of three studs designed to resist the design loads.

G. Between Studs: Install framing for attachment of electrical boxes, mechanical and for other items to be anchored to walls.

H. At Butting Walls: Place studs not more than 2 inches from walls.

I. Insulation: In all multiple jamb studs and multiple headers not accessible to insulation contractors, insulation equal to that specified elsewhere shall be provided.

END OF SECTION 05 41 00

SECTION 054500
MEDICAL SUPPORTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Medical support system as indicated on the drawings with accessories for a complete installation.

1.02 REFERENCE STANDARDS

A. AISC - American Institute of Steel Construction.

B. AISI - American Iron and Steel Institute.

C. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical Quality).

D. ASTM A569 - Steel, Carbon (O.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.

E. ASTM A570 - Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.

F. ASTM A575 - Steel Bars, Carbon, Merchant Quality, M-Grades.

G. ASTM A675 - Steel Bars, Carbon, Hot-Wrought, Special Quality, Medical Properties.

H. AWS - American Welding Society.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide medical support system produced by a single manufacturer with not less than five years successful experience in the design, fabrication and installation of systems of the type and quality specified in this section.

B. Installing contractor shall be able to furnish coverage liability insurance with limitation of no less than one million dollars.

1.04 SYSTEM DESCRIPTION

A. System shall be a “universal grid” type or "rigid mount", where applicable, with rails extending wall to wall, perpendicular to the path of travel of the equipment. Rail shall be on centers as required by equipment manufacturer and allow continuous attachment along any point on the rail. System shall be true, plumb and level to the tolerances indicated, with no more than 1/720th of the span maximum deflection in either plane, when maximum loading conditions are applied due to equipment operation.

B. Vendor shall provide the single source responsibility for materials and workmanship, and shall provide a warranty period of one (1) year from date of acceptable by architect/owner.

1.05 SUBMITTALS

A. Submit the following in accordance with Division 01.

B. Shop Drawings: Clearly indicate the following:
   1. Plan layout of system at 1/4" = 1'-0" scale.
   2. Typical Elevations.
   3. Details and anchoring methods.
   4. Structural calculations which verify adequacy of the design for gravity and other required loads, including earthquake loads. Structural calculations and drawings shall be furnished with a stamp by a licensed engineer complying with all applicable codes and regulatory requirements.

C. Manufacturer's Product Data: Indicating full compliance with requirements of this section, installation instructions, and including engineering information for calculating stresses and for verifying the strength of individual members or components.

1.06 DELIVERY, HANDLING, STORAGE

A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels and in accordance with 01600.

B. Store and protect products in accordance with manufacturer's recommendations and Section 016000.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Basis of Design Manufacturer: UNISTRUT Corporation, Ann Arbor, MI.

B. Substitutions: Powerstrut products of the following manufacturer are acceptable for evaluation only after compliance with substitutions requirements specified in Section 016000.
   1. Power Engineering Co., Inc., Shrewsburg, MA.
   2. The Pate Company.
   3. Unitron Products, Inc.

2.02 MATERIAL AND DESIGN

A. Materials: Conform to the following specifications:
   1. ASTM A446 Grade A, G90.
   2. ASTM A570 Grade 33.
   3. ASTM A575 Grade 50.
   4. ASTM 675 Grade 50, SAE J429, Grade 2.

B. All materials shall be stamped and identifiable by manufacturer and part number. Materials that appear damaged, distressed, unidentifiable or rusted shall not be used and will not be accepted.

C. Design:
   1. Refer to Vendor drawings for exact loading requirements of equipment.
   2. Support Structure: Support members at the ceiling plane shall be located as indicated on shop drawings. Provide for equipment to be attached at any point along the support members without drilling into support system or welding to same.
   3. Ceiling Anchorage: Wherever possible attachment to ceiling shall be imbedded concrete inserts, through bolts, or direct attachment to structural framing.
   4. Loading: The support structure shall be designed to support a concentrated load of 2000 pounds at any point along all equipment rails.
   5. Safety Factor: Support structure shall be designed for a minimum safety factor of 3 based on the ultimate strength under static loading conditions. Deflection shall not exceed 1/720 span in either plane under maximal loading conditions.
   6. Seismic Bracing: Comply with applicable tables, charts, Cp values, importance factors, and other requirements.
      a. Comply with applicable Building Code latest edition.
      b. Use installation methods required to meet local and governing seismic regulatory requirements.

D. Finish: All members and connections shall be coated with a corrosion resistant finish. Hardware shall be electro-galvanized.

PART 3 - EXECUTION

3.01 COORDINATION

A. Verify that surface conditions are ready to receive work.

B. Coordinate the layout of ceiling anchorage with other work above ceiling.

C. Beginning medical support system work means acceptance of existing conditions.

3.02 INSTALLATION

A. General:

1. Install supporting framework plumb and true and to the following tolerances:
    a. The mounting surfaces of the support structure shall be horizontal within the tolerance of 1/32" in 24 inches and within 1/16" in 18 foot length.
    b. The elevation of one rail mounting surface to the other shall be within 1/16" in any 24" length of the rails.

B. Installation:
1. The medical support structure shall be installed in full accordance with approved shop drawings. Any modification shall be reported to the Architect.
2. The contractor shall assure that the support system is installed in a timely and practical sequence, ahead of any extensive electrical, mechanical or HVAC work in that area, and prior to any ceiling framing or room finishes.
3. All exposed members shall be painted by the painting contractor with paint compatible to the support systems.

3.03 SCHEDULE

A. Provide Unistrut framing above GEN RAD for equipment rails

B. Contractor's option to use Unistrut in lieu of structural framing for:
1. CT Scan injector support

END OF SECTION

SECTION 055133
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated ladders.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

C. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

D. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

F. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

G. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Specimen warranty.

E. Executed warranty.

1.05 QUALITY ASSURANCE

A. Design ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for material and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.

B. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

C. Bolts, Nuts, and Washers: Stainless steel.

D. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; 6063 alloy, T52 temper.
   3. Finish: Mill finish aluminum.
   4. Manufacturers:
      a. Alaco Ladder Company; 561 Series Fixed Wall Ladder: www.alacoladder.com/#sle.
      b. Industrial Ladder & Scaffolding, Inc: www.anyladder.com/#sle.
      c. O'Keeffe's Inc: Model 503A: www.okeeffes.com/#sle.
      d. Precision Ladders, LLC: www.precisionladders.com/#sle.
      e. Substitutions: See Section 016000 - Product Requirements.

2.04 FINISHES - ALUMINUM

A. Interior Aluminum Surfaces: Class I natural anodized.

B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

2.06 ACCESSORIES

A. Provide a telescoping arm (Ladder UP Safety Post) Model LU-1 at top of ladder
   1. It shall be designed with a telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip aluminum where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheathing.

B. Roof-mounted curbs.

C. Roofing nailers.

D. Preservative treated wood materials.

E. Fire retardant treated wood materials.

F. Communications and electrical room mounting boards.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

H. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2021, with Editorial Revision (2022).

I. PS 1 - Structural Plywood; 2023.

J. PS 2 - Performance Standard for Wood Structural Panels; 2018.

K. PS 20 - American Softwood Lumber Standard; 2025.

L. SPIB (GR) - Standard Grading Rules; 2021.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing: PS 2 type, rated Structural I Sheathing.
   1. Bond Classification: Exterior.
   2. Span Rating: 60.
   3. Performance Category: 3/4 PERF CAT.

B. Wall Sheathing, For backside of parapets: PS 2 type.
   1. Bond Classification: Exterior.
   2. Grade: Structural I Sheathing.
   3. Span Rating: 16.
   4. Performance Category: 3/4 PERF CAT.
   5. Edge Profile: Square edge.
   6. Must be compatible with adhesive to attach roofing membrane.

C. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant (16 mm Type X fire resistant).
   1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   2. Edges: Square.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   2. Gypsum Board Screws: ASTM C1002; Type W, bugle head, self-piercing, tapping screws; length to penetrate wood members 5/8 inch (15.9 mm) minimum.
   3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Termite-Resistant Sill Flashing: Self-adhesive membrane; polyethylene film bonded to sealant.
   1. Thickness: 40 mil, 0.040 inch (1 mm).
   2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   3. Water Vapor Permeance: 0.035 perm (2 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing, flashing, or waterproofing.
      d. Treat lumber in contact with masonry or concrete.
      e. Treat lumber less than 18 inches (450 mm) above grade.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Wall mounted medical equipment.
   11. Television and Trackers.

3.03 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
   1. Install plywood wall sheathing in accordance with manufacturer's current ICC-ES evaluation report for specified sheathing product.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.
   5. Do not paint over the FR labels on exposed plywood panels. Labels shall be visible to AHJ for inspections.

3.05 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061643
GYPSUM SHEATHING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Gypsum wall sheathing.
   2. Sheathing joint and penetration treatment.

B. Related Requirements:
   1. Section 05 40 00 “Cold-Formed Metal Framing.”
   2. Section 06 16 36 "Plywood Sheathing” for sheathing to be installed on backside of parapet walls.
   3. Section 07 27 26 "Fluid-Applied Membrane Air Barrier" for air barrier applied over wall sheathing.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier and gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and gypsum sheathing.
   2. Refer to Division 05 Section “Cold-Formed Metal Framing” for additional information.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. Shop Drawings: Comply with provisions of Division 05 Section “Cold-Formed Metal Framing.”
   1. Shop Drawings that are required by that Section, indicate exterior sheathing screw fastener spacing to be utilized at interior zones and corner zones of building façade, as required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports, if required.

1.05 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for materials and execution.
   1. Provide mock-up in accordance with provisions of Section 01 43 39.
   2. Build integrated mockups of exterior wall assembly, 150 sq. ft. (14 sq. m), incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.
      a. Coordinate construction of mockups to permit inspection and testing of sheathing before external insulation and cladding are installed.
      b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
      c. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Testing Agency Qualifications (If Required):

1. For testing agency provide inspections that are acceptable to Owner that periodically performs inspections to verify that material are installed correctly.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.02 GYPSUM SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation; GlasRoc.
      b. Georgia-Pacific Building Products; Dens-Glass Exterior Sheathing.
      c. National Gypsum Company; Gold Bond eXP.
      d. United States Gypsum Co.; Securock.
   2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
   3. Permeance: Not less than 15 perms per ASTM E 96.
   4. Size: 48 by 96 inches (1219 by 2438 mm).
   5. Mold Growth: 10, per ASTM D 3273.

2.03 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
   1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, provide one of the following:
      a. Bugle-head screws complying with ASTM C 954.
      b. Wafer-head screws complying with ASTM C 1513.
   2. Minimum Fastener Head Diameter: Not less than 0.42 in. (10.7 mm), unless larger diameter is required by sheathing manufacturer.

2.04 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sheathing Sealant: Refer to Section 07 27 26 “Fluid-Applied Membrane Air Barrier.” Sealant must be approved by Air-Barrier manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. ASTM C 1280, unless closer spacing is required in order for sheathing to resist pressures imposed by design wind speeds.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with bugle-head or wafer-head screws, with minimum head diameter of 0.42 in. (10.7 mm), unless larger diameter is required by sheathing manufacturer.
   2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
   3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
      a. Decrease spacing between fasteners where required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds, as indicated in Shop Drawings submitted under Division 05 Section “Cold-Formed Metal Framing”.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
      a. Decrease spacing between fasteners where required to ensure sheathing installation will withstand negative wind pressures imposed by design wind speeds, as indicated in Shop Drawings submitted under Division 05 Section “Cold-Formed Metal Framing”.

3.03 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to “Air-Barrier” manufacturer's written recommendations.
   1. Apply sealant on joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling, unless directed otherwise by “Air-Barrier” manufacturer’s written instructions. Seal other penetrations and openings.
      a. Utilize primers and tapes as recommended by sealant manufacturer at corners and joints at adjacent substrates.
   2. Taping of joints will not be accepted as an alternative or substitute for application of joint sealant.
   3. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply [transition strip] [silicone sheet transition], so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.
      a. Transition Strip: Roll firmly to enhance adhesion.

b. Silicone Sheet Transition: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

4. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
5. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
6. Seal top of through-wall flashings to sheathing with an additional 6-inch- (150-mm-) wide, transition strip.
7. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
8. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.04 FIELD QUALITY CONTROL

A. Testing: Owner reserves the right to engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. The following items will be subject to testing and inspecting:
   1. Attachment of sheathing to studs and other supplemental support framing.
   2. Type and size of fasteners.
   3. Spacing of fasteners.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 061700
ENGINEERED FRAMING SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Engineered lumber framing systems for the following applications:
   1. Parapet cap engineered framing system.
   2. Window and door buck engineered framing system.
   3. Top and sill plate engineered framing system.

1.02 REFERENCES

A. American Wood Protection Association (AWPA):
   1. AWPA U1-15, UC2 Interior/Damp Use.

B. ASTM International (ASTM):
   1. ASTM E 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. (R-Value).

C. ICC Evaluation Service:
   1. ICC-ES Report ESR-1387 -StrandGuard TimberStrand LSL 1.30E treated with zinc borate.

D. NAHB Research Center:
   1. Green Approved Product for National Green Building Certification, Certificate 00008.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 30 00 - Administrative Requirements.

B. Product Data: Submit manufacturer's current published data including materials, standard details, and installation instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.

B. AWPA Standards: Materials shall meet AWPA U1-15 for Use Category UC 2. Service conditions for UC2 are interior construction, above ground, damp; protected from weather, but may be subject to sources of moisture.

C. NAHB Green Approved Product: Materials shall be NAHB Green Approved; StrandGuard TimberStrand LSL is an Green Approved Product for National Green Building Certification, Certificate 00008.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials in accordance with manufacturer's recommendations and as required to avoid damage.

1.06 PROJECT CONDITIONS

A. Maintain temperature and humidity within limits recommended by the manufacturer. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.07 WARRANTY

A. Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: PreBuck, which is located at: 2555 28th St. SW; Wyoming, MI 49519; Tel: 616-309-6256; Email: request info at sales@prebuckproducts.com; Web:http://www.prebuckproducts.com

B. Requests for substitutions will be considered in accordance with provisions of the General Conditions and Division 01.

2.02 PARAPET CAP ENGINEERED FRAMING SYSTEM

A. Parapet Cap Engineered Framing System: StrandGuard TimberStrand LSL 1.30E Engineered Lumber by PreBuck Engineered Framing Systems.
   1. Meets AWPA U1-15 for Use Category 2 (UC2).
   2. NAHB Research Center Green Approved.
   3. MDI resin, 100 percent waterproof when cured.
   4. Treated with zinc borate through complete cross section.
   5. Typical material 1-1/2 inches (38 mm) thick; built-up as required.
   6. Round 1-1/4 inch counter sunk anchor openings at 24 inches O.C.
   7. Acceptable for direct contact with concrete, non-corrosive to metals, insect and fungi resistive.
   8. Materials: StrandGuard TimberStrand LSL 1.30E Engineered Lumber, ICC ESR-1387.
      a. Treatment: Zinc borate through complete cross section.
      b. Bending Strength: 1900 psi.
      c. Tensile Strength: 1075 psi.
      d. Shear Strength: 150 psi.
      e. Compression - Perpendicular to Grain: 670 psi.
      f. Specific Gravity: 0.50 into the face, 0.42 into the edge.
      g. R-value of 1-1/2 inch thickness (ASTM E 518): 1.86.

2.03 WINDOW AND DOOR BUCK ENGINEERED FRAMING SYSTEM

A. Window and Door Buck Engineered Framing System: StrandGuard TimberStrand LSL 1.30E Engineered Lumber by PreBuck Engineered Framing Systems.
   1. Meets AWPA U1-15 for Use Category 2 (UC2).
   2. NAHB Research Center Green Approved.
   3. MDI resin, 100 percent waterproof when cured.
   4. Treated with zinc borate through complete cross section.
   5. Typical material 1-1/2 inches (38 mm) thick; built-up as required.
   6. Metal flange, 1-1/2 inch (38 mm) x 1-1/2 inch (38 mm), 20 gauge galvanized metal as applicable.
   7. Fasteners, 3-4 16D nails, minimum, each corner.
   8. Two continuous dovetail keyways at entire perimeter to eliminate air infiltration.
   9. Non-obstructive with insulated concrete forming (ICF) web.
   10. Unit self-aligns on wall.
   11. Acceptable for direct contact with concrete, non-corrosive to metals, insect and fungi resistive.
   12. Materials: StrandGuard TimberStrand LSL 1.30E Engineered Lumber, ICC ESR-1387.
      a. Treatment: Zinc borate through complete cross section.
      b. Bending Strength: 1900 psi.
      c. Tensile Strength: 1075 psi.
      d. Shear Strength: 150 psi.
      e. Compression - Perpendicular to Grain: 670 psi.
      f. Specific Gravity: 0.50 into the face, 0.42 into the edge.
      g. R-value of 1-1/2 inch thickness (ASTM E 518): 1.86.

2.04 TOP AND SILL PLATE ENGINEERED FRAMING SYSTEM

A. Top and Sill Plate Engineered Framing System: StrandGuard TimberStrand LSL 1.30E Engineered Lumber by PreBuck Engineered Framing Systems.
   1. Meets AWPA U1-15 for Use Category 2 (UC2).
   2. NAHB Research Center Green Approved.
   3. MDI resin, 100 percent waterproof when cured.

4. Treated with zinc borate through complete cross section.
5. Typical material 1-1/2 inches (38 mm) thick; built-up as required.
6. Countersinking cutouts for bolts.
7. Wet set system for anchoring sill plates while concrete is still wet.
8. Acceptable for direct contact with concrete, non-corrosive to metals, insect and fungi resistive.
9. Materials: StrandGuard TimberStrand LSL 1.30E Engineered Lumber, ICC ESR-1387.
    a. Treatment: Zinc borate through complete cross section.
    b. Bending Strength: 1900 psi.
    c. Tensile Strength: 1075 psi.
    d. Shear Strength: 150 psi.
    e. Compression - Perpendicular to Grain: 670 psi.
    f. Specific Gravity: 0.50 into the face, 0.42 into the edge.
    g. R-value of 1-1/2 inch thickness (ASTM E 518): 1.86.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install materials in accordance with manufacturer's recommendations and in proper relationship with adjacent construction. Set members level, plumb, and true to line.

B. Coordinate construction sequence with installation of flashings and adjacent materials provided by others to prevent exterior moisture from entering or passing through completed assemblies.

C. Remove excess and waste materials from the job.

END OF SECTION

SECTION 064020
CASEWORK HARDWARE AND ACCESSORIES

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

A. BHMA A156.9 - Cabinet Hardware; 2020.

B. BHMA A156.11 - American National Standard for Cabinet Locks; 2019.

C. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.

D. BHMA A156.18 - Standard for Materials and Finishes; 2020.

1.02 SUMMARY

A. This section includes finish hardware and accessories for cabinetry and countertops.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 064116 “Plastic-Laminate-Faced Architectural Cabinets”.
   2. Section 123216 “Manufactured Plastic-Laminate-Faced Casework”.
   3. Section 123623.13 "Plastic-Laminate-Clad Countertops".
   4. Section 123661 “Simulated Stone Countertops”.

1.03 REFERENCES

A. Standards of the following as referenced:
   1. American National Standards Institute (ANSI)
   2. Builders Hardware Manufacturers Association (BHMA)
   3. Business and Institutional Furniture Manufacturer’s Association (BIFMA)

B. Regulatory standards of the following as referenced:
   1. Department of Justice, Office of the Attorney General, Americans with Disabilities Act, Public Law 101-336 (ADA).
   2. CABO/ANSI A117.1: Providing Accessibility and Usability for Physically Handicapped People, 2010 edition.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of hardware and accessory, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements. Provide catalog information for the specified items and for those submitted.
   1. Submittal Coordination: Submit concurrent with, or combined with, casework/countertop submittals to allow a coordinated review.
   2. Submittal Sequence: Submit at earliest possible date particularly where acceptance of hardware must precede fabrication of casework that is critical in the Project construction schedule.
   3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

C. Review shop drawings of other work to confirm that adequate provisions are made for locating and installing casework hardware and accessories to comply with indicated requirements.

D. Contract closeout submittals:
   1. Operation and maintenance data: Complete information for installed casework hardware and accessories.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware and accessory from a single manufacturer.

B. Supplier Qualifications: A distributor that has a record of successful in-service performance for supplying casework hardware and accessories similar in quantity, type, and quality to that indicated for this Project.

1.06 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of casework hardware and accessories.

PART 2 - PRODUCTS

2.01 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
   1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Frameless Concealed Hinges (European Type): provide BHMA A156.9, Type B01602, 170 degrees of opening, self-closing. Provide 2 hinges for doors less than 36”, 3 hinges for door from 36 to 72”, 4 hinges for doors over 72”.

C. Pocket Door Slide System: Haefele No. RP 42/60, Nickel-Plated, size as required.

D. Pulls: ADA compliant, solid aluminum wire pulls, 4 inches (101.6 mm) long minimum, 5/16 inch (7.94 mm) in diameter, fastened from back with two screws. For sliding doors, provide recessed chrome-plated flush pulls. Provide two pulls for drawers more than 24 inches wide.

E. Door Catches: BHMA A156.9, B04013 Zinc-plated, dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches (1219.2 mm) high.

F. Drawer Slides: BHMA A156.9, Type B05091.
   1. Standard Duty: Extension slides shall be bottom and side mount epoxy steel slides. Lateral stability achieved through a formed captive slide profile. Slides shall glide on nylon rollers and carry a 100# dynamic load rating. Slides feature both in and out drawer stop with 3" self close and adjustable cam side alignment. Drawer slides shall meet or exceed Grade 1 requirements per ANSI A156.9/BHMA with full extension slides on file and paper storage. For drawers more than 6 inches (152.4 mm) high or more than 24 inches (609.6 mm) wide, slides shall meet or exceed Grade 1HD-100.
   2. File Drawer Slides: Full extension ball bearing slides. Slides shall be side mounted with profile to not reduce interior drawer space normally provided. Ball bearing slides to be tested under the Business and Institutional Furniture Manufacturer’s Association (BIFMA) X5.5 Section 7. Slides shall pass both 50,000 and 100,000 cycle test with a 120# load rating.

G. Label Holders: Chrome plated, sized to receive standard label cards approximately 1 by 2 inches (50.8 mm), attached with screws or brads.
   1. Provide label holders where indicated on drawings.

H. Drawer and Hinged Door Locks: Cylindrical (cam) Mortise type, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.
   1. Provide a minimum of two keys per lock and six master keys.
   2. Provide locks where indicated.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door units. Satin finish.

K. Adjustable Shelf Standards and Supports: BHMA A156.9 , B04071; with shelf rests, B04081.

L. Adjustable Shelf Rests: Single-pin satin finish metal shelf rests complying with BHMA A156.9, Type B04013.

M. Wardrobe Rods:

1. Knape & Vogt Manufacturing Company, 1-1/16 inch (27 mm) Rod No. 770 with No. 632 Flanges.
2. Knape & Vogt Manufacturing Company, Clothing Carrier No. KV1, size as required. FOR USE IN WARDROBE CABINETS LESS THAN 24 INCHES DEEP.

N. Wardrobe Hooks: Double Hook, Ives No. 572, Satin Finish.

O. Wire Manager: Doug Mockett and Company Large J-Shape Wire Manager with Flange No. WM22A. Install per manufacturer's recommendations for double-sided tape installation.

P. Grommets for Cable Passage through Countertops: Doug Mockett and Company as follows:
1. EDP3 Flip-Top Series 2-1/2 inch (64 mm) Grommet.
2. RG Rectangular Grommet.
3. Color: Matte Black.

Q. Workstation and Countertop Support Brackets: A&M Hardware, Inc., Standard Bracket, 1/8" Steel, ADA compliant.
1. Finish: Pre-primed finish.
2. Color: As selected from manufacturer's full range.
3. Size: As required to support 50 lb/sf minimum uniform load and 200 lbf minimum concentrated load with maximum ¼" deflection.

2.02 HARDWARE FINISHES

A. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

B. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware and accessories.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install each item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware and accessories onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

B. Set units level, plumb, uniformly and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

C. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and accessories to ensure proper operation or function of every unit. Doors and drawers shall operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where operating items are installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all operable items in such space or area. Clean operating items as necessary to restore proper function and finish.

B. Clean adjacent surfaces soiled by field installed hardware and accessories.

C. Hardware and Accessory Supplier's Field Service:
   1. Inspect items for correct installation and adjustment after complete installation.
   2. Instruct Owner's personnel in the proper adjustment and maintenance of hardware, accessories and finishes.
   3. File written report of this inspection to Architect.

END OF SECTION

SECTION 064116
PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. PS 1 - Structural Plywood; 2023.

1.02 SUMMARY

A. Section Includes:
   1. Custom fabricated plastic-laminate-faced architectural cabinets. Examples of custom fabrications are Nurse Station fronts and plastic laminate finished decorative panels. Refer to Section 123216 Manufactured Plastic-Laminate-Faced Casework for specification for standard, fabricated casework units of stock design.
   2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:
   1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
   2. Section 079200 “Joint Sealants” for sealing gaps between casework components and building components.
   3. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
   4. Section 096513 "Resilient Base and Accessories" for resilient base applied to plastic-laminate-faced casework.
   5. Section 123216 "Manufactured Plastic-Laminate-Faced Casework."
   6. Section 123570 "Healthcare Casework."
   7. Section 123623.13 "Plastic-Laminate-Clad Countertops."
   8. Section 123661 "Simulated Stone Countertops."
   9. Division 22 Plumbing Fixtures and Trim.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product , including.
   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   2. Show locations and sizes of cutouts and holes for electrical switches and outlets installed in architectural plastic-laminate cabinets.
   3. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches (254 mm), for each type, color, pattern, and surface finish, with one sample applied to core material.

2. Wood-grain plastic laminates, 12 by 24 inches (609.6 mm), for each type, pattern and surface finish, with one sample applied to core material.
3. Thermoset decorative panels, 8 by 10 inches (254 mm), for each color, pattern, and surface finish, with edge banding on one edge.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product.
1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Glass.
5. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 degrees Fahrenheit (32.22 degrees Celsius) and relative humidity between 43 and 70 _____ percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 PRODUCTS

2.01 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide labels from AWI certification program indicating that woodwork , including installation, complies with requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Reveal Dimension: 1/2 inch (12.7 mm) _____.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
   1. Manufacturers: For each laminate type, manufacturer, series and color, see Finish Legend on Finish Drawings. Also coordinate with Section 002150 and the Owner’s Preferred Vendor List for other manufacturers that may be considered acceptable. Substitutions shall be submitted in accordance with Division 01 section "Product Requirements".

G. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGS.
   2. Vertical Surfaces: Grade VGS.
   3. Edges: Grade HGS.
   4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

H. Materials for Semi-exposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3 , Grade VGS.
      a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3.05 mm) thick, matching laminate in color, pattern, and finish.
      b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
      c. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
   2. Drawer Sides and Backs: Solid-hardwood lumber.
   3. Drawer Bottoms: Hardwood plywood.

I. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join sub-fronts, backs, and sides with glued dovetail joints.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As indicated by laminate manufacturer's designations.
   2. Match Architect's sample.
   3. As selected by Architect from laminate manufacturer's full range in the following categories:

a. Solid colors, gloss finish.
b. Solid colors with core same color as surface, gloss finish.
c. Wood grains, gloss finish.
d. Patterns, gloss finish.

2.02 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard: ANSI A208.2, Grade 130 _____, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2.
3. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
a. Products: Subject to compliance with requirements, provide the following:
1) Environ Biocomposites Manufacturing LLC; Biofiber Wheat.
2) Sorm Incorporated; Primeboard Premium Wheat.
4. Softwood Plywood: DOC PS 1, medium-density overlay.
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.03 CABINET HARDWARE AND ACCESSORIES

A. Cabinet hardware and accessory materials associated with architectural casework are specified in Section 064020 "Casework Hardware and Accessories."

2.04 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.05 FABRICATION

A. Fabricate cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 EXECUTION

3.01 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.02 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
   1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch (3.18 mm) in 96-inch sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (406.4 mm) o.c. with either No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish or toggle bolts through metal backing or metal framing behind wall finish.

G. Install cabinet hardware and accessory materials associated with architectural casework as specified in Section 064020 "Casework Hardware and Accessories."

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware as specified in Section 064020 "Casework Hardware and Accessories.".

C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION

SECTION 071113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous dampproofing.

1.02 REFERENCE STANDARDS

A. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).

B. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mar-flex Waterproofing & Building Products: www.mar-flex.com/#sle.

B. W. R. Meadows, Inc: www.wrmeadows.com/#sle.

C. Tremco.

D. Substitutions: See Section 016000 - Product Requirements.

E. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.02 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
   1. Composition: ASTM D4479/D4479M Type I, asbestos free.
   2. VOC Content: Not more than permitted by local, State, and federal regulations.
   3. Applied Thickness: 1/16 inch (1.5 mm), minimum, wet film.
   4. Products:
      a. W. R. Meadows, Inc; Sealmastic Spray-Mastic: www.wrmeadows.com/#sle.
      b. Tremco TremProof 250 GC.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

C. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

D. Prime surfaces at a rate approved by manufacturer for application indicated, and allow primer to dry thoroughly.

E. Apply bitumen by spray application.

F. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F (14 degrees C); do not exceed finish blowing temperature for four hours.

G. Apply bitumen in two coats, continuous and uniform, at a rate of 25 sq ft/gal (0.6 sq m/L) per coat.

H. Apply from 2 inches (50 mm) below finish grade elevation down to top of footings.

I. Seal items watertight with mastic, that project through dampproofing surface.

J. Immediately backfill against dampproofing to protect from damage.

END OF SECTION

SECTION 072116
THERMAL BATT INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Section 072610: Vapor retarder materials adjacent to insulation.

B. Section 092900: Batt-type sound insulation.

1.02 REFERENCED STANDARDS

A. American Society for Testing and Materials (ASTM).
   1. E84-Test Method for Surface Burning Characteristics of Building Materials.
   2. E136-Test Method for Behavior of Materials in a Vertical Tube Furnace at 750oC.
   3. C518-Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter.
   4. C665-Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.03 SUBMITTALS

A. Submit items under provisions of Section 013310.

B. Submit product data showing product characteristics, performance criteria, limitations and installation instructions. Include certification that insulation is free of formaldehyde.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver items to the site and handle, store and protect under provisions of Section 016000.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Acceptable manufacturers: Refer to the Owner's Bulk Purchasing Vendor List in Document 002150 for the Owner’s preferred manufacturer. Materials of manufacturers other than the preferred manufacturers which are of the same function and performance will be considered under provisions of Section 016000.

B. Insulation: Full-thick non-backed formaldehyde-free fiberglass batts, thickness as indicated, complying with the property requirements of ASTM C665, Type 1, and ASTM E136. Use insulation wide enough to compress between building components and completely fill the cavity being insulated.
   1. Maximum flame characteristics: Flame Spread rating of 10, Smoke Development rating of 10 when tested in accordance with ASTM E84.
   2. Minimum thermal insulating value: R-value of 3 per inch thickness when tested in accordance with ASTM C518.
   3. Dimensional stability: Linear shrinkage less than 0.1%.

C. Tie wire: 22 gauge galvanized steel wire.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Preparation:
   1. Verify adjacent materials are dry and ready to receive insulation.
   2. Verify mechanical and electrical services within walls have been installed and tested.
   3. Coordinate the work of this Section with the work of Section 072610 for installation of vapor retarder materials.

B. Install insulation in accordance with the manufacturer's printed instructions without voids or gaps. Use batts free of damage. Do not compress insulation.

C. Trim insulation to neatly fit spaces. Insulate miscellaneous gaps.

D. Fit insulation tight in spaces and tight to exterior side of mechanical, plumbing and electrical services within the plane of the insulation.

3.02 PROTECTION

A. Protect installed insulation from weather damage.

B. Replace insulation that becomes wet or is otherwise damaged with new insulation.

END OF SECTION

SECTION 072419
WATER DRAINAGE EIFS SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Water-drainage exterior insulation and finish system (EIFS) including liquid-applied air/moisture applied over gypsum sheathing.

B. **NOA Product Appoval: 24-0921.14 (over Studs & Sheathing)**
   1. **Expires 01-17-2028**

C. **NOA Product Appoval: 25-0107.03 (over CMU)**
   1. **Expires 05-21-2030**

D. Related Sections include the following:
   1. Division 04 Section “Unit Masonry” for concrete masonry unit substrate.
   2. Division 06 Section "Gypsum Sheathing" for sheathing.
   3. Division 07 Section "Joint Sealants" for requirements of joints sealants used in EIFS.

1.02 SYSTEM DESCRIPTION

A. Water-Drainage Class PB EIFS: A non-load-bearing, exterior wall cladding system that consists of an insulation board attached adhesively to the substrate over a liquid applied air/moisture barrier in a manner allowing water entering into the system to drain to the exterior; an integrally reinforced base coat; and a textured protective finish coat as indicated on Drawing.

1.03 ACTION SUBMITTALS

A. Product Data: For each type and component of EIFS indicated.

B. Shop Drawings: For EIFS. Include plans, elevations, sections, details of components, details of penetration and termination, flashing details, joint locations and configurations, fastening and anchorage details, and connections and attachments to other work.

C. Samples for Verification: 24-inch-(600-mm-) square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including custom trim, each profile, an aesthetic reveal, a typical control joint filled with sealant of color selected.
   1. Include sealants samples to verify color selected.

1.04 INFORMATIONAL SUBMITTALS

A. Installer Certificates:
   1. Signed by system manufacturer certifying that installers comply with specified requirements.
   2. Submit proof of payment and performance bonding for this specific project.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

C. Manufacturer Certificates: Signed by manufacturers certifying that EIFS and joint sealants comply with requirements.

D. Material or Product Certificates: For base coat water resistant coating, adhesive, insulation, finish coat and joint sealant, from manufacturer.

E. Field quality-control reports and special inspection reports.

F. Sample Warranty: Submit unexecuted copy of EIFS manufacturer’s warranty stating obligations, remedies, limitations, and exclusions of warranty.

G. Project Observation Form:

1. Submit two copies to Architect and Owner's representative within 48 hours of each site visit.
2. Use form included at the end of this Section.
3. Refer to Field Quality Control article in Part 3.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.

B. Warranties: Special warranty specified in this Section.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by EIFS manufacturer as qualified to install manufacturer's system using trained workers.
   1. Bondable. Refer to "Informational Submittals" Article above.

B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with system components.

C. Fire-Test-Response Characteristics: Provide EIFS and system components with the following fire-test-response characteristics as determined by testing identical EIFS and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
   1. Radiant Heat Exposure: No ignition of EIFS when tested according to NFPA 268.
   2. Surface-Burning Characteristics: Provide insulation board, adhesives, base coats, and finish coats with flame-spread index of 25 or less and smoke-developed index of 450 or less, per ASTM E 84.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Construct sample panel at jobsite, in location directed by Architect.
   2. Size: Minimum 4 feet wide by 8 feet tall 2 feet deep sample wall with one outside corner. Wall construction shall include the following:
      a. Typical wall substrate including studs, sheathing, and primer/sealer.
      b. Outside corner construction.
      c. Scheduled insulation thickness.
      d. Weep screed/starter track.
      e. Typical routed joint (reveal), horizontal and vertical.
      f. Typical sealant joint, including sealant in selected color.
      g. Typical window opening construction, including flashings.
      h. Typical parapet/cornice construction.
      i. Approved color, texture, and finish.
   3. Utilize sample panel for coordination with trades whose work is adjacent to or interfaces with EIFS.
   4. Approval of sample panels is for color, texture, sealant colors to EIFS colors, tooling of joints, aesthetic qualities of workmanship, and other material and construction qualities specifically approved by Architect in writing.
      a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.
2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.09 COORDINATION

A. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant sheathing paper, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and drainage plane that is behind water-drainage EIFS.

B. Coordinate installation of EIFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant sheathing, flashing, trim, joint sealants, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of EIFS.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Bond integrity and weathertightness.
      b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.
   2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
      a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
      b. Insulation installed as part of EIFS including foam build-outs.
      c. Insulation adhesive and mechanical fasteners.
      d. EIFS accessories, including trim components and flashing.
      e. Water-resistive coatings.
      f. EIFS drainage components.
   3. Warranty Period: Five years from date of Substantial Completion.

B. Special Project Warranty: EIFS Installer's agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within the following warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

C. Warranty: Provide for assignment of warranty to new owner if facility is sold.

D. Legal Forum Selection: State where project is located or State of Tennessee.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following and; Manufacturers: Subject to compliance with requirements, provide products by manufacturers listed in Document 002150 - Owner's Preferred Vendor List. *No substitutions permitted.*
   1. Dryvit Systems, Inc., West Warwick, RI.
   2. Sto Corp.

B. Basis of Design: Sto Corp.; StoTherm ci LM 180.

2.02 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with the following:
   1. Bond Integrity: Free from bond failure within EIFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
   2. Weathertightness: Resistant to water penetration from exterior into water-drainage EIFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of EIFS and assemblies behind it, including substrates, supporting wall construction, and interior finish, and including a means that allows water entering into an EIFS assembly to drain to the exterior.

B. Class PB EIFS: Provide EIFS having physical properties and structural performance that comply with the following:
   1. Abrasion Resistance: Sample consisting of 1-inch-(25.4-mm-) thick EIFS mounted on 1/2-inch-(12.7-mm-) thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts(500 L) of sand when tested per ASTM D 968, Method A.
   2. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
   3. Accelerated Weathering: Five samples per ICC-ES AC235 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 155.
   4. Freeze-Thaw: No surface changes, cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination, or indications of delamination between components when viewed under 5 times magnification after 10 cycles per ICC-ES AC235.
   5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch (50.8 by-50.8-mm) clean glass substrate, cured for 28 days, and showing no growth when tested per ASTM D 3273 and evaluated according to ASTM D 3274.
   6. Tensile Adhesion: No failure in the EIFS, adhesive, base coat, or finish coat when tested per ICC-ES AC235.
   7. Water Penetration: Sample consisting of 1-inch-(25.4-mm-) thick EIFS mounted on 1/2-inch-(12.7-mm-) thick gypsum board, cured for 28 days, and showing no water penetration into the plane of the base coat to expanded polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft.(299 Pa) of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02.
   8. Water Resistance: Three samples, each consisting of 1-inch-(25.4-mm-) thick EIFS mounted on 1/2-inch-(12.7-mm-) thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
   9. Impact Resistance: Sample consisting of 1-inch-(25.4-mm-) thick EIFS when constructed, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following:

a. Standard Impact Resistance: 25 to 49 inch-lb (2.8 to 5.6 J).
b. High Impact Resistance: 90 to 150 inch-lb (10.2 to 17 J).

10. Drainage: According to ICC-ES AC235.
11. Structural Performance Testing: EIFS assembly and components shall comply with ICC-ES AC235 when tested per ASTM E 330.

2.03 MATERIALS

A. Compatibility: Provide liquid-applied air/moisture barrier, adhesive, board insulation, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by EIFS manufacturer for Project.

B. Liquid-Applied Air/Moisture Barrier: EIFS manufacturer's standard formulation and accessories for use as water/weather-resistive barriers, compatible with substrate, and complying with physical and performance criteria of ICC-ES AC212.
1. Sheathing Joint Compound and Self-Adhesive Mesh: Type recommended by EIFS manufacturer for sealing joints between and penetrations through sheathing, perimeters of sheathing, perimeters of rough openings, and other locations and conditions recommended by manufacturer.
2. VOC Content of Coatings Used as Insulation Adhesive: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; specifically formulated to be applied to back side of insulation in a manner that creates open vertical channels designed to serve as an integral part of the water-drainage system of the EIFS-clad drainage-wall assembly; compatible with substrate; and complying with the following:
1. Factory-mixed, single-component, polymer-modified, cement-based dry powder material; self-gauging to achieve 1/16 inch (1.6 mm) base coat thickness in a single coat application.
2. Wood Substrates: Factory-mixed non-cementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, self-gauging to achieve 1/16 inch (1.6 mm) base coat thickness in a single coat application as recommended by EIFS manufacturer.

D. Molded or Extruded, Rigid Cellular Polystyrene Board Insulation: Comply with ASTM C 578, Type I or Type IV; EIFS manufacturer's requirements; and EIMA's "EIMA Guideline Specification for Expanded Polystyrene (EPS) Insulation Board" for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than 6 weeks or by another method approved by EIMA that produces equivalent results.
2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, per ASTM E 84.
3. Dimensions: Provide insulation boards not more than 24 by 48 inches (610 by 1219 mm) and in thickness indicated but not more than 4 inches (102 mm) thick or less than thickness allowed by ASTM C 1397.
4. Foam Shapes: Provide with profiles and dimensions indicated on Drawings.

E. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per ASTM E 2098; complying with ASTM D 578 and the following:
1. Standard-Impact Reinforcing Mesh: Not less than 4.0 oz./sq. yd. (136 g/sq. m).
2. High-Impact Reinforcing Mesh: Not less than 15 oz./sq. yd.(509 g/sq. m).
3. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd. (127 g/sq. m).
4. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd. (136 g/sq. m).
5. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).

F. Base-Coat Materials: EIFS manufacturer's standard mixture complying with the following requirements:
   1. Factory-mixed, single-component, polymer-modified, cement-based dry powder material; self-gauging to achieve 1/16 inch (1.6 mm) base coat thickness in a single coat application.
   2. Factory-mixed non-cementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.

G. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating complying with the following:
   1. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.
   2. Colors: As selected by Architect from manufacturer's full range.

H. Water: Potable.

2.04 TRIM ACCESSORIES

A. General: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard Cell Class for use intended, and ASTM C 1063.

B. Weep Screed/Starter Track:
   1. Prefabricated, one-piece extruded PVC type for attachment behind insulation with perforated face leg sloped and extended to form a drip, weep holes in track bottom of depth required to suit thickness of coating and insulation.
   2. Face leg to be perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
   3. Thickness: 1/16 inch.
   4. Width: As required to receive scheduled insulation thickness.
   5. Basis of Design Products:
      a. Vinyl Corporation No. CBS-16SDWF Starter Strip/Casing Bead.
      b. Plastic Components; No. STDE.

C. Window Sill Flashing: Prefabricated type 0.032 inch prefinished aluminum with drip for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.

D. Window Head Flashing: Prefabricated type, 0.032 inch prefinished aluminum with drip designed to direct water to exterior.

2.05 ELASTOMERIC SEALANTS

A. Elastomeric Sealant Products: Provide EIFS manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Division 07 Section "Joint Sealants" for products corresponding to description indicated below:
   1. Single-component, nonsag, neutral-curing silicone sealant.

B. Sealant Color: As selected by Architect from manufacturer's full range.

2.06 MIXING

A. General: Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of EIFS.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.

C. Substrate:
   1. Inspect the substrate to determine if it is in accordance with the Drawings, Specifications, and EIFS manufacturer's requirements.
   2. Promptly correct deficiencies.
   3. Acceptance of substrate, as further confirmed by commencement of EIFS application, precludes asserting substrate problems as a defense for product failure during the warranty period.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Begin coating application only after surfaces are dry.
   2. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.

C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.03 EIFS INSTALLATION, GENERAL

A. Comply with EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.04 SUBSTRATE PROTECTION APPLICATION

A. Liquid-Applied Air/Moisture Barriers: Apply over substrates to protect substrates from degradation and to provide water-/weather-resistive barrier.
   1. Ensure joints, exposed edges, terminations, and inside and outside corners of sheathing are sealed unless otherwise indicated by EIFS manufacturer's written instructions.

3.05 TRIM INSTALLATION

A. Trim: Apply trim accessories according to EIFS manufacturer's written instructions. Coordinate with installation of insulation.
   1. Weep Screed/Starter Track: Use at bottom termination edges of water-drainage EIFS unless otherwise indicated. Provide splices and seal joints, intersections, and ends ensuring weeps remain clear.
   2. Window Sill and Head Flashing: Use at windows unless otherwise indicated.

3.06 INSULATION INSTALLATION

A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397, EIFS manufacturer's written instructions, and the following:
   1. Apply adhesive on back of insulation by notched-trowel method in a manner that results in ridges forming vertical drainage channels leaving channels free of adhesive once insulation is adhered to substrate. Use properly sized notched trowel as recommended by manufacturer providing vertical drainage channels spaced as recommended by manufacturer.

2. Apply adhesive to a thickness of not less than 1/4 inch (6.4 mm), measured from surface of insulation before placement.
3. Press insulation into place maintaining channels free of adhesive. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
4. Allow adhered insulation to remain undisturbed for period recommended by EIFS manufacturer, but not less than 24 hours, before beginning rasping and sanding insulation, or applying base coat and reinforcing mesh.
5. Begin first course of insulation from weep screed/starter track and work upward.
6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) from corners of window and door openings and not less than 4 inches (100 mm) from aesthetic reveals.
    a. Adhesive Attachment: Offset joints of insulation not less than 6 inches (150 mm) from horizontal and 4 inches (100 mm) from vertical joints in sheathing.
7. Interlock ends at internal and external corners.
8. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
    a. Spray foam approved by manufacturer may be used in lieu of insulation strips.
9. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
10. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/16 inch (1.6 mm) from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm).
11. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch (19 mm).
12. Install foam shapes and attach to sheathing.
13. Interrupt insulation for expansion joints where indicated.
14. After installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches (64 mm) over front and back face unless otherwise indicated on Drawings.
15. Treat exposed edges of insulation as follows:
    a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
    b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
    c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
16. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and liquid-applied air/moisture barrier.

B. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9 mm) OD by 4 inches (100 mm) long.

3.07 BASE-COAT INSTALLATION

A. Base Coat: Apply to exposed surfaces of insulation and foam shapes in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch(1.6-mm) dry-coat thickness.

B. Reinforcing Mesh: Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches(64 mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches (204 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.
   1. Standard-impact reinforcing mesh unless otherwise indicated.
   2. High-impact reinforcing mesh where indicated. Butt joints; do not overlap.
   3. Provide impact-resistant reinforcing mesh at ground floor to a minimum height of 10 feet, stopping only at a joint, reveal, or change in plane.

C. Double-Layer Reinforcing Mesh Application: Where indicated, apply second base coat and second layer of standard-impact reinforcing mesh, overlapped not less than 2-1/2 inches(64 mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions in same manner as first application. Do not apply until first base coat has cured.

D. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-300-mm) strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch-(200-mm-) wide strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.
   1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches (200 mm) wide.
   2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

E. Foam Shapes: Fully embed reinforcing mesh in base coat.

3.08 FINISH-COAT INSTALLATION

A. Finish Coat: Apply over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
   1. Texture: As selected by Architect from manufacturer's full range.

B. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.09 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 07 Section "Joint Sealants" and in ASTM C 1481.
   1. Apply joint sealants after base coat has cured but before applying finish coat.
   2. Clean surfaces to receive sealants to comply with indicated requirements and EIFS manufacturer's written instructions.
   3. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
   4. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
   5. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.

3.10 FIELD QUALITY CONTROL

A. Correct deficiencies in or remove and replace EIFS that inspections and test reports indicate do not comply with requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

C. System Manufacturer’s Field Services:

1. Utilize form included with this Section. This form is for minimum observation criteria only and does not exclude any additional observation information that may be relevant. Carry over any noted deficiencies in subsequent report and note re-observation and corrective measures.
2. Provide a detailed examination of the Project at the following process steps:
    a. Review sample panel for proper detailing of junctions of differing products with the EIFS including relief details, roof parapet details, control joints, doors, substrata, flashing, and joint sealants.
    b. Attend Preinstallation Conference.
    c. First floor substrate including the high impact resistant system.
    d. First floor foam application process, base coat applicaton and finish coat.
    e. Subsequent floors during the same stages.
    f. Flashing and termination points of the system and sealants.
    g. Final observation of overall Project.
3. Conduct classes with Contractor as to product types, process, installation issues, substrate concerns, and other issues relevant to EIFS.
4. System manufacturer to observe and report on EIFS installation.
5. Promptly notify Contractor and Architect in writing when any unacceptable condition is observed.
6. Advise Contractor on corrective measures and the impact on the EIFS schedule of installation.

3.11 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

3.12 ATTACHMENT

A. HCA EIFS Quality Assurance Program Project Observation Form

END OF SECTION

SECTION 07 24 19.10

EIFS QUALITY ASSURANCE PROGRAM FORM

HCA

The Healthcare Company
Design, Construction, Equipment, Engineering Services
EIFS Quality Assurance Program

Project Observation Form

Date		
Manufacturer		
Project	Name	
	City/State	
	Building Type	
Architect	Firm	
	City/State	
	Contact/Phone number	
Manufacturer	Representative name	
	City/State	
	Contact/Phone number	
Subcontractor	Name	
	City/State	
	Contact/Phone number	

Observation

Area (bldg location)	Item Reviewed	Status of Work	Description of Deficiencies	Corrective Action Necessary

Defective prior work review

Date of prior observation	Area (bldg location)	Item Reviewed	Status of Work	Description of Deficiencies	Corrective Action Necessary
	Actual corrective action and effectiveness				

Observer & Date: _____

General Contractor & Date: _____

Distribution:
File Legal Sales
Manager General Contractor Owner

SECTION 072500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.

B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay; 2017 (Reapproved 2021).

B. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2024.

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).

G. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; 2015, with Editorial Revision (2020).

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. Provide manufacturer letter that system will not cause degredation to adjacent surfaces.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIERS

A. Regulatory Requirements: For use in ICC (IBC) construction Types I, II, III, and IV buildings greater than 40 feet (12.2 m) in height.
   1. Comply with NFPA 285 wall assembly requirements in accordance with local building code and authorities having jurisdiction (AHJ).

B. Water-Resistive Barrier Coating: Fluid-applied air and water-resistive coating for various exterior substrates.
   1. Air Permeance, Building Assembly Air Leakage Rate: Not greater than 0.04 cfm/sq ft (0.2 L/sq m) when tested at 1.57 psf (75 Pa) in accordance with ASTM E2357.
   2. Air Permeance, Building Material Air Leakage Rate: 0.004 cfm/sq ft (0.02 L/sec sq m) maximum leakage when tested at 1.57 psf (75 Pa) pressure difference in accordance with ASTM E2178.
   3. Water-Resistive Barrier over Sheathing Compliance: Complying with ICC-ES AC212.
   4. Water Vapor Permeance: Tested in accordance with ASTM E96/E96M.
      a. Procedure A: Greater than 5 perms (287 ng/(Pa s sq m)).
      b. Procedure B: Greater than 14 perms (804 ng/(Pa s sq m)).
   5. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 120 days of weather exposure.
   6. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
   7. System Accessory Products: As recommended by coating manufacturer.
   8. Products:
      a. Momentive Performance Materials, Inc/GE Silicones: www.siliconeforbuilding.com/#sle.
      b. PROSOCO, Inc: www.prosoco.com/#sle.

2.02 ACCESSORIES

A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.

B. Flashings and Sealants: As recommended by water-resistive barrier manufacturer for application.

C. Flexible Flashing: Self-adhering or mechanically attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.

D. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable liquid flashing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Install continuous water-resistive barriers where indicated on drawings, with sheets lapped to shed water.

C. Apply sealants within recommended temperature range in accordance with manufacturer's installation instructions.

D. Fluid-Applied Sheets:
   1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
   2. Where exterior masonry veneer is being applied, install masonry anchors prior to placement of water-resistive barrier over masonry substrate; seal airtight around anchors.
   3. Apply bead or trowel coat of mastic sealant with minimum thickness of 1/4 inch (6 mm) along coating seams, rough cuts, and as recommended by manufacturer.
   4. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.

E. Openings and Penetrations in Exterior Water-Resistive Barriers:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto water-resistive barrier and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
   2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
   3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
   4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches (50 mm) beyond face of jambs; seal water-resistive barrier to flashing.
   5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
   1. Allow access to work areas and staging.
   2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
   3. Do not cover work of this section until testing and inspection is accepted.

C. Do not cover installed water-resistive barriers until required inspections have been completed.

D. Obtain approval of installation procedures from water-resistive barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

E. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 074213
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels, interior liner panels, soffit panels, retrofit panels, and subgirt framing assembly, with insulation, related flashings, and accessory components.

1.02 APPROVED SYSTEM: NOA # 23-1117.02

A. Expires 03/18/2029

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

A. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

C. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 15-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panels - Exposed Fasteners:
   1. McElroy Metal; PBR Panel Wall: www.mcelroymetal.com/#sle. (BASIS OF DESIGN)

2.02 MANUFACTURED METAL PANELS (IMPACT RATED)

1. Provide exterior panels and subgirt framing assembly.
2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
3. Design Pressure: In accordance with applicable codes.
4. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
5. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
6. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
7. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
8. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
9. Corners: Factory-fabricated in one continuous piece with minimum 2-inch (51 mm) returns.

B. Exterior Wall Panels:
   1. Profile: Horizontal; PBR style.
   2. Side Seams: Double-interlocked, tight-fitting, sealed with continuous gaskets.
   3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch (0.76 mm) minimum thickness.
   4. Color: Kynar 500 Sandstone.

C. Subgirt Framing Assembly:
   1. 16 gauge, 0.0598 inch (1.52 mm) thick formed non-precoated steel sheet.
   2. Vertical Zee shape profile; to attach panel system to structural frame.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Non-Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, SS Grade 33/230, with G90 (Z275) coating.

C. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.04 FINISHES

A. Exposed Surface Finish: Panel manufacturer's standard polyvinylidene fluoride (PVDF) coating, top coat over epoxy primer.

B. Panel Backside Finish: Panel manufacturer's standard siliconized polyester wash coat.

C. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch (0.023 mm); color and gloss as selected by Architect from manufacturer's standard line.

2.05 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
   1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

C. Field Touch-up Paint: As recommended by panel manufacturer.

D. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.02 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated.

B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. Install panels on walls in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches (51 mm), minimum.

F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

G. Provide a permanent label on wall panels indicated NOA approval number.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch (1.6 mm), maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch (6.4 mm), maximum.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

SECTION 075423
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Adhered TPO membrane roofing system.
   2. Roof insulation.

B. **NOA Product Approval: 23-0502.06**
   1. Expires 08-31-2029
   2. Refer to structural drawings for wind loading requirements

1.02 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

C. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems", before multiplication by a safety factor.

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
   1. Corner Uplift Pressure: Varies, see Structural Drawings.
   2. Perimeter Uplift Pressure: Varies, see Structural Drawings.
   3. Field-of-Roof Uplift Pressure: Varies, see Structural Drawings.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
   1. Fire/Windstorm Classification: Class 1A-120.
   2. Hail-Resistance Rating: MH.

E. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

G. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

1.04 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Product Data: Include information evidencing compliance with specified requirements.

1. Roofing membrane.
2. Roof insulation.
3. Installation accessories.

C. Certificates and Warranties
1. Sample Manufacturer’s Warranty.
2. Sample Contractor’s Warranty.
3. Certificate of UL compliance.
4. Certificate of FM compliance when applicable.

D. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
5. Sheet layout.
6. Penetration locations and details.

1.05 INFORMATIONAL SUBMITTALS

A. Certification: Submit manufacturer's signed statement that Project design and conditions have been reviewed and that the installation will be fully warrantable if correctly installed. This submittal may be in the form of a photocopy of manufacturer's authorization to Installer to proceed with installation.

B. Preinstallation meeting records.

C. Manufacturer's Inspections: Submit copies of inspection reports and punch lists prepared by representatives of membrane manufacturer within 2 working days of their receipt by Installer.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Manufacturer warranties.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation & fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
1. Installer shall have 10 years’ experience in application of specified system.
2. Provide authorization letter on manufacturer's letterhead, signed by an officer of the company and shall state that the Roofing Contractor is approved to install specified sytem.

D. Fire-Resistance Ratings: Where indicated, provide fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

E. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary terminations and procedures for evaluating water infiltration during construction.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

F. Preinstallation Roofing Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. Manufacturer’s Field Services during Construction:
1. Have a trained technical representative on the site for the first full 3 days of operations of the work of this Section, and at regular intervals of 10 to 14 days during the roof construction period to perform onsite inspections.
2. Provide detailed field inspection reports to the Architect, the Contractor and the roofing subcontractor within 5 days of the initial 30day work period, and within 5 days of each periodic on-site inspection.
3. Provide a detailed final, field inspection of the completed roofing installation. Inspection is to identify all conditions that would prohibit the manufacturer from issuing the system warranty for the installed roofing system. Issue final inspection report within 10 working days of inspection. Submit report of the Architect, Contractor, Owner, and Roofing Contractor.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.09 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system.
   2. Warranty coverage to include materials, watertightness and workmanship.
   3. Warranty Period: 20 years from date of Substantial Completion.
      a. The date all warranty criteria has been satisfied; or
      b. The date the warranty fee is paid; or
      c. The Date of Substantial Completion.

PART 2 PRODUCTS

2.01 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Fleece Backed Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers listed on the Owner’s Preferred Vendor List, Document 002150:
      a. Carlisle SynTec Incorporated.
      b. Centimark
      c. Fiber-Tite/Seaman Corporation.
      d. Firestone Building Products Company.
      e. GenFlex Roofing Systems.
      f. J Reynolds & Company
      g. Sarnafil/Sika Group.
      h. No substitutions permitted.
   2. Thickness: 115 mils total membrane thickness consisting of 60 mils thick, fire retardant TPO membrane laminated to 55 mils thick non-woven polyester fleece backing.
   3. Exposed Face Color: White.

2.02 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    a. Plastic Foam Adhesives: 50 g/L.
    b. Gypsum Board and Panel Adhesives: 50 g/L.
    c. Multipurpose Construction Adhesives: 70 g/L.
    d. Fiberglass Adhesives: 80 g/L.
    e. Contact Adhesive: 80 g/L.
    f. Other Adhesives: 250 g/L.
    g. Single-Ply Roof Membrane Sealants: 450 g/L.
    h. Nonmembrane Roof Sealants: 300 g/L.
    i. Sealant Primers for Nonporous Substrates: 250 g/L.
    j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 60 mils (1.5 mm) thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.03 VAPOR RETARDER

A. Polyethylene Film: ASTM D 4397, 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).
    1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
    2. Adhesive: Manufacturer's standard lap adhesive, FM Approvals approved for vapor-retarder application.

2.04 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured [or approved] by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated [and that produce FM Approvals-approved roof insulation].

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.05 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation[and cover boards] to substrate, and acceptable to roofing system manufacturer.

C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, [1/4 inch (6 mm)] [1/2 inch (13 mm)] [5/8 inch (16 mm)] thick [, factory primed].
   1. Products: Subject to compliance with requirements, provide the following:
      a. Georgia-Pacific Corporation; [Dens Deck] [Dens Deck Prime] [Dens Deck DuraGuard].

E. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate.
   1. Products: Subject to compliance with requirements, provide the following:
      a. USG Corporation; Securock.
         1) 1/2 inch (13 mm) thick

F. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.06 ASPHALT MATERIALS

A. Roofing Asphalt: [ASTM D 312, Type III or Type IV] [ASTM D 6152, SEBS modified].

B. Asphalt Primer: ASTM D 41.

2.07 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
   4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Install acoustical roof deck rib insulation strips, specified in Division 05 Section "Steel Decking," according to acoustical roof deck manufacturer's written instructions, immediately before installation of overlying construction and to remain dry.

3.03 VAPOR-RETARDER INSTALLATION

A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.
   1. Continuously seal side and end laps with tape.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.04 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
   1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft.(0.3 L/sq. m) and allow primer to dry.
   2. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
   1. Fasten insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

I. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
3. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

J. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck.
1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

K. Install slip sheet over [insulation] [cover board] and immediately beneath membrane roofing.

3.05 ADHERED MEMBRANE ROOFING INSTALLATION

A. Provide means of screening airborne spray adhesive particles from migrating away from the area of application. Take particular measures to prohibit particle intake into mechanical system outside air intake openings.

B. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

C. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

D. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

F. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

G. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

I. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

J. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing membrane roofing system.

3.06 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings[and mechanically anchor to substrate through termination bars].

3.07 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches (75 mm) of space between adjacent roof pavers.

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS [Insert Name] of [Insert Address], herein called the "Roofing Installer", has performed roofing and associated work ("work:") on the following project:
   1. Owner: [Insert name of Owner].
   2. Address: [Insert address].
   3. Building Name/Type: [Insert information].
   4. Address: <Inspect address>.
   5. Area of Work: [Insert information].
   6. Acceptance Date: [Insert date].
   7. Warranty Period: [Insert time].
   8. Expiration Date: [Insert date].

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designed Warranty Period.

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty or defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:
   1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
      a. Lightning;
      b. Peak gust wind speed exceeding 72 mpg (32.2m/sec);
      c. Fire;
      d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
      e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
      f. Vapor condensation on bottom of roofing; and
      g. Activity on roofing by others, including construction contractors, maintenance personnel, other person, and animals, whether authorized or unauthorized by Owner.
   2. When work has been damaged by an of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expanse thereof have been paid by Owner or by another responsible party so designated.
   3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
   4. During Warranty Period, if Owner allows alteration of work by anyone other than penetrations, attachment of other work, and positioning of anyone on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alternations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
   5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
   6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
   7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontractor with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this [Insert day] day of [Insert month], [Insert year].
   1. Authorized Signature: [Insert signature].
   2. Name: [Insert name].
   3. Title: [Insert title].

END OF SECTION

SECTION 077100
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, and gravel stops.

B. **NOA product approval: 22-0411.03**
   1. Expires 10-18-2027
   2. Refer to structural drawings for wind loading requirements

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

C. NRCA (RM) - The NRCA Roofing Manual; 2025.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings:
   1. Hickman Edge Systems; PermaSnap Premier Plus Coping: www.hickmanedgesystems.com/#sle.
   2. Substitutions: Not permitted.

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Fascia, cant, and edge securement for roof membrane.
   2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
   3. Exposed Face Height: 6 inches (152 mm).
   4. Material: Extruded aluminum, 0.08 inch (2.0 mm) thick, minimum.
   5. Finish: 70 percent polyvinylidene fluoride (PVDF).
   6. Color: As shown on drawings.
   7. Products:
      a. Hickman Edge Systems; Drip Edge Fascia: www.hickmanedgesystems.com/#sle.

B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
   1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.

2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: 6 inches (152 mm).
5. Inside Face Height: 4 inches (102 mm).
6. Material: Formed aluminum sheet, 0.040 inch (1.01 mm) thick, minimum.
7. Finish: 70 percent polyvinylidene fluoride.
8. Color: As indicated on drawings.
9. Products:
   a. Hickman Edge Systems; PermaSnap Cantilever Coping: www.hickmanedgesystems.com/#sle.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 077123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

B. Precast concrete splash pads.

1.02 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Hickman Edge Systems; Wind Resistant Gutter: www.hickmanedgesystems.com/#sle.
   3. Metal-Era Inc: www.metalera.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209/B209M; 0.032 inch (0.8 mm) thick.
   1. Finish: Plain, shop pre-coated with modified silicone coating.
   2. Color: As indicated.

2.03 COMPONENTS

A. Gutters: SMACNA rectangular style profile.

B. Downspouts: SMACNA square profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: Brackets.

3. Downspout Supports: Straps.

D. Fasteners: Same material and finish as gutters and downspouts, with soft neoprene washers.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.06 ACCESSORIES

A. Splash Pads: Precast concrete type, profiles size(s) as indicated; minimum 3,000 psi (21 MPa) compressive strength at 28 days, with minimum 5 percent air entrainment.

B. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
   3. Finish: Manufacturer's standard factory applied powder coat finish.
   4. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
   5. Products:
      a. Downspoutboots.com, a division of J. R. Hoe & Sons; ____: www.downspoutboots.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.381 mm).

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Slope gutters 1/8 inch per foot (3.175 mm/m) .

C. Connect downspouts to downspout boots at 8 inches (200 mm) above grade. Grout connection watertight.

D. Connect downspouts to storm sewer system. Grout connection watertight.

E. Set splash pans under downspouts.

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 078100 - Applied Fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2011a.

B. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems; 2007 (Reapproved 2011).

C. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2010.

D. ASTM E2837 - Standard Test Method for Determining Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2011.

E. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

F. FM 4991 - Approval of Firestop Contractors; Factory Mutual Research Corporation; 2001.

G. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

H. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Underwriters Laboratories Inc.; 2004.

I. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

J. ASTM E2174 & ASTM E 2393 - Inspection Requirements: Standard Practice for On-site Inspection of Installed Fire Stops

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Sole Source Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty subcontractor.

D. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by the manufacturer.
   2. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors.
   3. UL approved.

1.06 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall or floor constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.

B. Obtain approval of authority having jurisdiction before proceeding.

C. If accepted, mock-up will represent minimum standard for the Work.

D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Manufacturers:
   1. Basis of design:
      a. Hilti, Inc: www.us.hilti.com. Designs specified below are taken from Hilti catalogs.
   2. Substitutions: Refer to the Owner’s Preferred Vendor List in Document 002150 for other acceptable manufacturers.
      a. WR Grace
      b. 3M
      c. STI

B. Devices, Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use any system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of the floor assembly.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
   2. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
   3. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.

4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

B. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.

C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
   4. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

D. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
   4. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

E. Definition: Where 2 hour and 3 hour construction is specified below, the the design specified is acceptable for use in applications of that rating and less.

2.03 FIRESTOPPING FOR PERIMETER CONTAINMENT

A. Perimeter Joint Systems That Have Not Been Tested For Movement Capabilities (Static-S):

B. 2 Hour Construction: Intertek System CEJ 421P; Hilti: Firestop Joint Spray CFS-SP WB or Silicone Joint Spray CFS-SP SIL.

C. Perimeter Joint Systems That Have Movement Capabilities (Dynamic-D):

D. 2 Hour Construction: Intertek System CEJ 259P; Hilti Firestop Joint Spray CFS-SP WB or Silicone Joint Spray CFS-SP SIL.

E. 2 Hour Construction: Intertek System HI/BPF 120-32; Edge of Slab QuickSeal CFS-EOS QS

2.04 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, BOTTOM-OF-WALL, SHAFT WALL, AND WALL-TO-WALL JOINTS

A. Concrete and Concrete Masonry Walls and Floors:
   1. Floor to Floor Joints:
      a. 2 Hour Construction: UL System FF-D-1013; Hilti CFS-SP WB Firestop Joint Spray.
   2. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor:
      a. 2 Hour Construction: UL System HW-D-0181; Hilti CFS-SP WB Firestop Joint Spray.
      b. 2 Hour Construction: UL System HW-D-1037; Hilti CFS-SP WB Firestop Joint Spray.
   3. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Floor:
      a. 3 Hour Construction: UL System HW-D-1058; Hilti CFS-SP WB Firestop Joint Spray.
      b. 2 Hour Construction: UL System HW-D-0268; Hilti CP 606 Flexible Firestop Sealant.

4. Concrete/Concrete Masonry Wall to Wall Joints:
    a. 2 Hour Construction: UL System WW-D-0032; Hilti CP 606 Flexible Firestop Sealant.

B. Gypsum Board Walls:
1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
    a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
2. Head-of-Wall Joints at Underside of Steel Beam and Concrete Over Metal Deck Floor with Sprayed On Fireproofing:
    a. 2 Hour Construction: UL System HW-D-0259; Hilti CFS-SP WB Firestop Joint Spray.
    b. 2 Hour Construction: UL System HW-D-0874, HW-D-0875, HW-D-0876; Hilti Firestop Top Track Seal.
3. Head-of-Wall Joints at Underside of Flat Concrete:
    a. 2 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray.
    b. 2 Hour Construction: UL System HW-D-0880; Hilti Firestop Top Track Seal.
4. Head-of-Wall Joints at Concrete Over Metal Deck:
    a. 2 Hour Construction: UL System HW-D-0871, HW-D-0872, HW-D-0873, HW-D-0874, HW-D-0875, HW-D-0876; Hilti Firestop Top Track Seal.
5. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
    a. 2 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray
    b. 2 Hour Construction: UL System HW-D-0872; Hilti Firestop Top Track Seal.
6. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Gypsum Board Cut to Fit Ribs:
    a. 2 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.
7. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Not Cut to Fit:
    a. 2 Hour Construction: UL System HW-D-0042; Hilti CFS-SP WB Firestop Joint Spray
    b. 2 Hour Construction: UL System HW-D-0871; Hilti Firestop Top Track Seal.
8. Bottom-of-Wall Joints at Concrete Floor:
    a. 2 Hour Construction: UL System BW-S-0002; Hilti CP 606 Flexible Firestop Sealant.
    b. 2 Hour Construction: UL System BW-S-0068; Hilti Bottom Track Seal (CFS-BTS)

2.05 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
1. In Floors or Walls:
    a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 2 Hour Construction: UL System C-AJ-0155; Hilti CFS COS Composite Sheet.

B. Penetrations Through Floors or Walls By:
1. Multiple Penetrations in Large Openings:
    a. 3 Hour Construction: UL System C-AJ-1140; Hilti CP 637 Firestop Mortar.
    b. 3 Hour Construction: UL System C-AJ-8316; Hilti CFS-COS Composite Sheet.
    c. 3 Hour Construction: UL System C-AJ-8207; Hilti CFS-BL Firestop Block.
    d. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Bathtub Drains:
    a. Up to 3 Hour Construction: UL System F-A-1037, F-A-1038, F-A-2094, or F-A-2095; Hilti CP 681 Tub Box Kit.
3. Uninsulated Metallic Pipe, Conduit, and Tubing:
    a. 3 Hour Construction: UL System C-AJ-1184; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 3 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    c. 2 Hour Construction: UL System C-AJ-1498; Hilti CP 680-P/M Cast-In Device.

4. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
    a. 3 Hour Construction: UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar.
    b. 2 Hour Construction: UL System C-AJ-2567; Hilti FS-ONE MAX Intumescent Firestop Sealant.
5. Electrical Cables Not In Conduit:
    a. 3 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 2 Hour Construction: UL System C-AJ-3216; Hilti CP 658 Firestop Plug.
    c. 2 Hour Construction: UL System W-J-3200; Hilti CP653 Speed Sleeve.
6. Electrical Busways:
    a. 3 Hour Construction: UL System C-AJ-6017; Hilti FS-ONE MAX Intumescent Firestop Sealant.
7. Insulated Pipes:
    a. 3 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE Intumescent Firestop Sealant.
    b. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
8. HVAC Ducts, Uninsulated:
    a. 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 2 Hour Construction: UL System C-AJ-7195; Hilti CFS-COS Composite Sheet.

C. Penetrations Through Floors By:
1. Multiple Penetrations in Large Openings:
    a. 2 Hour Construction: UL System F-A-8012; Hilti CP 604 Self-Leveling Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
    a. 2 Hour Construction: UL System F-A-1016; Hilti CP 680-P/M Cast-In Device.
3. Electrical Cables Not In Conduit:
    a. 2 Hour Construction: UL System F-A3085; Hilti CFS-MSL (S, M, L) Modular Sleeves.
    b. 2 Hour Construction: UL System F-A-3033; Hilti CP 680-P/M Cast-In Device.
    c. 2 Hour Construction: UL System F-A-3088; Hilti CFS-COS Composite Sheet & CFS-MSL or CP 653.
4. Electrical Busways:
    a. 2 Hour Construction: UL System F-A-6002; CFS-S SIL SL Firestop Silicone Sealant Self-Leveling.
5. Insulated Pipes:
    a. 2 Hour Construction: UL System F-A-5015; Hilti CP 680-P/M Cast-In Device.
    b. 2 Hour Construction: UL System F-A-5017; Hilti CP 680-P/M Cast-In Device.

D. Penetrations Through Walls By:
1. Uninsulated Metallic Pipe, Conduit, and Tubing:
    a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Electrical Cables Not In Conduit:
    a. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 2 Hour Construction: UL System W-J-3278: Hilti CFS-MSL (S, M, L) Modular Sleeves.
    c. 2 Hour Construction: UL System W-J-3279: Hilti CFS-MSL (S, M, L) Modular Sleeves (2+ Sleeves).
3. Insulated Pipes:
    a. 2 Hour Construction: UL System W-J-5041; Hilti FS-ONE MAX Intumescent Firestop Sealant.

b. 2 Hour Construction: UL System W-J-5042; Hilti FS-ONE MAX Intumescent Firestop Sealant.

4. HVAC Ducts, Uninsulated:
   a. 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.06 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
2. 2 Hour Construction: UL System W-L-0040; Hilti FS-ONE MAX Intumescent Firestop Sealant.
3. 2 Hour Construction: UL System W-L-0030; Hilti FS-ONE MAX Intumescent Firestop Sealant.
4. 2 Hour Construction: UL System W-L-0042; Hilti CFS-BL Firestop Block.

B. Penetrations By:
1. Multiple Penetrations in Large Openings:
   a. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-8071; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-8079; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-8093; Hilti CFS-BL Firestop Block
   e. 2 Hour Construction: UL System W-L-8105; CFS COS Composite Sheet
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   c. 2 Hour Shaftwall Construction: UL System W-L-1206; Hilti FS-ONE Intumescent Firestop Sealant.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   b. 2 Hour Construction: UL System W-L-2474; Hilti FS-ONE Intumescent Firestop Sealant.
4. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, Hilti CFS-S SIL GG Firestop Silicone Sealant Gun-Grade, or CP 618 Firestop Putty Stick.
   b. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   c. 2 Hour Construction: UL System W-L-3395; Hilti CFS-SL SK Firestop Sleeve Kit with Hilti CFS-SL GP Gangplate.
   d. 2 Hour Construction: UL System W-L-3482; Hilti CFS-MSL (S, M, L) Modular Sleeves.
   e. 2 Hour Construction: UL System W-L-3484; Hilti CFS-MSL (S, M, L) Modular Sleeves (2+ Sleeves).
   f. 2 Hour Construction: UL: System W-L-3414; Hilti Cable Disc
   g. 2 Hour Construction: UL: System W-L-3415; Hilti Cable Disc
   h. 2 Hour Construction: UL: System W-L-3441; Hilti Cable Disc
   i. 2 Hour Construction: UL: System W-L-3446; Hilti Cable Disc

5. Insulated Pipes:
   a. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
6. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.07 SCHEDULE OF JOINT FIRESTOP SYSTEMS. BASIS OF DESIGN: HILTI, INC.

Joint Type	F-Rating (Hr)	Hilti Basis of Design UL System	
		Joint Width Less than or Equal to 2"	Joint Width Greater than 2" Less than or Equal to 6" *
Concrete (Floor to Floor)	1 OR 2	FF-D-1012, FF-D-1013'	FF-D-1012, FF-D-1013
	3	FF-D-1011, FF-D-1026'	FF-D-1011, FF-D-1026
	4	FF-D-1047	FF-D-1125
Concrete (Edge of Floor Slab to Wall)	1 OR 2	FW-D-1011, FW-D-1012, FW-D-1013	FW-D-1011, FW-D-1012, FW-D-1013, FW-D-1021
	3	FW-D-1011	FW-D-1011, FW-D-1021
	4	FW-D-1047	FW-D-1092
Concrete or Block Wall to Flat Concrete Floor (Top-of-Wall)	1	HW-D-0268	N/A**
	2	HW-D-0825, HW-D-1070, HW-D-0268, HW-D-1045, HW-D-1009, HW-D-0097'	HW-D-1078, HW-D-1070, HW-D-1045, HW-D-1009
	3	HW-D-0929, HW-D-0403, HW-D-1008', HW-D-0268	HW-D-1058, HW-D-1008
	4	HW-D-1042	HW-D-1103
Concrete or Block Wall to Concrete Over Fluted Metal Deck (Top-of-Wall)	1	HW-D-0098	N/A**
	2	HW-D-0285, HW-D-0155, HW-D-1069, HW-D-1037, HW-D-0080, HW-D-0081, HW-D-0098	HW-D-0225, HW-D-1069, HW-D-1037
	3	N/A**	N/A**
	4	HW-D-0294	N/A**
Gypsum Wall to Flat Concrete Floor (Top-of-Wall)	1 OR 2	HW-D-0757, HW-D-0082, HW-D-0083, HW-D-0106, HW-D-0119	HW-D-1011, HW-D-1012, HW-1020
	3	HW-D-0119	HW-D-1011, HW-D-1012, HW-1020
Gypsum Shaft Wall to (Top-of-Wall)	2	HW-D-0920, HW-D-0342 (FLAT CONCRETE) HW-D-0881, HW-D-0882, HW-D-0541, HW-D-0542 (CONCRETE OVER METAL DECK)	N/A**
Gypsum Shaft Wall to Concrete Floor (Bottom-of-Wall)	1 OR 2	BW-S-0070, BW-S-0023	N/A**
			N/A**
Gypsum Wall to Concrete Floor (Bottom-of-Wall)	1 OR 2	BW-S-0068, BW-S-0001, BW-S-0002	N/A**
			N/A**
Gypsum Wall to Concrete Over Fluted Metal Deck (Top-of-Wall)	1 OR 2	HW-D-0933, HW-D-0925, HW-D-0923*, HW-D-0883, HW-D-0882, HW-D-0881, HW-S-0134*, HW-D-0876, HW-D-0884, HW-D-0875, HW-D-0874, HW-D-0873, HW-D-0872, HW-D-0871, HW-D-0042*, HW-D-0049*, HW-D-0087*, HW-D-0089*, HW-D-0045, HW-D-0046', HW-D-0076*, HW-D-0077*, HW-D-0154, HW-D-0154*, HW-D-0292, HW-D-0295, HW-D-0539*	HW-D-1067, HW-D-1066, HWD-1011, HWD-1012, HW-D-1020
	3	HW-D-0292, HW-D-0295	HW-D-1011, HWD-1012, HW-D-1020
	4	HW-D-0292, HW-D-0295	N/A**
Concrete (Wall to Wall)	2	WW-D-1129, WW-D-0017, WW-D-0032, WW-D-0082	WW-D-1129, WW-D-1080, WW-D-1084
	3	WW-D-1011', WW-D-0140, WW-D-0032	WW-D-1011
	4	WW-D-1047	WW-D-1128
Gypsum to Concrete (Wall to Wall)	1 OR 2	WW-D-0105, WW-D-0068, WW-D-0040	N/A**
			N/A**

* SEE NOTE 3 ** CONTACT HILTI FOR CURRENT UL-CLASSIFIED SYSTEM OR ENGINEER JUDGMENT DRAWING: 800-879-8000

NOTES:

1. CLASSIFIED SYSTEMS FOR 2" - 6" WIDE JOINTS MAY BE USED FOR JOINTS 2" WIDE AND LESS.
2. CONFIRM THAT MOVEMENT CAPABILITIES OF THE SELECTED UL SYSTEM MEETS OR EXCEEDS THE SPECIFIED MOVEMENT RANGE OF THE PARTICULAR JOINT.
3. SYSTEMS MARKED WITH ASTERIK (*) ARE SUITABLE FOR TOP-OF-WALL JOINTS WHERE THE FLUTED METAL DECK HAS SPRAY-ON MONOKOTE MK-6/HY FIREPROOFING.
4. VERIFY ALLOWABLE JOINT WIDTH ON SPECIFIC UL SYSTEM DRAWING.

2.08 SCHEDULE OF THROUGH PENETRATION FIRESTOP SYSTEMS. BASIS OF DESIGN: HILTI, INC.

CONCRETE FLOORS			CONCRETE OR BLOCK WALLS		
TYPE OF PENETRANT	F-RATING (HR)	BASIS OF DESIGN UL SYSTEM	TYPE OF PENETRANT	F-RATING (HR)	BASIS OF DESIGN UL SYSTEM
CIRCULAR BLANK OPENINGS	1 OR 2	F-A-0048, C-AJ-0055, C-AJ-0090	CIRCULAR BLANK OPENINGS	1 OR 2	C-AJ-0055, C-AJ-0090
	3	F-A-0048, C-AJ-0055, C-AJ-0086		3	C-AJ-0055, C-AJ-0086
SINGLE METAL PIPES OR CONDUIT	1 OR 2	C-AJ-1226, F-A-1028, F-A-1222	SINGLE METAL PIPES OR CONDUIT	1 OR 2	C-AJ-1226, W-J-1067, W-J-1020, W-J-1248
	3	C-AJ-1226, F-A-1222		3	C-AJ-1226, W-J-1041, W-J-1068
	4	C-BJ -1037, C-BJ-1034		4	C-BJ-1034, C-BJ-1037, W-J-1041, W-J-1042, W-J-1068
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT)	1	F-A-2025, C-AJ-2109, C-AJ-2098, C-AJ-2271, C-AJ-2167	SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, ENT)	1 OR 2	C-AJ-2109, C-AJ-2098, C-AJ-2167, C-AJ-2371, C-AJ-2342
	2	F-A-2103, C-AJ-2098, C-AJ-2271, C-AJ-2167, C-BJ-2021, C-AJ-2371, C-AJ-2342			
	3	F-A-2411, C-AJ-2109, C-AJ-2098, C-AJ-2371, C-AJ-2342		3	C-AJ-2109, C-AJ-2098, C-AJ-2371, C-AJ-2342
	4	C-BJ-2016, C-AJ-2017		4	W-J-2057, W-J-2091
SINGLE/CABLE BUNDLES	1	F-A-3091, C-AJ-3095, C-AJ-3180, C-AJ-3283	SINGLE/CABLE BUNDLES	1	W-J-3036, C-AJ-3095, C-AJ-3180, W-J-3060, W-J-3167
	2	F-A-3085, F-A-3087, F-A-3089, F-A-3091, C-AJ-3095, F-A-3093		2	W-J-3036, C-AJ-3095, W-J-3277, W-J-3278 W-J-3060, W-J-3167, W-J-3189
	3	F-A-3091, C-AJ 3095, C-AJ-3285		3	C-AJ-3095, C-AJ-3180, W-J-3167
				4	W-J-3050
CABLE TRAY	1, 2 OR 3	C-AJ-4034, C-AJ-4035	CABLE TRAY	1 OR 2	W-J-4027, C-AJ-4034, C-AJ-4035
				3	C-AJ-4034, C-AJ-4035
				4	W-J-8007
SINGLE INSULATED PIPES	1 OR 2	C-AJ-5090, C-AJ-5091, C-AJ-5048	SINGLE INSULATED PIPES	1 OR 2	C-AJ-5090, C-AJ-5091, C-AJ 5061, W-J-5042
	3	F-A-5083, C-AJ-5090, F-A-5083		3	C-AJ-5090, C-AJ-5061
	4	C-BJ-5006		4	C-BJ-5006, W-J-5028
ELECTRICAL BUSWAY	1 OR 2	C-AJ-6006, C-AJ-6017, C-AJ-6036	ELECTRICAL BUSWAY	1 OR 2	C-AJ-6006, C-AJ-6017, C-AJ-6036
	3	C-AJ-6006, C-AJ-6017		3	C-AJ-6006, C-AJ-6017
MECHANICAL DUCTWORK WITHOUT DAMPERS NON-INSULATED	1 OR 2	C-AJ-7046, C-AJ-7051, C-AJ-7084	MECHANICAL DUCTWORK WITHOUT DAMPERS NON-INSULATED	1 OR 2	C-AJ-7046, C-AJ-7051, W-J-7021, W-J-7022

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install damming materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Contractor to ensure a manufacturer’s direct representative is on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. Training will be done per manufacturer’s written recommendations published in their literature and drawing details. During installation, contractor shall have manufacturer’s representative provide periodic visual observations.

B. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

C. Do not cover installed firestopping until inspected by authority having jurisdiction.

D. Install manufacturer labeling at all penetrations identifying the UL assembly, Installer, and Manufacturer, equal to FIRESTOP SYSTEM ADHESIVE LABELS #339611

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Substrates for which laboratory adhesion and/or compatibility testing is required.
   7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   8. Sample product warranty.
   9. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Allow sufficient time for testing to avoid delaying the work.
   4. Deliver sufficient samples to manufacturer for testing.
   5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

E. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Hilti, Inc: www.us.hilti.com/#sle.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   4. Koroseal.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
      d. Joints where sealant installation is specified in other sections.
      e. Joints between suspended ceilings and walls.

B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant silyl-terminated polyurethane sealant.

D. Interior Wet Areas: Bathrooms, restrooms, and food service areas; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

F. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.03 JOINT SEALANTS - GENERAL

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   3. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.

4. Color: Match adjacent finished surfaces.
5. Service Temperature Range: Minus 20 to 180 degrees F (Minus 29 to 82 degrees C).

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.

C. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum
2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.
4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
5. Products:
a. Pecora Corporation; DynaFlex SC (Security Sealant): www.pecora.com/#sle.

2.05 ACCESSORIES

A. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

B. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION

SECTION 079219
ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.02 DEFINITIONS

A. Acoustic Joint Sealant: “Acoustic Joint Sealant or Spray: Material or combination of materials used to achieve specified acoustical rating of non fire-rated assembly by providing an effective barrier against sound transmission through construction joint and through penetration openings.”

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested acoustic systems shall be used in specific locations as follows:

B. Top and bottom of gypsum board partitions.

C. Top of masonry walls.

D. Through-penetrations in gypsum and masonry walls.

1.04 REFERENCES

A. Test Requirements:
   1. ASTM C734, Standard Test Method for Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
   2. ASTM C834, Standard Specification for Latex Sealants
   3. ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications
   4. ASTM D217, Standard Test Methods for Cone Penetration of Lubricating Grease
   5. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
   6. ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
   7. ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
   8. ISO 11600, Building construction -- Jointing products -- Classification and requirements for sealants
   9. All major building codes: IBC, SBCCI, BOCA
   10. (Note to specifier: Further elaborate, retain or delete building codes listed above as applicable)

1.05 QUALITY ASSURANCE

A. Installing contractor shall arrange for the acoustic joint sealant manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of acoustic sealant and spray systems to train appropriate contractor personnel in proper selection and installation procedures.

B. Acoustical sealants shall be installed per manufacturer's written recommendations published in their literature and drawing details.

1.06 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the acoustic sealant and acoustic spray manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its acoustical sealant products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.08 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of acoustical sealants after completion of gypsum wall board but prior to covering or concealing of joints.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of acoustical sealant materials when temperatures are outside the manufacturers recommended limitations.

E. During installation, provide masking and drop cloths to prevent acoustical sealant materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 ACOUSTICAL SEALANTS

A. Acoustic Sealant for Exposed and Concealed Joints and annular spaces around through-penetrations: Provide manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834, ASTM C919 and the following:

1. Sealant effectively reduces airborne sound transmission through head-of-wall and bottom-of-wall joints and openings to accommodate through-penetrations in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
2. Acoustical Sealant to maintain STC ratings at sound rated partitions as indicated on the drawings.
3. Sealant has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.
4. Sealant is mold and mildew resistant per ASTM G21 with a rating of zero (0), “no growth”.
5. Sealant has movement capability of minimum 12.5% in accordance with ISO 11600. Latex sealant according to ASTM C 834 class OP -18°C with shrinkage according to ASTM C 1241 < 25 % C.
6. Proposed acoustic sealant materials and methods shall conform to applicable governing codes having local jurisdiction.

2.02 ACOUSTICAL SPRAYS

A. Acoustic Spray for exposed and concealed joints: Provide manufacturer's standard sprayable latex material complying with ASTM C919 and the following:

1. Spray effectively reduces airborne sound transmission through head-of-wall joints in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
2. Acoustical Spray to maintain STC ratings at sound rated partitions as indicated on the drawings.
3. Spray has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.
4. Spray is mold and mildew resistant per ASTM G21 with a rating of zero (0), “no growth”.
5. Spray has movement capability of minimum 12.5%.

6. Proposed acoustic spray materials and methods shall conform to applicable governing codes having local jurisdiction.

2.03 ACCEPTABLE MANUFACTURERS

A. Hilti, Inc., Tulsa, Oklahoma
800-879-8000
www.us.hilti.com

B. No substitutions will be accepted.

2.04 MATERIALS

A. Products: Subject to compliance with requirements, provide the following:
1. Hilti CP 506 Smoke and Acoustic Sealant
2. Hilti CP 572 Smoke and Acoustic Spray

2.05 ACCESSORIES

A. Pre-formed mineral wool:
1. CP 767 Speed Strips
2. CP 777 Speed Plugs

B. Mineral wool

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
1. Verify acoustic joints are properly sized and in suitable condition for application of materials.
2. Surfaces to which acoustic sealant and spray materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by acoustic sealant and spray materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of acoustic sealant and spray.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Comply with acoustic sealant and spray manufacturer's written installation instructions for products and applications indicated.

B. Standards: Comply with recommendations of ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.

C. Install acoustic sealant backings of type indicated to support sealant and spray during application in accordance with manufacturer's written installation instructions.

D. Install acoustic sealant and spray free of air pockets, embedded foreign matter, sags and ridges.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess acoustic sealant from surfaces adjacent to joint.
2. Remove excess acoustic spray from surfaces adjacent to joint as indicated on the drawings.
3. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

4. Provide concave joint configuration per Figure 8A in ASTM C1193, unless otherwise indicated.

3.03 FIELD QUALITY CONTROL

A. Examine acoustic joints and penetrations to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

3.04 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturer of acoustical joint sealants.

B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

3.05 PROTECTION

A. Protect acoustic joints during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Contract Completion.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing: Glass for doors and windows.

C. Section 099100 - Painting and Coatings, Staining and Transparent Finishing.

D. Section 134905 - X-Ray Radiation Protection: Lead sheet for installation in lead-lined frames specified herein.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI A250.11 - Recommended Erection Instructions for Steel Frames; 2012.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.

I. ASTM A924/A924M - Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process; 2013.

J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

L. ASTM E413 - Classification for Rating Sound Insulation; 2010.

M. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.

N. FBC TAS 201 - Impact Test Procedures; Testing Application Standard; 1994.

O. FBC TAS 202 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure; Testing Application Standard; 1994.

P. FBC TAS 203 - Criteria for Testing Products Subject To Cyclic Wind Pressure Loading; Testing Application Standard; 1994.

Q. FLA (PAD) - Florida Building Code Online - Product Approval Directory; database at www.floridabuilding.org.

R. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

S. ITS (DIR) - Directory of Listed Products; current edition.

T. Miami (APD) - Approved Products Directory; Miami-Dade County; database at www.miamidade.gov/development/product-control.asp.

U. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

W. SDI 111 - Recommended Standard Details for Steel Doors & Frames; 2009.

X. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Wind-Borne-Debris Resistance Approval Documentation: Provide the manufacturer's current approved documentation of equivalent NOA or Florida Building Code approval as acceptable to the authorities having jurisdiction.

D. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
   1. For Frames at Lead-Lined Door Openings: Show location and contour of lead to be placed into frame.
   2. Indicate frame configurations, anchor types and spacing, location of cutouts for hardware, reinforcement, to ensure doors and frames are properly prepared and coordinated to receive hardware.
   3. Indiccate door elevations, internal reinforcement, closure method, and cutouts for items such as, but not limited to, glass lights and louvers.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Distributor's Personnel Qualifications: Identify individuals credentialed as Architectural Openings Consulant, Architectural Hardware Consultant, Certified Door Consultants and Electrified Hardware Consultant.

G. Submittals not including all of the requirements of this Article will be considered incomplete, will not be reviewed, and will be returned directly to the Contractor

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

B. Distributor Qualifications: Company regularly engaged in distribution of hollow metal doors and frames with contacts credentialed as an Architectural Openings Consultant (AOC) assigned to be available to consult with the Architect regarding matters affecting this Project's openings.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.05 REQUIREMENTS FOR RATED OPENINGS

A. Comply with requirements of the code having jurisdiction for fire rated door frames, window frames, and sidelite frames, and doors for the rating class indicated.
   1. Label fire doors and frames listed in accordance with Underwriters Laboratories standard UL10C, and Positive Pressure Fire Tests of Door Assemblies.
   2. In case of conflicts in required fire protection ratings, provide fire ratings as required by NFPA and UL.

B. Labeling Agency:

1. If labeling agency is Underwriters' Laboratories: Manufacture doors and frames under the UL factory inspection program and in strict compliance to UL procedures, and provide the degree of fire protection, heat transmission and panic loading capability indicated by the opening class.
2. If labeling agency is Intertek Testing Services/Warnock Hersey: Manufacture doors and frames under the ITS/WH factory inspection program and in strict compliance to ITS/WH procedures, and provide the degree of fire protection capability indicated by the opening class

C. Have metal labels, bearing the name of the labeling agency, shipped on items located as follows:
1. Door Frames: Placed on the rabbet between the two upper hinge locations so as to be concealed when doors are shut.
2. Doors: Placed on the hinge stile between the two upper hinge locations so as to be concealed when doors are shut.
3. Window frames: Placed on the public side rabbet approximately 5 ft above finished floor - do not place on the face of the frame.

D. The following label materials/methods will not be acceptable and will be cause for rejection of all work of this Section:
1. Paper or plastic labels.
2. Stamped or embossed label markings.
3. Loose labels to be applied at the site.

E. Provide stairway doors to meet 250 degrees F Rise Class criteria minimum.

1.06 REQUIREMENTS FOR LEAD-LINED OPENINGS

A. Coordinate with Section 134905 - X-Ray Radiation Protection for receiving specified sheet lead for installation specified under this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
1. Do not use non-vented plastic or canvas shelters, which create a humidity chamber and promote rusting.
2. If items become wet, or moisture appears, remove protective wrapping immediately and take measures to dry items.

C. Store items in an enclosed space not subject to precipitation..
1. Store frames in an upright position with heads uppermost under cover on wood sills on floors in a manner that will prevent rust and damage. Do not store more than five in a stack. Provide a 2 inch space between frames to permit air circulation.
2. Store doors vertically. Place the units on at least 4 inch high wood sills on floors in a manner that will prevent rust and damage. Provide a 4 inch space between the doors to permit air circulation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Refer to the Owner's Bulk Purchasing Vendor List in Document 002150 for the Owner’s sole source manufacturer - No substitutions.
a. Basis of Design - Frames: Steelcraft F Series.
b. Basis of Design - Exterior Doors: Steelcraft B-Series.
c. Basis of Design - Exterior Doors: Steelcraft H-Series, Florida Building Code Approval.
d. Basis of Design - Temperature Rise Doors: Steelcraft T- Series.

2.02 DESIGN CRITERIA

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Edge Profile: Beveled, both sides.
   4. Vertical Edge Seams on Doors: Continuous vertical mechanical inter-locking joints at lock and hinge edges with visible edge seams, or a one piece full height 14 gage channel
   5. Typical Door Face Sheets: Flush.
   6. Glass Moldings and Stops (Labeled and Non-Labeled Doors:
      a. Fabricate from 24 gage steel:
         1) Interior Openings: ASTM A1008/A1008M cold rolled steel.
         2) Exterior Openings: ASTM A924/A924M Zinc-Iron Alloy-Coated galvannealed steel with a zinc coating of 0.06 ounces per square foot (A60).
      b. Install trim into the door as a four sided welded assembly with mitered, reinforced and welded corners; indentical on both sides of doors.
      c. Mounting:
         1) Fit into a formed area of the door face, not extending beyond the door face, and interlocking into the recessed area.
         2) Cap the cutout not extend more than 1/16” from the door face.
         3) Exposed fasteners are not permitted.
   7. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
      a. Coordinate with approved hardware schedule provided under Section 087100 - Door Hardware for frames to be prepped for siliencers and frames to be left un-punched to recieve gasketing or weatherstripping.
      b. Silencer preparation: Punch or drill frames for resilient rubber type, specified in Section 087100.
         1) Single Doors: 3 on strike side jamb.
         2) Pairs With no Center Mullion: 2 on head.
         3) Pairs With Center Mullion: 3 on each side of mullion.
      c. Mortises: Prepare mortises to fit hardware. Coordinate location of mortises with locations of door hardware items.
      d. Reinforcements:
         1) Mortise Hinges: Minimum 7 gage (0.180 inch).
            (a) Provide high frequency hinge reinforcement for top hinge on all exterior, cross corridor, and stairwell frames, in accordance with SDI 111-H, Example “A” Application, where full mortise hinges are specified.
         2) Strikes: Minimum 16 gage (0.053 inch) and prepared for an ANSI-A115.1-2 strike.
         3) Closers: Minimum 14 gage (0.067 inch)steel.
         4) Provide adequate reinforcements for other hardware as required.
         5) Provide reinforcements to be galvanized in galvanized/galvannealed frames.
         6) Projection weld hinge and strike reinforcements to the door frame.
         7) Provide metal plaster guards for all mortised cutouts.
   8. Frame Welds: Factory die-mitered corner connections reinforced with four integral tabs to secure and interlock at jambs to head. Continuously face-weld joints. Grind and finish all exposed surfaces of joints so that no traces of the mitered joints are visible. Frames showing traces of mitered joints are not acceptable.
      a. Note: The remaining elements at miters between jambs and head (soffit, stop and rabbets) are not required to be welded.

9. Frame Returns:
    a. Masonry Walls: Where frames are shown to wrap the masonry, provide wrap-around returns between frame face and wall to be 1/2 inch. Where frames are mounted within the opening, provide returns of a minimum of 1/4 inch so that frame faces do not face straight into the masonry jamb.
    b. Metal Stud Walls: Provide standard returns for all frames in metal stud walls. Size returns between frame face as follows:
        1) Frames With Resilient Base Abuting Frame: 1/2 inch.
        2) Frames Where Sheet Flooring With Coved Base Cccurs: 3/4 inch.
        3) Frames in Walls where no Base is Scheduled: 1/2 inch.
10. Frame Anchors: Each jamb to have:
    a. Frames in Masonry Walls: One masonry anchor for each two feet of frame height.
    b. Frames in Metal Stud Walls: One floor clip and one metal stud anchor for each two feet of frame height.

B. Electrical Requirements: Coordinate electrical requirements for doors and frames. Make provisions for installation of electrical items arranged so that wiring can be readily removed and replaced.
1. Openings With Electrified Hinges: Furnish conduit raceway to permit wiring from electric door hardware.
    a. Hinge Locations: Provide electric hinge at intermediate or center location. Top or bottom electric hinge locations are not acceptable.
    b. Refer to Section 087100 - Door Hardware for electrified hardware items

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
    e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
2. Core: Mineral core, fiberglass or other non-foam plastic type standard with the manufacturer.
3. Reinforcing: 20 gage channel shaped or hat chaped vertical stiffeners at 6 inches oc, welded to both sheets.
4. Door Thickness: 1-3/4 inch, nominal.
5. Top Closures for Outswinging Doors and Interior Doors in Sterile Environments: Flush with top of faces and edges.
6. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.

C. Interior Doors, Non-Fire Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 2 - Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
2. Core Material: Non-foam plastic type standard with the manufacturer.

3. Reinforcing: Channel shaped vertical stiffeners at 6 inches oc, welded to both sheets.
4. Door Thickness: 1-3/4 inch, nominal.

D. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 2 - Heavy-duty.
   b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
2. Fire Rating: As indicated on drawings, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   a. Temperature-Rise Rating (TRR) Across Door Thickness: 250 degrees F.
   b. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   c. Attach fire rating label to each fire rated unit.
3. Core Material: Mineral board.
4. Reinforcing: Channel shaped vertical stiffeners at 6 inches oc, welded to both sheets.
5. Door Thickness: 1-3/4 inch, nominal.

E. Sound-Rated Interior Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 3 - Extra Heavy-duty.
   b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
2. Sound Transmission Class (STC) Rating of Door and Frame Assembly: STC of 35, calculated in accordance with ASTM E413, and tested in accordance with ASTM E90.
3. Core Material: Manufacturer's standard construction as required to meet acoustic requirements indicated.
4. Door Thickness: As required to meet acoustic requirements indicated.
5. Reinforcing: Channel shaped vertical stiffeners at 6 inches oc, welded to both sheets.
6. Sound Seals: Integral, concealed in door and/or frame.
7. Opening Force of Sound-Rated Doors, Non-Fire Rated: 5 lbs, maximum, in compliance with ADA Standards.

F. Hurricane Resistant Doors:
1. Comply with Florida Building Code (FBC) test protocols for High Velocity Hurricane Zone (HVHZ) FBC TAS 201, FBC TAS 202 and FBC TAS 203.
2. Design and size door and frame components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
   a. Design Wind Loads: Comply with requirements of authorities having jurisdiction.
   b. Wind-Borne Debris Resistance: Door and frame components shall have FLA (PAD) approval or Miami (APD) approval for Large and Small Missile impact and pressure cycling at design wind loads.
   c. **Impact rated up to: Missle Level E**
3. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 3 - Extra Heavy-duty.
   b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
   e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
4. Core Material: Manufacturers standard core material/construction and in compliance with requirements for stiffness and insulating requirements.
5. Door Thickness: 1-3/4 inch, nominal.

6. Top Closures: Flush with top of faces and edges.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Face welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
   2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
   3. Frame Finish: Factory primed and field finished.
   4. Weatherstripping: Separate, see Section 087100.

C. Interior Door Frames, Non-Fire Rated: Face welded type.
   1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
   2. Frame Finish: Factory primed and field finished.

D. Door Frames, Fire-Rated: Face welded type.
   1. Fire Rating: Labelled as a fire rated frame.
   2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
   3. Frame Finish: Factory primed and field finished.

E. Hurricane Resistant Door Frames: With same hurricane resistance as door; face welded construction, ground smooth, fully prepared and reinforced for hardware installation.
   1. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings. Additionally, meet the following:
   1. Welds: Continuously weld joints along all surfaces along the throat of the frames. Grind and finish all exposed surfaces of joints so that no traces of the mitered joints are visible. Frames showing traces of mitered joints are not acceptable.
   2. Anchors: One anchor appropriate for the surrounding construction construction for each 2 feet of jamb height in each jamb.

H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As specified in Section 088000, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered corners; prepared for countersink style tamper proof screws.

C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and with Steel Door Institute's ANSI A250.11 recommended erection instructions for steel frames.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
   1. Provide a vertical wood brace during grouting of frame at openings over 4'0" wide, to prevent sagging of frame header.
   2. Provide full height 3/8 inch to 1-1/2 inch thick strip of polystyrene foam blocking at non-labeled frames requiring grouting where continuous hinges are specified. Apply the strip to the back of the frame, where the hinge is to be installed, to facilitate field drilling or tapping

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

G. Coordinate installation of electrical connections to electrical hardware items.

H. Touch up damaged factory finishes.
   1. Sand smooth rusted or damaged areas of prime coat, and apply touch-up of compatible air-drying primer.
   2. Leave touched-up areas without blemishes that will affect adherence or appearance of final paint coatings.

3.04 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test doors with gasketing for weather, fire, smoke, or sound for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.06 PROTECTION

A. Provide protective measures required throughout the construction period to ensure that door and frame units will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 081423
LAMINATED PLASTIC FACED WOOD DOORS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

1.02 REFERENCE STANDARDS

A. ASTM E413 - Classification for Rating Sound Insulation; 2010.

B. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

D. ICC (IBC) - International Building Code.

E. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

G. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

H. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Clearly describe full compliance with the requirements of the Section, including quality of door construction, core material, face cladding, fire ratings and installation instructions.

C. Submit identification of the labeling agency and the labeling agency's approved labeling procedures for door construction, including installation of astragals if applicable.

D. Submit manufacturer's certification that doors meet or exceed specified fire rating requirements.

E. Shop Drawings: Show the following minimum information. Use the same reference numbers for openings as those indicated on the Drawings. Shop fabrication work tickets are not acceptable submittals.
   1. Door elevations with dimensions.
   2. Hand and swing.
   3. Fire ratings.
   4. Stile and rail construction and reinforcement, mortises and internal blocking for hardware in non-rated and fire-rated doorss, and positive pressure provisions for fire-rated doors.
   5. Location and type of provisions in doors for scheduled hardware attachment.
   6. Thickness and type of laminated plastic cladding and crossbands.
   7. Type of finish for all door edges.
   8. Locations and dimensions of cut-outs, holes and mortises.
   9. Type of glazing stops.
   10. Doors with thresholds, undercut bottom edges and other special features.

F. Specimen warranty.

G. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

H. Warranty, executed in Owner's name.

1.04 REQUIREMENTS FOR RATED OPENINGS

A. Comply with requirements of the code having jurisdiction for fire rated doors for the rating class indicated.

B. Ensure metal labels, bearing the name of the labeling agency, are shipped on rated doors, placed between the two upper hinge locations. Paper or plastic labels are not acceptable.

C. Doors shipped without factory affixed labels will be rejected.

D. Ensure that astragals are shipped on rated doors if the manufacturer's approved labeling procedures require factory installation.

E. Provide stairway doors to meet 450 degrees F Rise Class criteria minimum.

F. Provide with internal positive pressure strips.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer that is certified for chain of custody by an FSC-accredited certification body and a certified participant in AWI's Quality Certification Program.

B. Source Limitations: Obtain doors from single manufacturer

C. Forest certification: Provide doors made with a minimum of 70% of all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship". Door distributors must also be certified for chain of custody by an FSC-accredited certification body.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver items to the site and handle, store and protect under provisions of Section 016000.

B. Have doors individually packaged at the factory sealed with heat shrunk plastic, and marked on the top and bottom rails for individual door openings indicated on the Drawings.

C. Deliver doors after the building is enclosed, dry, heated and adequately ventilated. Do not receive or store doors in damp areas. Do not drag the doors on the ground, floor or across one another.

D. Store doors flat on a level surface. Do not lean doors against vertical surfaces. Break sealed plastic packaging to permit ventilation. Do not subject doors to extreme conditions or changes in heat, dryness or humidity (humidity to be no less than 30% and no more than 60%).

E. Do not lean doors against vertical surfaces or store doors on edge. Do not store other materials on top of stacked doors. Do not walk on stacked doors.

F. Handle doors with clean gloves. Do not drag doors across one another or across other surfaces.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Warranty: Replace, including rehanging and refinishing, at no cost to the Owner, doors exhibiting defects in materials and workmanship, including warp (bow, cup, or twist) or delamination, the life of the installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Doors - General: "Perma-Clad" laminated plastic clad doors by VT Industries, Inc. (vtindustries.com) as specified below for the application:

1. Particleboard Cores: Particleboard (FSC certified Particleboard), ANSI A208.1, grade 1-LD-2, with the following percentage of door construction weight, composed of pre-consumer recycled material:
   a. Lead lined doors: 40%.
   b. Other doors: 70%.

2. Mineral Board Cores: Noncombustible mineral board, 30.8-34.7 lbs/ft3, containing no asbestos: 70%.
3. Sound Attenuation Cores: Multi-ply composite sound core standard with the manufacurer.
4. Crossbanding: Rotary cut, single ply, clear grade hardwood, 1/16 inch thick before sanding.
5. Laminated Plastic: NEMA LD3, Type 1 general purpose, 1/16 inch thick.
6. Stiles and Rails: Suitable for hanging on full mortise butt hinges. “Firestop” stiles and rails will not be acceptable for rated doors.
    a. Non-Rated, 20-Minute and 45-Minute Doors: Structural composite lumber (SCL).
    b. 60 and 90 Minute Label Doors: Reinforced “Triple-Ply” stile for suitable hanging on full mortise butt hinges.
    c. All Label Doors: Include internal intumescent strip on stiles and top rail to meet positive pressure requirements.
7. Edge Bands: Laminated plastic matching faces for stiles. If tops of any doors are visible, also band the top rail.
8. Lite Moldings: Moldings wide enough to completely cover exposed edges of veneer and crossbanding when seated against the glass pane.
    a. Non-Rated Doors: “VT1” flush rectangular poplar beads, unless noted otherwise.
    b. Acoustical Doors: No. 105 Acoustical Lite Kit.
    c. Rated Doors: “VT1F” veneer wrapped moldings, using poplar veneer unless noted otherwise. Other veneer wrapped or solid wood moldings approved in the manufacturer’s labeling procedures will be considered. Include concealed metal glazing clips where required by the manufacturer’s labeling procedures.
9. Substitutions: See substitutions per the Owner's Bulk Purchasing Vendor List in Document 002150.

B. Non-Rated Doors:
1. Lead Lined Doors: No. 1515-3.
2. Acoustical Core Doors: No. 1050H, STC 45.
3. Other Doors: No. 404-3 with laminated particleboard core of 28-30 lbs/cu ft density.

C. Rated Doors:
1. 20-minute Label Doors - non lead-lined: No. 4P04-3.
2. 20-minute Label Doors - lead lined: No. 1P15-3.
3. 20-minute Acoustical Core Doors: No.1P50H, STC 45.
4. 45 minute Label Doors: No. 1P45-3 with stiles for using mortise hinges, and meeting U.L. 250 deg F temperature rise criteria.
5. 60 and 90 Minute Label Doors: No. 1P11-3 with stiles for using mortise hinges, and meeting U.L. 250 deg F temperature rise criteria.

D. All Doors: See drawings for locations and additional requirements.
1. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.
2. High Pressure Decorative Laminate Faced Doors: 5-ply unless otherwise indicated.

E. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Provide solid core doors at all locations.
2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with International Building Code ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is open.
3. Smoke and Draft Control Doors 3.0 cfm per sq ft of door opening at 0.10 inch w.g. pressure at both ambient and elevated temperatures; with "S" label; gasketing is specified in Section 087100.
4. Sound Retardant Doors: Minimum STC of 45, calculated in accordance with ASTM E413, tested in accordance with ASTM E1408.
5. Lead Lined Doors: Minimum 1/16 inch thick, 4 pound lead unless otherwise indicated.

6. High Pressure Decorative Laminate Finish where indicated on drawings.

2.02 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated above.

B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound Retardant Doors: Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.

D. Lead Lined Doors: Equivalent to Type bonded particleboard core (PC) with continuous lead sheet from edge to edge in the center of the core or between the crossband and the core; lead thickness, plies, and faces as indicated above.

2.03 DOOR FACINGS

A. High Pressure Decorative Laminate Facing for Fire Doors: NEMA LD 3, SGF; color(s) as indicated; high gloss finish.

B. High Pressure Decorative Laminate Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; color(s) as indicated; high gloss finish.

C. Cross Banding Behind High Pressure Laminate Finish: 1 ply; of Rotary cut, single ply, clear grade hardwood, 1/16 inch thick before sanding.

D. Facing Adhesive: Type I - waterproof.

2.04 FABRICATION

A. Fabricate doors to have faces, crossbanding, stiles and cores to match the specified manufacturer's construction for applicable type of doors. For all labeled doors, include internal intumescent strip to meet positive pressure label requirements.

B. Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

C. Construction: 5 ply with stiles and rails are bonded to core, then entire unit abrasive planed before crossbanding and veneering. Lead-lined doors similar, but with a ply of lead lining on each side of core.

D. Cores: Particleboard for non-rated and 20-minute doors, and mineral core for all doors with a fire rating of greater than 20 minutes.

E. Blocking: Provide wood blocking as needed to eliminate through-bolting hardware, but no less than the following:
   1. Doors Indicated to Have Closers: 5-inch top-rail blocking.
   2. Doors Indicated to Have Exit Devices: 5-inch mid-rail blocking.

F. Edge Bands: Apply to conceal crossbanding, Intumescent strips and lead lining, applicable, as well as the transition from the face laminate to the edge band.

G. Bevel strike and hinge stiles 1/8 inch in 2 inches

H. Astragals:
   1. Lead-Lined Pairs of Doors: Provide leaded aluminum or steel astragals for all pairs of lead-lined doors. Where doors are rated, provide astragals complying with the manufacturer's approved labeling procedures for the rating class indicated.
   2. Double Egress Doors in Smoke Partitions: Provide astragals arranged to meet requirements of NFPA 101 with the minimum allowed overlap.
   3. Other Labeled Pairs of Doors: Provide astragals complying with the manufacturer's approved labeling procedures for the rating class indicated.
   4. Finish: Exposed surfaces to be clear anodized if aluminum, and factory primed if steel.

I. Make cut-outs for vision panels at the factory to be of sizes and locations indicated. Allow 6 inches minimum at door edge. Have rated doors with vision panels factory glazed with fire rated glass specified in Section 088000 and with veneered glazing beads also installed at the factory. Other doors may also be factory glazed - Contractor's option. Miter stops to form hairline joints.

J. Hardware Preparation: Make cut-outs at the factory from the hardware manufacturer's templates and approved shop drawings. Pilot drill holes for hardware attachment. Pre-machine doors within industry tolerances, and within the following:
   1. Lock Front Preparation Cutouts: +1/32 to -1/64 inch.
   2. Other Hardware Locations: +1/32 inch.

K. Prefitting: Factory prefit doors for frame opening dimensions identified on shop drawings. Perform any necessary factory trimming before any face or edge laminates are applied. For labeled doors, perform trimming in accordance with labeling procedures. Fit doors for the following clearances:
   1. Heads and Jambs: 1/8 inch.
   2. Floor Clearance - openings with carpet divider: 1/4 inch.
   3. Floor Clearance - all other openings: 1/2 inch maximum.

L. Seal top and bottom rails of doors and wood particleboard exposed by cut-outs with high quality preservative

M. Affix metal fire rating labels and metal STC labels to door the the factory.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

C. Do not attempt to trim doors on site. Return doors to the manufacturer, or a facility designated by the manufacturer, to have trimming done in accordance with the manufacturer's standard procedures, and in accordance with the manufacturer's approved labeling procedures if doors are rated. Ensure labels, and astragals if required, are installed on rated doors when the doors are returned to the Project site. Replace doors if:
   1. After trimming operations, evidence of trimming exists.
   2. Trimming operations will require new machining for lockset/latchset placement.
   3. Trimming cannot be performed within the guidelines and requirements of the manufacturer's approved labeling procedures.
   4. Doors are returned to the site without affixed labels.
   5. Doors are returned to the site without affixed astragals if required to be factory installed per the manufacturer's approved labeling procedures.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard. Pilot drill holes for hardware attachment.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Coordinate installation with installation of frames specified in Section 081113 and hardware specified in Section 087100.

D. If vision lites for non-rated doors are not factory installed, coordinate installation of vision lites. Install veneered stops with corners mitered to form hairline joints.

E. Installation tolerances:
   1. Maximum Diagonal Distortion (Warp): 1/16 inch measured with a straight edge or taught string, corner to corner.
   2. Maximum Vertical Distortion (Bow): 1/16 inch measured with a straight edge or taught string, top to bottom.

3. Maximum Width Distortion (Cup): 1/16 inch measured with a straight edge or taught string, edge to edge.

F. Replace doors which are damaged during installation, or as a result of subsequent construction activities.

3.03 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Ensure doors are free from:
   1. Hinge bound conditions, striking or binding.
   2. Rattling when in closed position.

C. If any doors cannot be adjusted to specified conditions, replace such doors and install to meet specified conditions.

D. If any doors are damaged during attempts at adjustment, replace such doors and install to meet specified conditions.

3.04 WASTE MANAGEMENT

A. Separate and recycle waste materials in accordance with the Waste Management Plan specified in Section 017419.

B. Fold up metal banding - flatten and place in designated area for metal recycling.

C. Separate corrugated packaging and place in designated area for paper product recycling.

END OF SECTION

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Current Edition.

B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Ceiling-Mounted Units:
   1. Location: As indicated on drawings.
   2. Panel Material: Steel.
   3. Material: Steel.
      a. Provide Galvanized Steel on Exterior Panels
   4. Size in Other Ceilings: 24x24 inch (____ mm), unless otherwise indicated.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
      a. Multipurpose Access Panel: Activar/JL Industries TM.
      b. High-Security (7 ga) Access Panel: Activar/JL Industries HSP.
      c. Insulated Fire-Rated Access Panel: Activar/JL Industries FD.
      d. Exterior Access Panel: Activar/JL Industries XT.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Airtight, Watertight, Wall and Ceiling Mounted Units: ACUDOR ADWT.
      b. Fire-Rated Ceiling-Mounted Units - 2 Hours or Less: ACUDOR FWC-5015.
      c. Fire-Rated Wall-Mounted Units - 2 Hours or Less: ACUDOR FW-5015.
   3. Babcock-Davis: www.babcockdavis.com/#sle.
   4. Cendrex, Inc: www.cendrex.com/#sle.
   5. Karp Associates, Inc: www.karpinc.com.
   6. Nystrom, Inc: www.nystrom.com/#sle.

B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Style: Exposed frame with door surface flush with frame surface.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Frames: 16-gauge, 0.0598-inch (1.52 mm) minimum thickness.
   4. Heavy-Duty Single Steel Sheet Door Panels: 14-gauge, 0.0747-inch (1.89 mm) minimum thickness.
   5. Door Panels to Receive Wall/Ceiling Finish: Surface recessed 5/8 inch (15.9 mm) back from wall face.
   6. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
      a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
      b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
   7. Steel Finish: Primed.
   8. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
   9. Door/Panel Size: As indicated on the drawings.
   10. Hardware:
      a. Hardware for Fire-Rated Units: As required for listing.
      b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
      c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.
      d. Provide tamper proof screws and access for antiligature functions within a Behaviorial space/room
      e. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
      f. Gasketing: Extruded neoprene, around perimeter of door panel.
         1) **Required on all access panels in any pressurized room (negative or positive)**

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

1.02 RELATED REQUIREMENTS

A. Section 088000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

E. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

G. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

H. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

J. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

L. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

M. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

N. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

O. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

P. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

Q. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

R. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

S. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
   1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
      a. North American Contractor Certification (NACC) for glazing contractors.
      b. Equivalent independent third-party ANSI accredited certification.

1.07 MOCK-UPS

A. Locate where directed.

B. Mock-up may not remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Wind-Borne-Debris Resistance Tested:
   1. Basis of Design: YKK 50 FI.
   2. Vertical Mullion Dimensions: 2-1/2 inches wide by 5 inches deep (63 mm wide by 127 mm deep).

B. Substitutions: See Section 016000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I natural anodized.
   2. Finish Color: As indicated on drawings.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   9. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel, and heel bead of glazing compound.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code FLA (PAD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
   3. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).

4. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.
5. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
6. Overall U-value Including Glazing: 0.49 Btu/(hr sq ft deg F) (_____ W/(sq m K)), maximum.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.
   2. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Fasteners: Stainless steel.

E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

F. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

B. Color: As indicated on drawings.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 088000.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

D. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf (200 Pa).
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce (14 gram) that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
   4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf (75 Pa).
      a. Maximum allowable rate of air leakage is 0.09 cfm/sq ft (0.5 L/s sq m).

E. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:

1. Hinges
2. Continuous hinges
3. Pivots
4. Key control system
5. Lock cylinders and keys
6. Lock and latch sets
7. Bolts
8. Exit devices
9. Closers
10. Overhead stops and holders
11. Miscellaneous door control devices
12. Door trim units
13. Protection plates
14. Weatherstripping for exterior doors
15. Sound and smoke seals for interior doors
16. Automatic drop seals (door bottoms)
17. Astragals or meeting seals on pairs of doors
18. Thresholds

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 08 11 13: Hollow Metal Doors and Frames
2. Section 08 14 23: Laminated Plastic Faced Wood Doors
3. Section 08 33 23: Overhead Coiling Doors
4. Division 26: Electrical
5. Division 28: Electronic Safety and Security

D. Products furnished but not installed under this Section to include:

1. Cylinders for locks on entrance doors.

1.3 REFERENCES

A. Standards of the following as referenced:

1. American National Standards Institute (ANSI)
2. Door and Hardware Institute (DHI)
3. Factory Mutual (FM)
4. National Fire Protection Association (NFPA)
5. Underwriters' Laboratories, Inc. (UL)

    a. UL 10C - Fire Tests Door Assemblies

6. Warnock Hersey

B. Regulatory standards of the following as referenced:

1. Department of Justice, Office of the Attorney General, *Americans with Disabilities Act*, Public Law 101-336 (ADA).
2. CABO/ANSI A117.1: Providing Accessibility and Usability for Physically Handicapped People, 2010 edition.

1.4 SYSTEM DESCRIPTION

A. Refer to applicable “HW SETS” for system description for electric and electro-pneumatic hardware products.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements. For items other than those scheduled in the “Headings” of Section 3, provide catalog information for the specified items and for those submitted.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format “hardware sets” indicating complete designations of every item required for each door or opening. Use specification HW SET numbers with any variations suffixed a, b, etc. Include the following information:

    a. Type, style, function, size, and finish of each hardware item.
    b. Name and manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
    e. Explanation of all abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for hardware.
    g. Door and frame sizes and materials.

h. Keying information.
i. Cross-reference numbers used within schedule deviating from those specified.

1) Column 1: State specified item and manufacturer.
2) Column 2: State prior approved substituted item and its manufacturer.

2. Furnish complete wiring diagrams, riser diagrams, elevation drawings, and operational descriptions of electrical components and systems, listed by opening in the hardware submittals. Elevation drawings to identify locations of the system components with respect to their placement in the door opening. Operational descriptions to fully detail how each electrical component will function within the opening, including all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval. Supply a copy with delivery of hardware to the jobsite and another copy to the Owner at the time of project completion.
3. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.
4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Provide samples, if requested, of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

F. Contract closeout submittals:

1. Operation and maintenance data: Complete information for installed door hardware.
2. Warranty: Completed and executed warranty forms.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware distributor, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who is available for consultation to Owner, Architect, and Contractor, at reasonable times during the course of the Work.

C. Coordination Meetings:

1. Organize and attend the following:

a. Lock distributor to meet with the Owner to finalize lock functions and keying requirements and to obtain final instructions in writing.
b. Lock distributor and lock, closer and exit device manufacturers' representative(s) to meet with the installer prior to commencing installation of door hardware. Instruct installer on proper installation of scheduled products.

2. Organize and attend the following:

a. Meet with the Owner, hardware supplier, frame and door supplier, electrical sub-contractor and security sub-contractor to coordinate all electrical hardware items. Hardware supplier to provide riser diagrams, elevation drawings, wiring diagrams, and operational descriptions as required by the General and sub-contractors.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges, and seals whether listed in the Hardware Schedule or not. All hardware to comply with State and local codes and UL 10C.

E. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

F. All hardware is to comply with Federal and State Handicap laws. Provide tactile warning at the back of all outside levers to electrical, mechanical, machine rooms, and doors that lead to hazardous areas.

1.7 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each item or package.

B. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

C. Deliver individually packaged door hardware items promptly to place of installation.

D. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.8 WARRANTY

A. Special warranties:

1. Surface Door Closers: Thirty (30) year period
2. Exit Devices: Three (3) year period
3. Automatic Door Operators: Two (2) year period
4. Mortise Locks and Cylinders: Three (3) year period

1.9 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS
(*Denotes manufacturer referenced in the Hardware Headings)

A. Hinges:

1. Acceptable manufacturers:

a. Ives*

2. Characteristics:

a. Templates: Provide only template-produced units.
b. Screws: Provide Phillips flat-head screws complying with the following requirements:

3) For metal doors and frames install machine screws into drilled and tapped holes.
4) For wood doors and frames install threaded-to-the-head wood screws.
5) For fire-rated wood doors install #12 x 1-1/4”, threaded-to-the-head steel wood screws.
6) Finish screw heads to match surface of hinges or pivots.

c. Hinge pins: Except as otherwise indicated, provide hinge pins as follows:

1) Out-Swing Exterior Doors: Non-removable pins.
2) Interior Doors: Non-rising pins.
3) Tips: Flat button and matching plug. Finished to match leafs.

d. Size: Size hinges in accordance with specified manufacturer’s published recommendations.
e. Quantity: Furnish one pair of hinges for all doors up to 5’-0” high. Furnish one hinge for each additional 2-1/2 feet or fraction thereof.

B. Continuous Hinges:

1. Acceptable manufacturers:

a. Ives*

2. Characteristics:

a. Continuous gear hinges to be manufactured of extruded 6063-T6 aluminum alloy with anodized finish, or factory painted finish as scheduled.
b. All hinges are to be manufactured to template. Uncut hinges to be non-handed and to be a pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising.
c. Vertical door loads to be carried on chemically lubricated polyacetal thrust bearings. The door

and frame leaves to be continually geared together for the entire hinge length and secured with a full cover channel. Hinge to operate to a full 180o.

d. Hinges to be milled, anodized, and assembled in matching pairs. Fasteners supplied to be security type steel self-drilling, self-tapping 12-24 x 3/4".
e. Provide UL listed continuous hinges at fire doors. Continuous hinges at fire doors to meet the required ratings without the use of auxiliary fused pins or studs.

C. Cylinders:

1. Acceptable manufacturers:

   a. Match Existing*

2. Characteristics:

   a. Key into existing facility key system. Coordinate all keying with owner's representative. The cylinders and cylinder preps included in the hardware sets indicate cylinder locations. Locksets may need to be modified to accommodate existing key system cylinders. See chart below for cylinder information.

Less SFIC	B
Less FSIC - Medeco (ATH, SPA, RHO and TLR only)	J-ME
Less FSIC – Corbin Russwin (6 Pin) (ATH, SPA, RHO and TLR only)	J-CO6
Less FSIC – Corbin Russwin (7 Pin) (RHO only)	J-CO7
Less FSIC – Sargent (ATH, SPA, RHO and TLR only)	J-SA
Less FSIC – Yale (6 Pin) (ATH, SPA, RHO and TLR only)	J-YA6
Less FSIC – Yale (7 Pin) (RHO only)	J-YA7
Less Conventional, Corbin Russwin (ATH, SPA, RHO and TLR only)	L-CO
Less Conventional, Sargent (ATH, SPA, RHO and TLR only)	L-SA

   b. Construction master key all cylinders.
   c. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
   d. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

      1) Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE".

   e. Key Material: Provide keys of nickel silver only.
   f. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, 5 grandmaster keys for each grandmaster system, 5 construction master keys, and 3 constructions block out keys.

      1) Furnish one extra blank for each lock.
      2) Furnish construction master keys to General Contractor.

3) Deliver keys to Owner.

D. Locksets, Latchsets, Deadbolts:

1. Acceptable manufacturers:

   a. Schalge*
   b. Glynn Johnson*

2. Mortise Locksets and Latchsets: as scheduled.

   a. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
   b. Latchbolts: 3/4” throw stainless steel anti-friction type.
   c. Lever Trim: Through-bolted, accessible design, cast or solid rod lever as scheduled. Spindles: Independent break-away.
   d. Thumbturns: Accessible design not requiring pinching or twisting motions to operate.
   e. Deadbolts: Stainless steel 1” throw.
   f. Electric operation: Manufacturer-installed continuous duty solenoid.
   g. Strikes: 16 gage curved stainless steel, bronze, or brass with 1” deep box construction, lips of sufficient length to clear trim and protect clothing.
   h. Scheduled Lock Series and Design: Schlage L Series.
   i. Certifications:

      1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
      2) ANSI/ASTM F476-84 Grade 30 UL Listed.

3. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled, fastened with through-bolts.

   a. Chassis: Cylindrical design, corrosion-resistant plated cold-rolled steel.
   b. Latch Retractors: Forged steel. Balance of inner parts: Corrosion-resistant plated steel, or stainless steel.
   c. Lever Trim: Accessible design, independent operation, spring-cage supported, minimum 2” clearance from lever mid-point to door face.
   d. Rosettes: Minimum 3-7/16” diameter for coverage of ANSI/DHI A115.18, 1994 door preparation, through-bolt lugs on both spring cages to fully engage this pattern.
   e. Electric operation: Manufacturer-installed continuous duty solenoid.
   f. Strikes: 16 gage curved steel, bronze, or brass with 1” deep box construction, lips of sufficient length to clear trim and protect clothing.
   g. Lock Series and Design: Schlage ND Series.
   h. Certifications:

      1) ANSI A156.2, 1994, Series 4000, Grade 1. Tested to exceed 3,000,000 cycles.
      2) UL listed for A label single doors up to 4 ft x 8 ft.

4. Deadbolts: as scheduled. Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4” dia. steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike with 1/8” thick strike reinforcer and two 3” long screws. ANSI A156.5, 1992 Grade 1 certified.

E. Exit Devices:

1. Acceptable manufacturers:

   a. Von Duprin*

2. Characteristics:

    a. Exit devices to be “UL” listed for life safety. All exit devices for fire rated openings to have “UL” labels for “Fire Exit Hardware”.
    b. All exit devices mounted on labeled wood doors to be mounted on the door in accordance with the door manufacturer’s requirements using sex nuts and bolts.
    c. All trim to be thru bolted to the lock stile case. Lever design to match locksets.
    d. All exit devices to be made of brass, bronze, stainless steel, or aluminum material, powder coated, anodized, or plated to the standard architectural finishes to match the balance of the door hardware.
    e. Provide glass bead conversion kits to shim exit devices on doors with raised glass beads.
    f. All exit devices to be one manufacturer. No deviation will be considered.
    g. All series exit devices to incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation.
    h. All exit devices to be non-handed. Touchpad to extend a minimum of 1/2 of the door width and extend to the height of the cross rail housing for a “no pinch” operation. Plastic touchpads are not acceptable.
    i. All latchbolts to be the deadlocking type. Latchbolts to have a self-lubricating coating to reduce wear. Plated or plastic coated latchbolts are not acceptable. Plastic linkage and “dogging” components are not acceptable.
    j. Lever trim to be solid case material with a break-away feature to limit damage to the unit from vandalism. The break-away feature to utilize a clutch mechanism allowing the lever to drop to the six o'clock position and reset manually.
    k. Surface vertical rod devices to be UL labeled for fire door applications without the use of bottom rod assemblies. Where bottom rods are required for security applications, the devices to be UL labeled for fire doors applications with rod and latch guards by the device manufacturer.
    l. Exit devices to include impact resistant, flush mounted end cap design to avoid damage due to carts and other heavy objects passing through an opening. End cap to be of heavy-duty metal alloy construction and provide horizontal adjustment to provide alignment with device cover plate. When exit device end cap is installed, no raised edges will protrude.

F. Closers and Door Control Devices:

1. Acceptable manufacturers:

    a. LCN*

2. Characteristics:

    a. Door closers to have fully hydraulic, full rack and pinion action with a high strength cast cylinder.
    b. All closers to utilize a stable fluid withstanding temperature range of 120oF to -30oF without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors to be provided with temperature stabilizing fluid that complies with standards UBC 7-2 (1997) and UL 10C.
    c. Spring power to be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped. Hydraulic regulation to be by tamper-proof, non-critical valves. Closers to have separate adjustment for latch speed, general speed and back check.
    d. All closers (overhead, surface, and concealed) to be of one manufacturer and carry manufacturer's ten (10) year warranty. Electric closers to have two year warranty.

e. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped provide adjustable units complying with ADA and ANSI A-117.1 provisions for door opening force.
f. Closers to be installed to allow door swing to the maximum degree of opening before striking an obstruction. Doors swinging into exit corridors to provide for corridor clear width as required by code. Where possible, mount closers inside rooms.
g. Combination Door Closers and Holders: Provide units designed to hold door in open position under normal usage and to release and automatically close door under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts.
h. Magnetic Door Holders to be heavy duty wall mounted with metal housing and complete mounting hardware. Provide 24V holding coils unless otherwise scheduled.

G. Automatic Operators:

1. Acceptable manufacturers:

a. LCN*
b. Stanley
c. Besam

2. Characteristics:

a. ADA operators with a closing force of 8 lbs. to include a manual “Off/Auto/Hold-Open” switch and to incorporate a failsafe feature. In the “Off” mode, and in the event of a power failure, the door to operate manually without damage to operator components.
b. Operators to provide adjustments by microprocessor for opening speed, backcheck speed, hold open (from 5 to 30 seconds), closing speed, opening force, soft-start and safety stop, and reverse in opening and closing cycle.
c. Operators to be UL and NEC compliant, include soft-start motor control and meet the following standards:
   1) ADA Law Section 4.13.12
   2) ANSI A156.19, Section 2.1
   3) ANSI A117.1, Section 4.13.13
   4) UL 325
   5) UL Listed for Fire Rated Door Operators with Automatic Closers, File (GUJY)
d. Operators to be furnished with all relays, time delay modules, controls, actuators, wiring diagrams, etc. as required to ensure complete and properly functioning installation.
e. Installation of automatic operators to be performed by factory-trained installer skilled in the installation of automatic door operators and equipment. All low voltage switch hookups are the responsibility of the operator installer, including temporary wiring hookup to plug into wall outlet for test of system. Final hookup of 115VAC power to be performed by and coordinated with the General Contractor’s electrical contractor.
f. The General Contractor to furnish a certificate, executed by a representative of the automatic operator manufacturer, certifying that all operators have been installed in accordance with the manufacturer’s instructions, have been inspected and adjusted, and are operating as designed.

H. Overhead Door Stops and Holders:

1. Acceptable manufacturers:

a. Glynn Johnson*

2. Characteristics:

    a. Provide door stops and holders of brass, bronze or stainless steel.
    b. Concealed stops and holders to be installed with the jamb bracket mortised flush with the bottom of the jamb. The arm and channel to be mortised into the door.
    c. Surface-mounted stops and holders to be installed with the jamb bracket mounted on the stop.

I. Floor Stops and Wall Bumpers:

1. Acceptable manufacturers:

    a. Ives*

2. Characteristics: Refer to Part 3, Hardware Schedule.

J. Door Bolts/Coordinators:

1. Acceptable manufacturers:

    a. Ives*

2. Characteristics:

    a. Flush bolts to be forged brass 6-3/4" x 1", with 1/2" diameter bolts. Plunger to be supplied with milled surface one side that fits into a matching guide.
    b. Automatic flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
    c. Self-latching flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
    d. Automatic flush bolts and self-latching flush bolts are to be UL listed for fire door application without bottom bolts.
    e. Furnish dust proof bottom strikes.
    f. Coordinator to be soffit mounted non-handed fully automatic UL listed coordinating device for sequential closing of paired doors with or without astragals.
    g. Provide filler pieced to close the header. Provide brackets as required for mounting of soffit applied hardware.

K. Push Plates:

1. Acceptable manufacturers:

    a. Ives*

2. Characteristics:

    a. Exposed Fasteners: Provide manufacturers security fasteners.
    b. Material to be stainless steel.
    c. Provide plates sized as shown in Part 3, Hardware Schedule.

L. Door Pulls & Pull Plates:

1. Acceptable manufacturers:

a. Ives*

2. Characteristics:

a. Provide concealed thru-bolted trim on back to back mounted pulls, but not for single units.
b. Material to be stainless steel.
c. Provide units of types and sizes shown in Part 3, Hardware Schedule.

M. Protective Plates:

1. Acceptable manufacturers:

a. Ives*

2. Characteristics:

a. Provide manufacturers security fasteners for door trim units consisting of either machine screws or self-tapping screws.
b. Materials:

1) Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).

c. Fabricate protection plates not more than 2” less than door width on push side and not more than 1” less than door width on pull side.

N. Thresholds:

1. Acceptable manufacturers:

a. Zero Weatherstripping*

2. Types: Indicated in Part 3, Hardware Schedule.

O. Door Seals/Gasketing:

1. Acceptable manufacturers:

a. Zero Weatherstripping*

2. Types: Indicated in Part 3, Hardware Schedule.

P. Silencers:

1. Acceptable manufacturers:
2. Ives*
3. Three (3) for each single door; two (2) for each pair of doors.
4. Omit silencers at openings scheduled to receive perimeter gasketing.

Q. Security Equipment:

1. Characteristics:

a. Provide items as found in Part 3, Hardware Schedule.

2. Coordinate security equipment with electrical systems.

2.2 MATERIALS AND FABRICATION

A. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish “optional” materials or forming methods for those indicated, except as otherwise specified.

B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for security machine screw installation.

1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint” surfaces to receive painted finish.
3. Unless indicated otherwise provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
4. Use thru bolts for installation of all exit devices, closers, and overhead stops. Coordinate with wood doors and metal doors and frames. Where thru-bolts are used, provide sleeves for each thru-bolt as a means of reinforcing the work, or use sex nut and bolt fasteners.

2.3 HARDWARE FINISHES

A. Match items to the manufacturer’s standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

B. Provide finishes that match those established by ANSI or, if none established, match the Architect’s sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standards, but in no case less than specified by referenced standards for the applicable units of hardware.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

B. “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

D. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space security fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section “Joint Sealers”.

G. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Door Hardware Supplier's Field Service:

1. Inspect door hardware items for correct installation and adjustment after complete installation of door hardware.
2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
3. File written report of this inspection to Architect.

3.3 HARDWARE SCHEDULE

Abbreviation	Name
BES	Best Locking Systems
DET	Detex Corp.
IVE	H.B. Ives
LCN	LCN Commercial Division
SCE	Schlage Electronic Security
SCH	Schlage Lock Company
STE	Steelcraft
VON	Von Duprin
ZER	Zero International Inc

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 05.0

205
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP		630	IVE
1	EA	MULT PT STOREROOM	LM9380BDC 07A		626	SCH
1	EA	SFIC CORE	AS REQ - MATCH EXISTING KEY SYSTEM		626	BES
1	EA	SURFACE CLOSER	4050A SHCUSH TBWMS		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	SET	GASKETING	PS-074			STE
1	EA	DOOR SWEEP	FAS-SEAL			STE
1	EA	THRESHOLD	566A-226		A	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 06.3

218

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP			630	IVE
1	EA	DELAYED EGRESS EXIT DEVICE	10-08D-EE ER x EU D TRIM			626	DET
1	EA	SFIC CORE	AS REQ - MATCH EXISTING KEY SYSTEM			626	BES
1	EA	SURFACE CLOSER	4050A SCUSH TBWMS			689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS			630	IVE
1	EA	RAIN DRIP	142AA			AA	ZER
1	SET	GASKETING	PS-074				STE
1	EA	DOOR SWEEP	FAS-SEAL				STE
1	EA	THRESHOLD	566A-226			A	ZER
1	EA	MULTITECH READER	LNL-R11325-05TB - BY ACCESS CONTROL SYSTEM CONTRACTOR				
1	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	WORK OF DIVISION 28				

DOORS ARE SECURED WITH CARD READERS ON BOTH SIDES. PRESSURE ON EXIT DEVICE FOR 2 SECONDS INITIATES AN IRREVERSIBLE COUNTDOWN DURING WHICH ALARM WILL SOUND. EXIT DEVICE WILL RELEASE AFTER DELAY INTERVAL FOR EGRESS. VALID CREDENTIAL AT CARD READER FROM EITHER SIDE OR LIFE SAFETY ALARM CONDITION TEMPORARILY SHUNTS DELAYED EGRESS SYSTEM. AFTER PRESET TIME INTERVAL, SYSTEM WILL RE-ARM.

Hardware Group No. 09.0

206 207 208

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80BDC ATH		626	SCH
1	EA	SFIC CORE	AS REQ - MATCH EXISTING KEY SYSTEM		626	BES
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	SURFACE CLOSER	4050A RW/PA TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MULTITECH READER	LNL-R11325-05TB - BY ACCESS CONTROL SYSTEM CONTRACTOR			
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	WORK OF DIVISION 28			

VALID CREDENTIAL AT CARD READER UNLOCKS ELECTRIC STRIKE FOR A PRESET TIME INTERVAL. ELECTRIC STRIKE RE-LOCKS WHEN TIME INTERVAL EXPIRES.

Hardware Group No. 09.2

204 221

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80JSARD ATH		626	SCH
1	EA	FSIC CORE	AS REQUIRED - MATCH EXISTING KEY SYSTEM		626	SAR
1	EA	ELECTRIC STRIKE	6211 FSE		630	VON
1	EA	SURFACE CLOSER	4050A RW/PA TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MULTITECH READER	LNL-R11325-05TB - BY ACCESS CONTROL SYSTEM CONTRACTOR			
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	WORK OF DIVISION 28			
1	EA	WIRING DIAGRAM	POINT TO POINT DIAGRAM			
1	EA	WIRING DIAGRAM	RISER DIAGRAM			

VALID CREDENTIAL AT CARD READER UNLOCKS ELECTRIC STRIKE FOR A PRESET TIME INTERVAL. ELECTRIC STRIKE RE-LOCKS WHEN TIME INTERVAL EXPIRES.

Hardware Group No. 15.0

201

Provide each DE door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	224XY		628	IVE
2	EA	FIRE EXIT HARDWARE	9827-EO-F-LBR-499F		626	VON
2	EA	SURFACE CLOSER	4050A RW/PA TBWMS		689	LCN
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS		630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850		689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	ASTRAGAL	322A			ZER

DOORS HELD OPEN BY WALL MAGNETS. WALL MAGNETS RELEASE UPON ACTIVATION OF FIRE ALARM.

Hardware Group No. 21.0

210 211 212 213 214 215
216 217

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S ATH		626	SCH
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 26.0

203

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80BDC ATH		626	SCH
1	EA	SFIC CORE	AS REQ - MATCH EXISTING KEY SYSTEM		626	BES
1	EA	SURFACE CLOSER	4050A RW/PA TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 35.0

209

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S ATH OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4050A RW/PA TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

DOOR INDEX

Door Numbers	HwSet#
201	15.0
203	26.0
204	09.2
205	05.0
206	09.0
207	09.0
208	09.0
209	35.0
210	21.0
211	21.0
212	21.0
213	21.0
214	21.0
215	21.0
216	21.0
217	21.0
218	06.3
221	09.2

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic sheet glazing units.

D. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

B. Section 081416 - Flush Wood Doors: Glazed lites in doors.

C. Section 084243 - Intensive Care Unit / Critical Care Unit Entrances: Glazing provided as part of entrance assembly.

D. Section 085113 - Aluminum Windows: Glazing provided by window manufacturer.

E. Section 134913 - Integrated X-Ray Shielding Assemblies: Leaded glass.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

H. ASTM F1915 - Standard Test Methods for Glazing for Detention Facilities; 2005 (Reapproved 2019).

I. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

J. ITS (DIR) - Directory of Listed Products; Current Edition.

K. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

L. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

M. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

N. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Sheet Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

E. Manufacturer's qualification statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.

1.06 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide mock-up of exterior window unit including glass and air barrier and vapor retarder seal.

C. Provide on-site glazing mock-up with the specified glazing components.

D. Locate where directed.

E. Mock-ups may not remain as part of the Work.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Polycarbonate Sheet Glazing: Provide a five (5) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

1.09 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Saint Gobain North America: www.saint-gobain.com/#sle.
   5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

6. Substitutions: See Section 016000 - Product Requirements.

B. Radiation Shielding Glass Manufacturers:
   1. Corning Inc; Med-X: www.mcgrory.com/#sle.
   2. SCHOTT North America Inc: www.us.schott.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

C. Insulating Glass with Internal Louvers or Blinds Manufacturers:
   1. Unicel Architectural Corp: www.unicelarchitectural.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

D. Plastic Sheet Glazing Manufacturers:
   1. Altuglas International: www.altuglasint.com/#sle.
   2. American Acrylic Corp: www.americanacrylic.com/#sle.
   3. Evonik Industries: www.acrylite.net/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

1.10 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections,
   2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

1.11 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   2. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   3. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
   4. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.

B. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.
   2. Exterior glazing outboard layer is comprised of 1/8" annealed glass, Kurary Sentryglas Interlayer, and 1/8" annealed glass laminated together per NOA assembly
   3. Durability: Certified by an independent testing agency to comply with ASTM E2190.

4. Warm-Edge Spacers: Low-conductivity thermoplastic with desiccant warm-edge technology design.
    a. Spacer Width: As required for specified insulating glass unit.
    b. Spacer Height: Manufacturer's standard.
5. Spacer Color: Black.
6. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
7. Color: Black.
8. Purge interpane space with dry air, hermetically sealed.

C. Type G-1 - Insulating Glass Units: Vision glass, double glazed.
1. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
    a. Tint: Match Existing.
    b. Coating: Self-cleaning type, on #1 surface.
    c. Coating: Low-E (passive type), on #2 surface.
2. Warm-edge spacer.
3. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
    a. Tint: Clear.
4. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.50, nominal.
5. Visible Light Transmittance (VLT): 51 percent, nominal.
6. Solar Heat Gain Coefficient (SHGC): 0.33 percent, nominal.
7. Glazing Method: Dry glazing method, gasket glazing.

D. Type G1-S - Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
    a. Tint: Match Existing.
    b. Coating: Same as on vision units, on #2 surface.
4. Warm-edge spacer.
5. Inboard Lite: Heat-strengthened float glass, 1/4 inch (6.4 mm) thick.
    a. Tint: Clear.
    b. Opacifier: Ceramic frit, on #4 surface.
    c. Opacifier Color: White.
6. Total Thickness: 1 inch (25.4 mm).
7. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.50, nominal.
8. Glazing Method: Dry glazing method, gasket glazing.

1.12 GLAZING UNITS

A. Type G2 - Monolithic Safety Glazing: Non-fire-rated.
    a. Glazed lites in doors, except fire doors.
    b. Sliding glass doors.
    c. Other locations required by applicable federal, state, and local codes and regulations.

B. Hurricane Impact Resistance Glazing: Laminated glass, 2-Ply.
1. Tint: Match Existing.
2. Outside Lite: Annealed glass.
3. Interlayer: Ionoplast, thickness as required to meet performance criteria.
4. Inside Lite: Annealed glass.
5. Performance Criteria:
    a. Hurricane Impact Resistance: Comply with ASTM E1996 windborne debris requirements for "Enhanced Protection" within building code requirements.

C. Type G3 - Radiation Shielding Glazing: Transparent lead-bearing glass for gamma and/or x-ray protection.
   1. Refer to Section 134905

1.13 PLASTIC SHEET GLAZING UNITS

A. Type G4 - Polycarbonate Flat Sheet: Ultraviolet (UV) stabilized.
   1. Type: Monolithic (single layer solid) sheet.
   2. Thickness: 0.472 inch (12 mm).
   3. Glazing Method: As required for application indicated on drawings.
   4. Forced Exit Resistance - Detention Glazing: ASTM F1915, Grade 1, tested from threat side.
   5. Manufacturers:
      a. SABIC Innovative Plastics US LLC; LEXAN MARGARD MR10: www.sabic.com/sfs/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

1.14 GLAZING COMPOUNDS

A. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

B. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

1.15 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.
   3. Spacer Rod Diameter: As required for application.
   4. Manufacturers:
      a. Pecora Corporation: www.pecora.com/#sle.
      b. Tremco Global Sealants: www.tremcosealants.com/#sle.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

2.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

2.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

2.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

2.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

2.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

2.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

2.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

SECTION 088813
FIRE-RATED GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors, borrowed lites, and transoms.

B. Section 081416 - Flush Wood Doors: Glazed lites in doors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. GANA (GM) - GANA Glazing Manual; 2022.

F. GANA (SM) - GANA Sealant Manual; 2008.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

I. ITS (DIR) - Directory of Listed Products; Current Edition.

J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

K. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

L. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

O. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

E. Manufacturer's qualification statement.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), IGMA TM-3000, and NGA (LGRM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Safety Glazing Certification Council (SGCC).

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty for Heat Soaked Tempered Glass: Provide 5-year manufacturer warranty coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Fire-Protection-Rated Glass:
   1. Manufacturers:
      a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperClear 45-HS: www.safti.com/#sle.
      b. SCHOTT North America Inc; PYRAN Platinum: www.us.schott.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

2.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Kind FT - Fully Tempered Type: Comply with ASTM C1048.

2.03 GLAZING UNITS

A. Type G5 - Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period of 90 minutes or less.
   1. Applications:
      a. Glazing in fire-resistance-rated door assembly.
      b. Glazing in fire-resistance-rated window assembly.
   2. Glass Type: Specialty tempered float glass.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Glazing Method: As required for fire rating.
   6. Fire-Rating Period: As indicated on drawings.
   7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction

a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.
c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.
d. "XXX" - placeholder that represents fire-rating period, in minutes.

8. Labels shall be visibile for inspections at all times.

2.04 ACCESSORIES

A. Setting Blocks: Aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that minimum required face and edge clearances are provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

END OF SECTION

SECTION 088816
VISION CONTROL GLASS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Vision control glass with adjustable cordless louvers.
   2. Manual operators.

1.02 REFERENCES

A. American National Standards Institute (ANSI) (www.ansi.org) Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

B. ASTM International (ASTM) (www.astm.org):
   1. C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
   2. C920 - Standard Specification for Elastomeric Joint Sealants.
   3. C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT, Coated and Uncoated Glass.
   4. C1115 - Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
   5. C1172 - Standard Specification for Laminated Architectural Flat Glass.
   6. C1294 - Standard Test Method for Compatibility of Insulating Glass Edge Sealants with Liquid-Applied Glazing Materials.
   7. C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
   8. E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   9. E2190 - Standard Specification for Insulating Glass Units Performance and Evaluation.

C. Consumer Product Safety Commission (CPSC) (www.cpsc.gov) 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

D. Glass Association of North America (GANA) (www.glasswebsite.com) - Engineering Standards Manual.

E. National Fire Protection Association (NFPA) (www.nfpa.org) 80 - Standard for Fire Doors and Fire Windows.

1.03 SUBMITTALS

A. Submittals for Review:
   1. Product Data: Descriptive data and performance attributes for vision control glass.

B. Closeout Submittals:
   1. Maintenance Instructions: Manufacturer’s printed instructions for cleaning and maintenance of glazed units, including operators.

1.04 SYSTEM DESCRIPTION

A. Vision Control Glass: Control vision through insulated glass unit assemblies by means of rotating, cordless, interlocking, horizontal extruded aluminum louvers with rotation controlled manually Rotation of louvers results in reduction in or elimination of vision through glazed assemblies.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Provide tempered safety glass for locations subject to human impact as indicated on drawings.
   2. Safety glass: Tested and labeled to CPSC 16 CFR 1201.

B. Perform Work in accordance with GANA Glazing Manual.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver and store glass units in upright position, on blocks, in dry and safe location.

B. Do not place units in direct sunlight.

C. Handle units using corner protectors.

1.07 WARRANTIES

A. Vision Control Glass in Interior Locations: Furnish manufacturer's 5 year warranty providing coverage against material obstruction of glass units by dust or film formation due to failure of hermetic seal.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Contract Documents are based on Vision Control by Unicel Architectural, 800-668-1580, www.unicelarchitectural.com.

B. Other Acceptable Manufacturers:
   1. Vistamatic

C. Substitutions: Under provisions of Division 01.

2.02 MATERIALS - GLASS

A. Clear Tempered Glass: ASTM C1048, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select, Kind FT fully tempered.

2.03 MATERIALS - LOUVERS, FRAMES, AND OPERATORS

A. Louvers: Hollow extruded aluminum, interlocking profile, 1/4 inch thick x 1-3/8 inches deep; Duracron K-1285 Glossy White finish.

B. Manual Operators: Thumb wheel type.

C. Glass Frame (Trim Kit): Extruded aluminum, factory glazed, sized to accept 1-3/4 inch thick glass for insertion into 1-3/4 inch thick doors; Duracron K-1285 Glossy White finish.

2.04 ACCESSORIES

A. Setting Blocks: ASTM C864, neoprene or EPDM, or ASTM C1115, silicone; 70 to 90 Shore A durometer hardness.

B. Spacers: ASTM C864, neoprene or EPDM, or ASTM C1115, silicone; 50 to 60 Shore A durometer hardness.

C. Glazing Gaskets: ASTM C864, neoprene or EPDM, or ASTM C1115, silicone or thermoplastic polyolefin rubber, molded or extruded shape to fit glazing channel retaining slot.

D. Glazing Sealant:
   1. ASTM C920, Type S, Grade NS, Class 25; single component polysulfide type, low modulus, non sag.
   2. Sealant backing: ASTM C1330, Type O, size and density to control glazing sealant depth and produce optimum glazing sealant performance.
   3. Compatible with glass unit edge seals; tested to ASTM C1294.

2.05 FABRICATION

A. Sealed Insulating Glass Units:
   1. Comply with ASTM E2190.
   2. Fabricate spacer bar frame of tubular aluminum filled with desiccant.
   3. Bond spacer bar frame to glass panes.
   4. Fill space outside frame to glass edge with elastomeric sealant.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean glazing rabbets; remove loose and foreign matter.

B. Remove protective coatings on metal surfaces.

C. Clean glass just prior to installation.

3.02 INSTALLATION - GENERAL

A. Install glass in accordance with glass manufacturer's instructions.

B. Maintain manufacturer's recommended edge and face clearances between glass and frame members.

3.03 INSTALLATION - GASKET GLAZING METHOD

A. Fabricate gaskets to fit openings; allow for stretching of gaskets during installation.

B. Set soft compression gasket against fixed stop or frame with bonded miter cut joints at corners.

C. Set glass centered in openings on setting blocks.

D. Install removable stops and insert dense compression gaskets at corners, working toward centers of glass, compressing glass against soft compression gaskets to produce weathertight seal.

E. Seal joints in gaskets.

3.04 INSTALLATION - SEALANT GLAZING METHOD

A. Apply sealant to full depth of permanent stops.

B. Press glass into sealant with slight lateral movement to ensure adhesion.

C. Apply sealant to full depth of removable stops. Secure stops in position, forcing contact with sealant bead and completely filling joint.

3.05 SCHEDULE

A. Vision Control Mini
   1. Outer lite: 1/4 inch glass.
   2. Air space: 1 inch.
   3. Inner lite: 1/4 inch glass.
      a. Controls on room side only at Triage

END OF SECTION

SECTION 089100
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

B. **NOA Product Approval: 25-0214.04**
   1. Expires 02-04-2026

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

D. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms; 2024.

E. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; 2020.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Test Reports: Independent agency reports showing compliance with specified performance criteria.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Product Qualifications:
   1. Florida Building Code (FBC) High Velocity Hurricane Zones: Test Application Standard (TAS) 100(A)-95.
      a. Test procedure for wind and wind-driven rain resistance and/or increased wind speed resistance of soffit ventilation strip and continuous or intermittent ventilation system installed at ridge area.
   2. Louver shall be certified to FBC standards TAS 201 (Large Missile Impact), TAS 202 (Uniform Static Air Pressure) and TAS 203 (Cyclic Wind Loading).

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
   1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Greenheck Model ESD-635DE Aluminum Louver.
   2. Substitutions: Not permitted.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
   2. High-Velocity Wind Load Resistance: Design to comply with applicable requirements of ICC 500 and FEMA P-361, including resistance to horizontal debris impact.
   3. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft (3.1 g/sq m) water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
   4. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   5. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, formed galvanized steel sheet construction, with intermediate mullions matching frame.
   1. Blades: Drainable.
   2. Frame: 6 inches deep (150 mm deep), channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
   3. Color: As selected from manufacturer's standard colors.
   4. Performance Data:
      a. Performance Ratings: AMCA licensed.
         1) Based on testing 39.4 inches by 39.4 inches (1000 mm by 1000 mm) size unit in accordance with AMCA 500.
      b. Free Area: 42 percent, nominal.
      c. Maximum Recommended Air Flow through Free Area: 1604 feet per minute (8.15 m/sec).
      d. Air Flow: 14,591 cubic feet per minute (413 cu. m/min).
      e. Maximum Pressure Drop (Intake): 0.40 inches w.g. (0.10 KPa).
      f. Louver shall be certified to FBC standards TAS 201 (Large Missile Impact), TAS 202 (Uniform Static Air Pressure) and TAS 203 (Cyclic Wind Loading).
      g. Wind load Test Performance: Maximum wind load of +112.5 PSF (5.39 kPa) and -225 PSF (10.77 kPa) design wind loads tested per Miami-Dade County Uniform Wind Pressure Test PA 202.
      h. Wind-driven Rain Performance: 99.9 percent effective at preventing water penetration through louver when tested at 50 miles per hour (81 km/h) wind with 8 inches per hour (203 mm/h) rainfall and 2155 feet per minute (11 m/sec) airflow through the free area. Penetration Class 'A' with Discharge Class (Intake) '3' in accordance with AMCA 500-L Wind Driven Rain Test.
   5. Design Load
      a. Designed Windload: Per Code.
      b. Louvers shall be provided with rear mounted blade supports as required to comply with wind load criteria.
      c. Louvers shall be factory engineered to withstand the specified seismic loads.
         1) Minimum design loads shall be calculated to comply with ASCE - 7, or local requirements of Authority Having Jurisdiction (AHJ).

2.03 MATERIALS

A. Bird Screen: Interwoven wire mesh of steel, 0.063 inch (1.6 mm) diameter wire, 1/2 inch (13 mm) open weave, diagonal design.

B. Insect Screen: 18 x 16 size aluminum mesh.
   1. Exterior Wall installations only

C. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, two coat finish, complying with AAMA 2604.

2.04 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).

B. Color: As selected from manufacturer's standard colors.

2.05 ACCESSORIES

A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

B. Fasteners and Anchors: Galvanized steel.

C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

E. NOA label must be clearly visible at all times for inspections.

3.03 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 PRICE AND PAYMENT PROCEDURES

A. General contractors must direct their subcontractors to ensure they are reaching out to only these manufacturers to obtain pricing and to purchase. Pricing is to be obtained during the bidding phase from mitigation contractor and/or flooring subcontractor, and is to be written into their subcontracts as an add-alternate.

B. Alternate for Alternate Flooring Adhesive: Do not include the cost of the alternate adhesive in the base bid; state on the bid form the total additional cost for the alternate adhesive, installed, in the event such remediation is required.

C. Alternate for Remedial Floor Coating or Sheet Membrane: Do not include the cost of floor coating or underlayment in the base bid; state on the bid form the total additional cost for the floor coating, installed, in the event such remediation is required.

1.03 REFERENCE STANDARDS

A. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report to Architect.
   7. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

E. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Utilize Manningtons' recommended adhesive product for each type of flooring for concrete testing up to 90% Relative Humidity (RH). For concrete testing over 90% RH, the use of either Adhesive or Moisture Mitigation, as listed below, will be acceptable for floor prep.
   1. Refer to attached recommendation chart by Mannington

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.

9. Protection.

3.02 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.03 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION

SECTION 090561.10
RECOMMENDED ADHESIVES FOR MANNINGTON FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. REFER TO NEXT PAGE FOR INSERT(S).

MANNINGTON RECOMMENDED ADHESIVES/SUNDRIES FOR HEALTHCARE PROJECTS

	Color Code	SAP Description	Application	RH%	MVER/lbs	pH	Size	sq ft/gallon	Porous	Non-porous
Sheet Goods	*803950*	**XpressStep For Sheet Vinyl*	*Spray Adhesive: use general application and under heavy rolling loads/ beds*	*95%*	*11*	*10*	*6 Cans*		*150sf/can*	*185sf/can*
	802387	MGUARD V-88	Pressure Sensitive Adhesive: 1/16 x 1/32 x 1/32 U - porous substrate 1/16 x 1/32 x 5/64 U - non-porous surfaces	95%	12	12	4 Gallon		250sf/ 1 gal	350sf/1 gal
	800291	V-95	Use under heavy rolling loads; Two-part epoxy: 1/16 x 1/32 x 1/32	75%	3	9	1 Gallon		185sf/1 gal	245sf/1 gal
	Various	**Solid Welding Rod*					*165lf/spool*			
	862915	MCS42 COM SEAMSEALR					16oz	400-600/ lf		
	801503	**Anti-Microbial Seam Coater Pen*	*Recommended on all heat welds in Healthcare Projects*				*6 pens/pack*	*250-300/lf*		
LVT		**QuickStix*	*Water based, solvent free, factory applied technology that is recommended for the installation of approved Commercial luxury vinyl tiles and planks over porous and non-porous substrates. Mannington Universal Primer must be used.*	*99%*	*18*	*12*	*N/A*	*N/A*		
	293459	*Mannington Universal Primer	Primer/ PH blocker/ Neutralizes Alkali for all installations specific to Quickstix				1 gallon or 4 gallon	350-400sf/ 1 gal		
	803881	**XPRESSSTEP SPRAY LVT*	*Spray Adhesive: use under heavy rolling loads*	*95%*	*11*	*10*	*6 cans*		*150sf/can*	*185sf/can*
	804876	**XPRESSSTEP PREMIUM LVT*	*Spray Adhesive: use under heavy rolling loads*	*98%*	*12*	*10*	*6 cans*		*150sf/can*	*185sf/can*
	802387	MGUARD V-88	Pressure Sensitive Adhesive: 1/16 x 1/32 x 1/32 U - porous substrate 1/16 x 1/32 x 5/64 U - non-porous surfaces	99%	12	12	4 Gallon		250sf/ 1 gal	350sf/1 gal
	800291	V-95	Use under heavy rolling loads; Two-part epoxy: 1/16 x 1/32 x 1/32	75%	3	9	1 Gallon		185sf/1 gal	245sf/1 gal

	Color Code	SAP Description	Application	RH%	MVER/lbs	pH	Size	sq ft/gallon	Porous	Non-porous
Amtico LVT		**QuickStix*	*Water based, solvent free, factory applied technology that is recommended for the installation of approved Commercial luxury vinyl tiles and planks over porous and non-porous substrates. Mannington Universal Primer must be used.*	*99%*	*18*	*12*	*N/A*	*N/A*		
	293459	*Mannington Universal Primer	Primer/ PH blocker/ Neutralizes Alkali for all installations specific to Quickstix				1 gallon or 4 gallon	350-400sf/ 1 gal		
	803881	**XPRESSSTEP SPRAY LVT*	*Spray Adhesive: use under heavy rolling loads*	*95%*	*11*	*10*	*6 cans*		*150sf/can*	*185sf/can*
	804876	**XPRESSSTEP PREMIUM LVT*	*Spray Adhesive: use under heavy rolling loads*	*98%*	*12*	*10*	*6 cans*		*150sf/can*	*185sf/can*
	804888	373 Adhesive	wet set/trowel	80%	5	BELOW 10	4 gallon		150/-180sf/1 gal	200-250sf/ 1 gal
		RP18	one component, 100% solids, cross linking modified silane polymer-based adhesive for heavy loads	95%	10	12	1 gallon		120sf	150sf
	804890	PSA-4	Dry to touch/trowel	99%	12	12	4 gallon		200-250sf/ 1 gal	300-350sgf/1 gal
	803914	Amtico Tackifier for Spacia Access	Dry to touch/ rolled on	75%	5	BELOW 10	4 gallon		300sf/1 gal	300sf/1 gal

	Color Code	SAP Description	Application	RH%	MVER/lbs	pH	Size	sq ft/gallon	Porous	Non-porous
Rubber	MR101G	MR101 Cove Base Adhesive	Wall base; Acrylic Adhesive				4gal, 1 gal or 6-30 oz cartridges	250lf/gal or 65lf/ cartridge		
	MR721G	MR721 Epoxy	Rubber tile and rubber & vinyl stair treads; Two-part epoxy;	75%	3		1 gallon	100sf		
	MR725G	MR725 Polyurethane	Rubber tile and rubber & vinyl stair treads; Two-part epoxy; 1/16" x 1/16" x 1/16" trowel	75%	3		1 gallon	125-250sf/ 1 gal		
	R710G4	MR710 Urethane	ReSet recycled rubber sports flr-tile & sheet; One-part urethane adhesive; 1/16 x 1/16 x 1/16 square trowel	75%	3		4 gallon	380sf/ 4 gal		
	R911G4	MR911 Acrylic	Rubber tile and Rubber & vinyl stair treads; One-part adhesive; 1/16" x 1/16" x 1/16" trowel	75%	3		4 gallon	100-150sf/1 gal		
	MR715G	MR715 Nose Filler	Rubber & vinyl stair tread and nose filler; Two-part epoxy adhesive; use putty knife with 1/4" bead				1 Gallon	150sf/1 gal		
	1INSBD	1" WIDE TWO SIDED TAPE	Tape used for Rubber Stair Treads; Nose filler.				12 roll/ctn	164lf/roll		
	6INSBD	6" WIDE TWO SIDED TAPE	Tape used for Rubber Stair Treads; Nose filler.				2 roll/ctn	164lf/roll		
	Various	Rubber Weld Rod	Weld Used for Rubber Sheet				roll	328lf/roll		
CARPET		*QuickStix	*Water based, solvent free, factory applied technology that is recommended for the installation of approved Commercial luxury vinyl tiles and planks over porous and non-porous substrates. Mannington Universal Primer must be used.*	99%	18	12	N/A	N/A		
	277856	**XPRESSSTEP SPRAY Carpet*	*BACKING: Infinity Modular/ Infinity RE/ Infinity Cushion*	*90%*	*8*	*11*	*6 Cans/ctn*	*150-185sf/can*		
	190714	MGUARD ULTRA	BACKING: SBR/ UltraBac RE/ DeltaLoc	90%	8	10	4 Gallon	32sy/4 gal		
	157096	Infinity	BACKING: Infinity Modular/ Infinity RE/ Infinity Cushion/ Infinity 6', rEvolve Cushion	90%	8	10	4 Gallon	100sy/4 gal		
	189625	Integra 2	BACKING: Integra HP/ Integra HP RE	85%	8	10	4 Gallon	60sy/4 gal		
	29140	MT800 Seam Sealer	Chemical Weld				1 pint	500lf/bottle		
	147599	Edge Guard Seam Sealer	Seam sealer for Latex back				6/ 8oz bottle	100lf/bottle		
	29141	MT900 Seam Sealer	Seam sealer cleaner for MT800				1 quart	1 qt/4 pt of sealer		
	293459	Mannington Universal Primer	Primer/ PH blocker/ Neutralizes Alkali for all installations specific to Integra HP				1 gallon or 4 gallon	350-400sf/ 1 gal		

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

D. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

1.02 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior partitions.
   2. Suspension systems for interior ceilings and soffits.
   3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:
   1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
   2. Section 05 50 00 "Metal Fabrications" for steel reinforcing used with partial height partitions.
   3. Section 07 21 00 "Thermal Insulation" for insulation installed within studs and insulation installed with Z-shaped furring members.
   4. Section 07 84 43 "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
   5. Section 09 29 00 "Gypsum Board".
   6. Section 09 21 16 "Gypsum Board Shaft Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 INFORMATIONAL SUBMITTALS

A. Span and Deflection Design Criteria: Provide height to load deflection charts showing studs supplied conform to deflection limit scheduled and allowed per ASTM C 754.
   1. Mark on chart(s) showing all major partitions scheduled conformance with criteria.
   2. Submit manufacturer’s certification of stud size, thickness, and spacing complying with performance requirements and selections made by architect are correct for application shown.

B. Product Certificates: For each type of code-compliance certification for studs and tracks.

C. Evaluation Reports: For embossed steel studs and tracks firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

B. Installer's Qualifications: Firm and individuals with a minimum of 5 consecutive years' experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

C. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer acceptable to the gypsum board manufacturer.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide metal framing assemblies to withstand the loads prescribed within the specified deflection limits.
   1. Horizontal Deflection: For wall assemblies per ASTM C 754: Allowing for 5 lbf/sq. ft. (239 Pa) lateral load.
      a. Typical Finishes: L/240.
      b. Tile, Plaster, Stone or Similar Finishes: L/360.
   2. Where partition heights exceed stud manufacturer's recommended spans, and to resist deflection limits or seismic forces, provide one of the following:
      a. Heavier stud gage, except at walls with STC ratings.
      b. Closer stud spacing.
      c. Deeper stud size (space permitting, as determined by Architect).
      d. Above-ceiling bracing, anchored to structure above.

B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
   1. Conform to applicable code for fire rated assemblies. Construct assemblies to achieve fire resistance ratings indicated on Drawings in accordance with UL, GA, or other acceptable tested approved assemblies. Where no test number is referenced, utilize and submit a tested approved assembly that achieves the fire rating required by the Drawings, including the Life Safety Plan.
   2. Assemblies listed do not necessarily indicate all assemblies that may be used in this project. Contractor may propose alternate UL listed assemblies or approved tested assemblies that meet the same requirements to the Architect for consideration. Contractor may not substitute assemblies without written authorization by the Architect.
   3. Drawings, keys or written descriptions located in the Contract Documents to describe fire rated assemblies for beams, floors, roofs, columns, walls, partitions and through-penetration firestop systems do not necessarily call out each and every specific requirement of the designated UL listed assembly identified or approved tested assemblies. It is the Contractor's responsibility to become thoroughly familiar with the corresponding requirements published in the most recent issue of the Underwriters Laboratories Inc. Fire Resistance Directory and construct the fire rated assemblies in strict accordance with those requirements.
   4. Prescribed UL Design Numbers or approved tested assemblies which may be called for on this Project and may be required as determined during the construction process if existing conditions dictate. The list of assemblies below is not intended to represent all rated conditions designated in whole of the Contract Documents or those that may be considered viable alternates (where approved by Architect). UL listed fire rated assemblies or approved tested assemblies include, but are not limited to the following:
      a. Wall Systems: Refer to Drawings.
      b. Through-Penetrations Firestop Systems: Refer to Section 07 84 13 "Penetration Firestopping."
      c. Fire-Resistive Joint Systems: Refer to Section 07 84 43 "Joint Firestopping."

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
   2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645.
   1. Steel Studs and Tracks: Minimum steel tensile strength 33 KSI.
      a. Minimum Base Metal Thickness: 0.0179 inches (0.45 mm) unless otherwise indicated or required to comply with span and deflection design criteria, before application of protective coating.
      b. Depth: 3-5/8 inches (92 mm) unless otherwise indicated or required to comply with span and deflection design criteria.
   2. Embossed / Dimpled Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks. Minimum steel tensile strength 50 KSI.
      a. Minimum Base Metal Thickness: 0.0147 inches (0.37 mm) unless otherwise indicated or required to comply with span and deflection design criteria, before application of protective coating.
      b. Depth: 3-5/8 inches (92 mm) unless otherwise indicated or required to comply with span and deflection design criteria.

C. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Double-Track System: ASTM C 645 top outer tracks, inside track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
   2. Proprietary Deflection Track/Clips: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Dietrich Metal Framing, “Fast Stop” clips, 0.064 inches (1.63 mm) thick, used in conjunction with 0.033 inch (0.84 mm) thick deep leg track.
         2) Marino / WARE WSC-DEFLEX Series slide clips, used in conjunction with 0.033 inch (0.84 mm) thick deep leg track.
         3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
         4) Stockton Products, Flexible Trak, FLT.
   3. Substitutions: None permitted.
   4. Single Deep-Leg Track (slotted or unslotted): Not permitted.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
      b. The Steel Network, Inc.; VertiClip SLD Series or VertiTrack VTD Series.
      c. Substitutions: Comparable product from another steel framing manufacturer listed, provided track system has been tested as part of an assembly according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Single Deep-Leg Track (slotted or unslotted): Not permitted.

E. Manufactured Headers and Jambs: Manufacturer's proprietary shape used to form header beams and jambs, columns or posts, of web depths indicated, unpunched, with stiffened flanges and as follows:
   1. Steel Sheet: ASTM A653/A653M and ASTM C645.
      a. 0.068 inch (1.73 mm) and 0.053 inch (1.34 mm): Grade 50 with a minimum yield point of 50,000 psi (345 MPa).
      b. 0.043 inch (1.09 mm) and 0.033 inch (0.84 mm): Grade 33 with a minimum yield point of 33,000 psi (228 MPa).
      c. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. ProX Headers as manufactured by Brady Construction Innovations, Inc.
      b. RedHeader RO as manufactured by ClarkDietrich Building Systems.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: 1-1/2 inches (38 mm).
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.0179 inch (0.45 mm).
   2. Depth: 7/8 inch (22.22 mm).

I. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
   1. Configuration: Asymmetrical or hat shaped, with face attached to single flange by a slotted leg (web) or attached to two flanges by slotted or expanded metal legs.

J. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: 3/4 inch (19.05 mm).
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.84 mm).
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

K. Flexible Track for Studs: Galvanized steel flexible track and strap system designed to receive studs for framing curves; component sizes as indicated on Drawings.
   1. Galvanized Steel: ASTM A 653, gage and grade as required for application.
   2. Acceptable Product: Flex-Ability Concepts; Flex-C Trac.

L. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22.22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.03 SUSPENSION SYSTEMS

A. Primary Suspension Members for Ceilings:
   1. General: Size and provide ceiling support components to comply with ASTM C754.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

C. Hanger Attachments to Concrete:

1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

D. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.06 mm) in diameter.

E. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

F. Rod Hangers: ASTM A 510 (ASTM A 510M), mild carbon steel.
   1. Diameter: 1/4-inch (6-mm).
   2. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.

G. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
   1. Depth: 2-1/2 inches (64 mm).

H. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.0538-inch (1.367-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19.05 mm) deep.
   2. Steel Studs and Tracks: ASTM C 645.
      a. Minimum Base-Metal Thickness: 0.0179 inch (0.45 mm).
      b. Depth: 1-5/8 inches (41 mm).
   3. Embossed Steel Studs and Tracks: ASTM C 645.
      a. Minimum Base-Metal Thickness: 0.0190 inch (0.48 mm).
      b. Depth: 1-5/8 inches (41 mm).
   4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.22 mm) deep.
      a. Minimum Base-Metal Thickness: 0.0179 inch (0.45 mm).
   5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
      a. Configuration: Asymmetrical or hat shaped.

I. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock. Note: #8 gage hanger wire shall be required if spacing exceeds 3'x3' or 9 sf of ceiling area.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Armstrong World Industries, Inc.; Drywall Grid Systems.
      b. Chicago Metallic Corporation; Drywall Grid System.
      c. USG Corporation; Drywall Suspension System.
   2. Provide compression struts and sway bracing to resist seismic forces.

2.04 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
   1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), non-perforated.
   2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.18 mm) thick, in width to suit steel stud size.

C. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
    b. Grabber Construction Products; Acoustical Sealant GSC.
    c. Pecora Corporation; AC-20 FTR.
    d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
    e. USG Corporation; SHEETROCK Acoustical Sealant.
2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Security Mesh: Expanded carbon steel, slit and drawn into a diamond patterned mesh, roll flattened to provide a finish thickness of not less than 0.060-inches (0.06 inch (1.52 mm)); with a maximum open area of 77 percent diamond openings.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. AMICO.
    b. EXMET Industries, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (609.6 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

F. Installation Tolerances: Install each steel partition, soffit, and ceiling framing and furring members to comply with the following:
   1. Variation in Level, Plumb, and True to Line: Maximum 1/8 inch (3.18 mm) in 10 feet (304.8 cm).
   2. Variation in Plane of Adjacent Fastening Surfaces: Not more than 1/8 inch (3.18 mm) from the plane formed by the faces of adjacent framing.
   3. Variation in Framing and Furring Spacing: Not more than 1/8 inch (3.18 mm).

3.04 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated or required to comply with span and deflection design criteria.
   2. Multilayer Construction: 16 inches (406 mm) o.c., unless otherwise indicated or required to comply with span and deflection design criteria.
   3. Partitions with Security Mesh: 8 inches (203 mm) o.c., unless otherwise indicated or required to comply with span and deflection design criteria.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
      a. Use double track system or proprietary deflection track at all locations except fire rated partitions.
      b. Use approved firestop track at fire rated partitions.
      c. Reference details on Drawings.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
      a. Rough openings up to 50 inches (1270-mm) wide:
         1) Jamb: Install two boxed studs, minimum of 0.033 inches (0.84 mm) thick at each jamb unless otherwise indicated or required to comply with span and deflection design criteria.
            (a) Extend jamb studs to underside of overhead structure and attach.
         2) Header: Install runner track section minimum of 0.033 inches (0.84-mm) thick or a box stud header, minimum of 0.018 inches (0.46 mm) thick, (for cripple studs) at head and secure to jamb.
            (a) Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
      b. Rough openings over 50 inches (1270-mm) to 74 inches (1879.6 mm) wide:
         1) Jamb: Install two boxed studs, minimum of 0.054 inches (1.37 mm) thick at each jamb unless otherwise indicated or required to comply with span and deflection design criteria.
            (a) Extend jamb studs to underside of overhead structure and attach.
         2) Header: Install a box stud header minimum of 0.054 inches (1.37 mm) thick, unless otherwise indicated.
            (a) Secure box header to jamb studs.

(b) Install runner track section (for cripple studs) at head and secure to jamb studs.
(c) Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Rough openings over 74 inches (1879.6 mm) wide and all lead lined and automatic doors:
1) Jamb: Install two boxed studs, minimum of 0.068 inches (1.73 mm) thick at each jamb unless otherwise indicated or required to comply with span and deflection design criteria or C3x4.1 steel channel with 2 1/2 by 2 1/2 by 1/4 by 2 1/2 clip angles.
(a) Extend jamb studs to underside of overhead structure and attach.
2) Header: Install a box stud header minimum of 0.068 inches (1.72-mm) thick, unless otherwise indicated or C4x5.4 steel channel.
(a) Secure box header to jamb studs.
(b) Install runner track section (for cripple studs) at head and secure to jamb studs.
(c) Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.

d. Manufacturer's proprietary header beam and jamb systems can be used in lieu of above provided system meets the minimum metal thickness indicated above.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Partitions Scheduled to Receive:
a. Tile Finish: Provide minimum stud thickness as follows:
1) Non-Embossed Studs: 0.031 inches (0.79 mm) thick studs.
2) Embossed Studs: 0.0195 inches (0.50 mm) thick studs.
b. Cementitious Backer Units: Provide minimum thickness as follows:
1) Non-Embossed Studs: 0.031 inches (0.79 mm) thick studs.
2) Embossed Studs: 0.0195 inches (0.50 mm) thick studs.
c. Bumper or Guard Rails: Provide minimum thickness as follows:
1) Non-Embossed Studs: 0.031 inches (0.79 mm) thick studs.
2) Embossed Studs: 0.0195 inches (0.50 mm) thick studs.
d. Lead Lining: Provide minimum thickness as follows:
1) Non-Embossed Studs: 0.031 inches (0.79 mm) thick studs.
2) Embossed Studs: 0.0195 inches (0.50 mm) thick studs.
e. Security Mesh: Provide minimum thickness as follows:
1) Non-Embossed Studs: 0.031 inches (0.79 mm) thick studs.
2) Embossed Studs: 0.0195 inches (0.50 mm) thick studs.
f. Equipment: Where wall mounted equipment, woodwork, and casework items are indicated or elsewhere as shown on Drawings, provide minimum thickness as follows:
1) Non-Embossed Studs: 0.031 inches (0.79 mm) thick studs.
2) Embossed Studs: 0.0195 inches (0.50 mm) thick studs.

5. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
6. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
7. Curved Partitions:

a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (152.4 mm) o.c.

E. Direct Furring:
1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (609.6 mm) o.c.

F. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches (609.6 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (609.6 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (304.8 mm) from corner and cut insulation to fit.

G. Security Mesh: Mechanically fasten security mesh to metal studs before installation of gypsum board.

3.05 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219.2 mm) _____ o.c.
2. Carrying Channels (Main Runners): 48 inches (1219.2 mm) _____ o.c.
3. Furring Channels (Furring Members): 16 inches (406.4 mm) _____ o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards _____.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.06 METAL BACKING PLATES:

A. Provide metal backing plates to support loads imposed at wall-mounted and wall-hung items that require backing plates, include, without limitation, the following:
   1. Louvered panel with plastic bins.
   2. Television equipment.
   3. Toilet accessories.
   4. Metal lockers.
   5. Fire protection specialties.
   6. Markerboards.
   7. Tackboards.
   8. Millwork.
   9. Wood trim.
   10. Wall-mounted door stops.
   11. Wall-mounted handrails and railings.
   12. Wall-mounted ladders.
   13. Medical equipment.
   14. Metal cabinets.
   15. Computer equipment wall mounting brackets.
   16. Within walls of C.U. Rooms, Storage Rooms.
   17. Upper wall casework units.
   18. Medical equipment rails.
   19. Wall protection.

B. Backing plates not provided with fixtures and equipment shall be long enough to span across a minimum of 3 studs, unless otherwise indicated, and may be one of the following:
   1. Galvanized steel plate 0.053-inch (1.34-mm) thick minimum by 4 inches (101.6 mm) wide.
   2. 3-5/8 inches (92 mm) un-punched wide flange steel stud of 0.053 inch (1.35 mm) thick. Notch studs so that backing plate will be flush with exterior face of stud.
   3. At Contractor's option, solid wood blocking may be used in lieu of metal backing plates. Refer to Section 06 10 53 "Miscellaneous Carpentry."
   4. Optional Backing Clip System:
      a. Material: ASTM A653/A653A cold formed steel.
      b. Coating G60 hot-dipped galvanized.
      c. Thickness: Minimum of 0.033 inches (0.84 mm).
      d. Acceptable Product: Mantisgrip Backing Clips.
         1) 206-718-0822.

C. Wood blocking only will be acceptable at the following locations:
   1. Television equipment.
   2. Wall-mounted door stops.
   3. Wall-mounted grab bars.
   4. Upper wall millwork / casework units.
   5. Wall-mounted handrails.
   6. Wall-mounted ladders.

END OF SECTION

SECTION 092900
GYPSUM BOARD

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Tile backing panels.

1.02 REFERENCE STANDARDS

A. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

1.03 RELATED REQUIREMENTS:

A. Section 06 16 53 "Gypsum Sheathing" for gypsum sheathing for exterior walls.

B. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

C. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.04 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of gypsum board product, including related accessories. Furnish a material list with technical data documenting the location and primary function, quality, and performance of each material component or system to be used in the Work, or other such primary characteristics as required by the Drawings or Specifications.
   1. Submit manufacturer's technical data for each gypsum drywall partition and each ceiling system.

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

1.05 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations.
      b. Each texture finish indicated.
   2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
   3. Simulate finished lighting conditions for review of mockups.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover, keep them dry, and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
   1. Conform to applicable code for fire rated assemblies. Construct assemblies to achieve fire resistance ratings indicated on Drawings in accordance with UL, GA, or other acceptable tested approved assemblies. Where no test number is referenced, utilize and submit a tested approved assembly that achieves the fire rating required by the Drawings, including the Life Safety Plan.
   2. Assemblies listed do not necessarily indicate all assemblies that may be used in this project. Contractor may propose alternate UL listed assemblies that meet the same requirements to the Architect for consideration. Contractor may not substitute assemblies without written authorization by the Architect.
   3. Drawings, keys or written descriptions located in the Contract Documents to describe fire rated assemblies for beams, floors, roofs, columns, walls, partitions and through-penetration firestop systems do not necessarily call out each and every specific requirement of the designated UL listed or other approved tested assembly identified. It is the Contractor’s responsibility to become thoroughly familiar with the corresponding requirements published in the most recent issue of the Underwriters Laboratories Inc. Fire Resistance Directory and construct the fire rated assemblies in strict accordance with those requirements and conforms to assemblies indicated on Drawings.
   4. Prescribed UL Design Numbers or other tested design which may be called for on this Project and may be required as determined during the construction process if existing conditions dictate. The UL assemblies or other tested designs indicated in the Contract Documents are not intended to represent all rated conditions designated in the Contract Documents or those that may be considered viable alternates (where approved by Architect). UL listed fire rated assemblies include, but are not limited to the following:
      a. Wall Systems: Refer to Drawings.
      b. Through-Penetrations Firestop Systems: Refer to Section 07 84 13 “Penetration Firestopping.”
      c. Fire-Resistive Joint Systems: Refer to Section 07 84 43 “Joint Firestopping.”

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 5 percent.

B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Gypsum.
   2. CertainTeed Corporation.
   3. Georgia-Pacific Building Products.
   4. National Gypsum Company.
   5. PABCO Gypsum.
   6. USG (EcoSmart gypsum board products are acceptable).

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
   1. Thickness: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.

C. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
   1. Thickness: 1/4 inch (6.4 mm).
   2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
   1. Thickness: 1/2 inch (12.7 mm).
   2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
   1. Core: 5/8 inch (15.9 mm), Type X.
   2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
   3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
   4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
   5. Long Edges: Tapered.
   6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.
   1. Core: 5/8 inch (15.9 mm), Type X.
   2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
   3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
   4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
   5. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements according to test in Annex A1.
   6. Long Edges: Tapered.
   7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.04 SPECIALTY GYPSUM BOARD

A. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
      b. National Gypsum Company, eXP Interior Extreme.
      c. USG Corporation; Sheetrock Glass-Mat Panels Mold Tough.
   2. Core: As indicated on drawings
      a. 5/8 inch (15.9 mm), Type X
      b. 5/8 inch (15.9 mm), abuse resistant

3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed; SilentFX.
   b. National Gypsum Company; Sound Break.
   c. Quiet Solution; Quite Rock.
2. Core: As indicated on drawings
   a. 5/8 inch (15.9 mm), Type X
3. Long Edges: Tapered.

2.05 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed Corp.; Diamondback GlasRoc Tile Backer.
   b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
   c. National Gypsum; eXP Tile Backer.
   d. USG Corporation; Durock Glass-Mat Tile Backer Boards.
2. Core: As indicated on Drawings
   a. 5/8 inch (15.9 mm), Type X.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. C-Cure; C-Cure Board 990.
   b. CertainTeed Corp.; FiberCement BackerBoard.
   c. James Hardie Building Products, Inc.; Hardiebacker 500.
   d. National Gypsum Company, PermaBase Cement Board.
   e. USG Corporation; DUROCK Cement Board.
2. Thickness: As indicated on drawings
   a. 1/2 inch (12.7 mm)
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.06 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: [Galvanized or aluminum-coated steel sheet, rolled zinc, or paper-faced galvanized-steel sheet] [Galvanized or aluminum-coated steel sheet or rolled zinc].
2. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Fry Reglet Corporation.
    b. Gordon, Inc.
    c. Pittcon Industries.
2. Profile: As indicated on Drawings.
3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified, unless otherwise indicated on Drawings.

2.07 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:
1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.08 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Adhesives shall have a VOC content of 50 g/L or less.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Moisture Barrier Membrane:
1. Material Quality Standard: ANSI A108 Series, A-2.1.8.
2. Acceptable Products:
    a. Reinforced Asphalt Paper: ASTM C171, duplex type.
    b. Polyethylene Vapor Retarder: ASTM D 4397, 4 mils thick, 0.19 maximum permeance rating.
3. Tape: Moisture resistant, pressure sensitive tape suitable for sealing membrane to plumbing pipes penetrating wallboard.

4. Products used for shower pan waterproofing specified in Section 09 30 00 “Ceramic Tiling”.

E. Electrical Box Pads: Putty Pads: Moldable non-curing one component, intumescent, fire-rated material for through-penetration fire stop systems and sound attenuation systems; self-adhering; 1/8 inch thick minimum.
   1. Acceptable Product: CP 617 as manufactured by Hilti Incorporated.

F. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   2. Thickness / STC Rating: As scheduled on Drawings.
   3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed; Sound Control Batts or Fire Batts.
      b. Johns Manville Sound Control Batts or Fire Batts.
      c. Knauf Insulation; EcoBatt with ECOSE Technology
      d. Owens Corning Company, SAB.
      e. Roxul Inc.; Acoustical Fire Batts.
      f. Thermafiber, Inc.; an Owens Corning Company, SAFB.

G. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
      b. Grabber Construction Products; Acoustical Sealant GSC.
      c. Hilti Incorporated; CP 506 Smoke and Acoustic Sealant.
      d. Pecora Corporation; AC-20 FTR.
      e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
      f. Tremco; Acoustical Sealant.
      g. USG Corporation; SHEETROCK Acoustical Sealant.
      h. No Substitutions Allowed.
   2. Sealant shall have a VOC content of 250 g/L or less.

H. Acoustic Joint Spray: Provide manufacturer’s standard sprayable latex material complying with ASTM C919 and the following:
   1. Spray effectively reduces airborne sound transmission through head-of-wall joints in building construction as demonstrated by testing representative assemblies in accordance with ASTM E90.
   2. Acoustical Spray to maintain STC ratings at sound rated partitions as indicated on the drawings.
   3. Spray has flame-spread and smoke-developed ratings of less than 25 as tested in accordance with ASTM E84.
   4. Spray is mold and mildew resistant per ASTM G21.
   5. Spray has movement capability of minimum 12.5%.
   6. Proposed acoustic spray materials and methods shall conform to applicable governing codes having local jurisdiction.
   7. Products: Subject to compliance with requirements, provide one of the following:
      a. Hilti Incorporated; CP 572 Smoke and Acoustic Spray.

I. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

J. Vapor Retarder: As specified in Section 07 26 00 "Vapor Retarders."

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated [and Smoke Rated] Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install electrical box pads after gypsum panels have been installed on one side. Comply with manufacturer instructions.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: Vertical surfaces unless otherwise indicated.
   2. Flexible Type: Apply in double layer at curved assemblies where indicated on drawings.

3. Ceiling Type: Ceiling surfaces, except at fire rated ceilings, then use Type X.
4. Abuse-Resistant Type: As indicated on Drawings.
5. Impact-Resistant Type: As indicated on Drawings.
6. Glass-Mat Interior Type:
    a. Interior side (face) of exterior walls.
    b. Interior partitions where Contractor desires to install gypsum board prior to building dry-in.
    c. On tile walls, unless noted otherwise.
    d. At urinal and toilet fixtures as indicated on Drawings.
7. Acoustically Enhanced Type: As indicated on Drawings.
8. Tile Backer-Glass-Mat Type:
    a. Walls in toilet room with shower.
    b. Tiled walls in showers and bathtubs.
    c. Tiled walls in restrooms and kitchens.
    d. Behind prefabricated shower or bathtub units.
9. Cementitious Backer Type: As indicated on Drawings.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels [vertically (parallel to framing)] [horizontally (perpendicular to framing)] unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.04 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
   1. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
   2. Do not install screws within 6 inches of the shower wall base so as to not penetrate shower pan waterproofing.

B. Cementitious Backer Units: ANSI A108.11.
   1. Moisture Barrier Membrane: Install membrane over area to be covered with cementitious wallboards.
      a. Use tape to temporarily hold membrane in place until covered with additional wallboards.
      b. Extend membrane over tub or shower pan lip for positive drainage.
      c. Shingle upper course over lower course.
      d. Lap not less than 3 inches.
      e. Where plumbing pipes penetrate membrane, seal membrane to pipe with tape.
   2. Backer Units: Install cementitious board vertically.
      a. Cut as directed by manufacturer without damaging edges. Treat edges per manufacturer’s recommendations.
      b. Anchor with screws, spaced according to fastening sequence as recommended by manufacturer.
      c. Do not install screws within 6 inches of the shower wall base to prevent penetrate of shower pan waterproofing.
      d. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.05 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners, unless otherwise indicated.
   2. Bullnose Bead: Use at outside corners where indicated.
   3. LC-Bead: Use at exposed panel edges .
   4. L-Bead: Use where indicated.
   5. U-Bead: Use at exposed panel edges where indicated.
   6. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.06 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Panels that are substrate for tile.
   3. Level 3: Mechanical Rooms, Electrical Rooms, and similar spaces.
   4. Level 4: At panels in all locations except where, another level of finish is specified.
      a. Primer and its application to surfaces are specified in Section 09 91 00 "Painting."
   5. Level 5:
      a. At exposed locations utilizing glass mat interior gypsum board products and where required by another specification Section as preparation of wall.
      b. Where indicated on Drawings
      c. Primer and its application to surfaces are specified in Section 09 91 00 "Painting."

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.07 PARTITION IDENTIFICATION

A. Wall Identification: Permanently label all fire-rated walls and smoke partition assemblies with the partition identification as defined below using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
   1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
   2. Partition Identification Text: Apply the following according to partition ratings on Drawings, and as acceptable to authorities having jurisdiction:
      a. SMOKE PARTITION – PROTECT ALL OPENINGS.
      b. 1-HOUR SMOKE BARRIER – PROTECT ALL OPENINGS.
      c. 1-HOUR FIRE PARTITION – PROTECT ALL OPENINGS.
      d. 1-HOUR FIRE BARRIER – PROTECT ALL OPENINGS.
      e. 2-HOUR FIRE WALL – PROTECT ALL OPENINGS.
      f. 2-HOUR FIRE BARRIER – PROTECT ALL OPENINGS.
      g. 3-HOUR FIRE WALL – PROTECT ALL OPENINGS.
   3. Refer to Section 09 91 00 "Painting" for painting. Use Semi-Gloss, Low-Odor paint.

3.08 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before installing gypsum board ceilings, conduct an above-ceiling inspection, and report and correct deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for Contractor’s above-ceiling inspection. Provide Architect with copy of deficiencies report. Architect reserves the right to supplement Contractor’s deficiency report with other incomplete or incorrect items that might be observed during Architect’s site visit.
   2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
      a. Installation of 80 percent of lighting fixtures, powered for operation.
      b. Installation, insulation, and leak and pressure testing of water piping systems.
      c. Installation of air-duct systems.
      d. Installation of air devices.
      e. Installation of mechanical system control-air tubing.
      f. Installation of ceiling support framing.
      g. Installation of seismic restraints (sway bracing and compression struts).

h. Touch-up / patching of spray fire-resistive materials (SFRM).
i. Installation of penetration firestopping in fire- and smoke-rated partitions.
j. Installation of fire-resistant joint sealants in fire-rated partitions.
k. Installation of acoustical sealants at adjacent sound-rated partitions.
l. Application of fire- and smoke-rated partition identification.

3.09 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Furnish labor, materials, tools and other equipment, and services necessary to provide surface preparation and the application of tile work, including all components and accessory items required for a complete installation.

1. Ceramic tile
2. Ceramic mosaic tile
3. Thresholds
4. Waterproof membrane
5. Crack-isolation membrane
6. Metal edge strips

B. Work under this Section also includes moisture and alkalinity testing, and surface preparation of substrates as required for acceptance of tile, including but not necessarily limited to, cleaning, small crack repair, patching, filling, any other work required to provide an appropriate substrate.

1.3 RELATED SECTIONS

A. Division 03 Section “Cast-In-Place Concrete” for monolithic slab finishes specified for tile substrate.

B. Division 07 Section “Joint Sealants” for sealing of expansion, contraction, control and isolation joints in tile surfaces.

C. Division 09 Section “Gypsum Board” for glass mat water-resistant gypsum board and cementitious backer boards.

D. Division 09 Section “Stone Tiling.”

1.4 REFERENCE STANDARDS

A. American National Standards Institute

1. ANSI A108 Series: Specifications for Installation of Ceramic Tile
2. ANSI A118 and A137.1 Series: Specifications for Materials

B. American Society For Testing Materials (ASTM) International

1. ASTM A 137.1: Test Method for Determining the Dynamic Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the DCOF Acu Test Method .

C. Tile Council of North America, Inc. (TCNA)

1. Handbook for Ceramic Tile Installation. Latest Edition.

D. This specification shall be supplemented by any applicable federal, state and local building codes, guidelines, regulations, and standards adopted in the immediate geographic area of the Project; insurance rating organizations; including all other Authorities Having Jurisdiction.

1.5 DEFINITIONS

A. General: Definitions in the ANSI A108 Series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Module Size: Actual tile size plus joint width indicated.

C. Face Size: Actual tile size, excluding spacer lugs.

D. Wet Area: Tile surfaces that are either soaked, saturated, or regularly and frequently subjected to moisture and liquids (including water), such as gang showers, tub enclosures, showers, laundries, saunas, steam rooms, swimming pools, hot tubs, and exterior areas.

1.6 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6 – Wet
2. Step Treads: Minimum 0.6 – Wet
3. Ramp Surfaces: Minimum 0.8 – Wet

B. Dynamic Coefficient of Friction: For tiles installed on walkway surfaces, provide products with the followings values as determined by testing identical products per ASTM A 137.1:

1. Level Surfaces: Minimum $\geq$ 0.42

1.7 ACTION SUBMITTALS

A. Submit items in accordance with Division 01 Section “Submittal Procedures.”

B. Product Data: For each type of product indicated, submit two (2) copies of manufacturers’ product data, installation instructions and accessories specified and/or required by manufacturer.

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Samples of Verification:

1. Two full-size units of each type and composition of tile and for each color and finish required. If units are larger than 12 by 12 inches, please send a smaller sample unless requested otherwise. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Two full-size units of each type of trim and accessory for each color and finish required.
3. Two thresholds in 6-inch lengths for each color and finish required.
4. Two metal edge strips in 6-inch lengths.

1.8 CLOSEOUT SUBMITTALS

A. Include maintenance and product data for all items installed.

B. Tile installation system warranty. Contractor shall obtain required information to meet manufacturers’ claim requirements, i.e., proof of purchase, Installer information and any additional requirements.

1.9 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Verify Installer is qualified and approved by Manufacturer/Supplier, with a minimum of five years of continuous, uninterrupted experience in successfully installing work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who agrees to employ only skilled tradesmen with a minimum of five years experience.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer verifying tile has been produced to meet requirements for ANSI 137.1.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and grouting product.

E. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

F. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

G. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
1. Waterproof membrane
2. Crack isolation membrane
3. Joint sealants
4. Metal edge strips

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Mock-Up Testing: Areas to receive waterproof membrane shall be tested for a minimum of 24 hours or longer as recommended by manufacturer to determine if watertight. Coordinate with waterproof membrane installation section.

J. Preinstallation Conference: Conduct conference at Project site prior to commencement of field installation with Contractor, Subcontractor, Architect/Designer and others, as required.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.12 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. In-Field Blending: For tile exhibiting color variations within ranges approved during Sample submittals, Installer shall blend tile in field by pulling tiles from several different packages to blend colors and to match Architect approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in swimming pools, on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of temporary protective coating specified by tile manufacturer. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. For each tile type, manufacturer, series, color and sizes, see Finish Materials Listing in Finish Drawings. Also see preferred vendor list for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 section "product requirements".

B. Waterproofing membranes, crack isolation membranes, setting materials and grout materials are part of a warrantied tile installation system. Coordinate requirements for warranty with manufacturer. Large installations require a job-specific warranty.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent hard surface floor finishes at specified door openings. See Floor Transition Details in Finish Drawings.
   1. Beveled Edge Type: Maximum 1:2 slope, with lower edge of bevel aligned with or up to 1/16-inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/4-inch or less above adjacent floor surface.

B. Solid-Surfacing Material Thresholds: Homogeneous solid strips of filled plastic resin complying with ISSFA-2. Provide Standard type.

   1. See Finish Materials Listing and Floor Transition Details in the Finish Drawings.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane (Floors and walls at Decontamination Rooms): System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

   1. Products: Subject to compliance with requirements, provide **[one of]** the following:

      a. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane
      b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane
      c. MAPEI Corporation; Mapelastic AquaDefense Premium Waterproofing and Crack-Isolation Membrane
      d. Merkrete, Parex USA Company, Hydro Guard 2000

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.

   1. Products: Subject to compliance with requirements, provide **[one of]** the following:

      a. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane
      b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane

c. MAPEI Corporation; Mapelastic AquaDefense Premium Waterproofing and Crack-Isolation Membrane

2.6 SETTING MATERIALS

A. Portland Cement Mortar (Thick-Set) Installation Materials: ANSI A108.02

1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

    a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
    b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
    c. Weight: 2.5 lb/sq. yd.

3. Mortar Bed: Subject to compliance with requirements, provide **[one of]** the following:

    a. Custom Building Products; CustomFloat Bedding Mortar
    b. Laticrete International, Inc.; 3701 Fortified Mud Bed
    c. MAPEI Corporation; 4 to 1 Mud Bed Mix

B. Dry-Set Portland Cement Mortar (Thin-Set and Medium-Bed) ANSI 118.1: Provide at locations to receive uncoupling membrane.

1. Products: Subject to compliance with requirements, provide **[one of]** the following:

    a. Custom Building Products; Uncoupling Mat Mortar
    b. Laticrete International, Inc.; No. 317
    c. MAPEI Corporation; Keraset
    d. TEC; a subsidiary of H.B. Fuller Company; Full Set Plus

C. Latex-Portland Cement Mortar (Thin-Set and Medium-Bed): ANSI A118.4

1. Products: Subject to compliance with requirements, provide **[one of]** the following:

    a. Custom Building Products; FlexBond Crack Prevention Mortar
    b. Laticrete International, Inc.; No. 254R Platinum
    c. MAPEI Corporation; Ultraflex 3
    d. TEC; a subsidiary of H.B. Fuller Company; FortiFlex 2
    e. TEC; a subsidiary of H.B. Fuller Company; Super Flex - white at glass tile locations

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3

1. Products: Subject to compliance with requirements, see Finish Material Listing for Basis of Design. Also see preferred vendor list for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 Section "product requirements".

2.8 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products: Subject to compliance with requirements, provide sealants recommended by tile installation systems' warranty manufacturer which maintains warranty.

D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide sealants recommended by tile installation systems' warranty manufacturer which maintains warranty.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland cement-based formulation provided or approved by manufacturer of tile-setting materials for warrantied installation systems indicated.

B. Metal Edge Strips: See Floor Transition Details in the Finish Drawings.

C. Adhesive for Glass Tile: Product as specified for thin-set cement mortar; 'white' in color unless noted otherwise.

D. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer’s standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

F. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, provide the following:

a. Custom Building Products; Surfacegard Grout and Tile sealer

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean, free of oil, waxy films, soap, silicones, and curing compounds; maximum variation in the plane or slope – 1/8-inch in 10-ft.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer, which maintains tile installation systems warranty.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, install to blend tile from 2 or 3 boxes.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas

B. Variation in Surface Plane of Large Format Flooring: Do not exceed 1/8 inch in 10 feet from level or slope indicated when tested with a 10-foot straightedge.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Provide manufacturers' standard trim shapes where necessary to eliminate exposed tile edges.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: See Finish Materials Listing in the Finish Drawings.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
3. Furnish and install movement joints per TCNA Handbook – movement joints EJ171.
4. Contractor to coordinate location of control and isolation joints with Architect upon observation at site.

J. Thresholds: Install thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-Portland cement mortar (thin set).
2. Do not extend cleavage membrane, waterproofing or crack isolation membrane under thresholds set in dry-set Portland cement or latex-Portland cement mortar. Fill joints between such thresholds and adjoining tile set on cleavage membrane, waterproofing or crack isolation membrane with elastomeric sealant.

K. Metal Edge Strips: Install [at locations indicated] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated].

L. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOF MEMBRANE INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

1. Locations: Install in the following wet areas:
   a. Decontamination Showers
   b. Toilet Areas and Locker Rooms
   c. Showers
   d. Water Fountains
   e. Janitor Closets

f. Any tiled areas with floor drains

B. Provide full height waterproofing at all wall tile installations listed above.

C. Do not install tile or setting materials over waterproofing until waterproofing has cured and been flood tested for 24 hours to determine that it is watertight.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

1. In areas of new construction or existing construction 5 years old or less specified to receive thin-set floor tile system, install membrane continuous over flooring substrate, from wall to wall.
2. In areas of existing construction more than 5 years old specified to receive a new thin-set floor tile system, install membrane as per manufacturer's recommended width centered over and running parallel with existing cracks in flooring substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR TILE INSTALLATION SCHEDULE

1. Tile Installation F121-12 (Wet Floors): Cement mortar bed (thick-set) on waterproof membrane; TCA F121 and ANSI A108.1C **[LOCATIONS WITH DRAINS]**

    a. Thin-Set Mortar for Cured-Bed Method: Latex-Portland cement mortar. Provide medium-bed at all locations with 12" or larger tiles.
    b. Grout: Water cleanable epoxy grout.

2. Tile Installation F122-12 (Wet Floors): Thin-set mortar on waterproof membrane; TCA F122 **[WET AREAS WHERE A DEPRESSED SLAB IS NOT POSSIBLE]**

    a. Thin-Set Mortar: Latex-Portland cement mortar. Provide medium-bed at all locations with 12" or larger tiles.
    b. Grout: Water-cleanable epoxy grout.

3. Tile Installation F128-12: Thin-set mortar on uncoupling membrane

    a. Thin-Set Mortar: Dry-set Portland cement mortar. Provide medium-bed at all locations with 12" or larger tiles.
    b. Grout: **[Water cleanable epoxy]** grout

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W243-12 (Dry Walls): Thin-set mortar on gypsum board; TCA W243-12

    a. Thin-Set Mortar: Latex-Portland cement mortar
    b. Grout: **[Water cleanable epoxy]** grout

2. Tile Installation W245-12 (Wet Walls): Thin-set mortar on coated glass-mat, water-resistant gypsum backer board; TCA W245-12.

    a. Thin-Set Mortar: Latex-Portland cement mortar
    b. Grout: Water-cleanable epoxy grout

C. Shower Receptor and Wall Installations, Metal Studs or Furring:

1. Tile Installation B419-12: Thin-set mortar on coated glass-mat, water-resistant backer board; TCA B419-12 **[PREFABRICATED SHOWER RECEPTORS]**

    a. Thin-Set Mortar: Latex-Portland cement mortar
    b. Grout: Water-cleanable epoxy grout

2. Tile Installation B420-12: Thin-set mortar on coated glass-mat, water resistant backer board; TCNA B420-12 **[TILE WALLS AND FLOORS]**

    a. Thin-Set Mortar: Latex-Portland cement mortar

D. Grout: Water-cleanable epoxy grout

END OF SECTION 093000

SECTION 095113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels, exposed suspension systems for ceilings, wire hangers, fasteners, hold-down clips and other related accessories.

B. Related Requirements:

1. Division 09 Section “Acoustical Tile Ceilings” for ceilings consisting of mineral-base and glass-fiber-base acoustical tile used with concealed suspension systems or adhesive bonding.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 SUBMITTALS

A. Product Data:

1. Product Data: Manufacturer's technical product data and specifications for each type of product indicated, including material descriptions, standard details, dimensions of individual components, profiles, and installation instructions. Include all test reports certifying that products have been tested and comply with performance requirements.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Two (2) 6-inch-square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Two (2) minimum 6-inch-long samples of each type, finish, and color.

E. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

    a. Lighting fixtures and lighting tracks
    b. Air outlets and inlets
    c. Speakers and other AV products
    d. Sprinklers
    e. Access panels
    f. Equipment mounts, tracks and rigging points

5. Perimeter moldings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Tests Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

B. Warranty Information: For products specified.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: One full carton for each product type of tile used in the project.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Work of this Section to be installed by a company or individual, qualified and approved by Manufacturer/Supplier, knowledgeable in the proper use and handling of materials specified herein, with a minimum of ten (10) years of continuous, uninterrupted experience in successfully installing work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who agrees to employ only skilled tradesmen for the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach a uniform room operating temperature and a stabilized moisture content as per manufacturer's recommendations.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.10 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.11 WARRANTY

A. Warranties: General and special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Pass-through warranties provided by subcontractors to manufacturer are not acceptable.

B. Acoustical Panel Ceilings: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:

1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
2. Grid System: Rusting and manufacturer's defects.
3. Acoustical Panels Designated as Inherently Resistive to the Growth of Micro-Organisms: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.

C. Warranty Period:

1. Acoustical Panels: Ten (10) years from date of Substantial Completion.
2. Grid: Ten (10) years from date of Substantial Completion.
3. Acoustical Panels and Grid Systems Designated as Inherently Resistive to the Growth of Micro-Organisms: Thirty (30) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials and with a flame-spread of 25 or less.
2. Smoke-Developed Index: [50][450] or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel and Suspension System: Obtain from single source from single manufacturer.

B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type as listed in the drawings.

E. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide manufacturers from HCA's "Preferred Vendors List" and the standard panel of configuration indicated in the Products Legend on the Reflected Ceiling Plans, or as otherwise indicated, relative to panel size, thickness, texture/pattern, color, and other characteristics.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated or anticipated.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
b. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
c. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire (No. 12 Gage) minimum.

D. Hanger Rods and/or Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

F. Hold-Down Clips: Where indicated by ceiling type, in areas required by Authorities Having Jurisdiction, and/or for fire-resistance rating requirements summarized below, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

1. Panels weighing less than 1 lb/sq. ft.: Hold-down clips are required for fire-resistance-rated ceilings to comply with UL design requirements.
2. Panels weighing more than 1 lb/sq. ft.: Hold-down clips are NOT required for fire-resistance-rated ceilings to comply with UL design requirements.

G. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

H. Clean-Room Gasket System: Where indicated, provide manufacturer's recommended system, including neoprene antimicrobial gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.5 METAL SUSPENSION SYSTEM

A. Subject to compliance with requirements, provide manufacture’s standard grid system indicated in the Products Legend on the Reflected Ceiling Plan relative to grid profile/size and other characteristics. Installer to verify that the specified panel and grid system are compatible before installation of grid begins.

1. Metal Edge Moldings and Trim: Subject to compliance with requirements, provide the products indicated in the Products Legend on the Reflected Ceiling Plan relative to metal edge moldings profile/size and other characteristics or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal or aluminum, of same material, finish, and color as that used for exposed flanges of suspension system runners.

B. Exposed Tee Ceiling Systems:

1. Wide-Face (15/16-inch), Capped, Double-Web, Hot-Dip Galvanized Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, not less than G30coating designation, prepainted, with prefinished cold rolled 15/16-inch-wide steel caps on flanges. Provide fire-resistance rated system where required.

a. Structural Classification: Intermediate-duty system, or greater as otherwise required to comply with seismic regulations.
b. Cross Tee/Main Beam Interface: Flush fit
c. Face Design: Flat
d. Cross Tee End Connection: "Stab T"
e. Cap Finish: White unless noted otherwise. See Reflected Ceiling Plan.

C. Clean Room Ceiling System:

1. Gasketed System: Wide-face (15/16- inch), capped, double-web, co-extruded aluminum suspension system, ASTM B 221, applications up to Class 5 performance per ISO standard; chemical resistant; main and cross runners formed from non-magnetic extruded aluminum, prepainted, with prefinished cold-rolled 15/16- or 1-1/2-inch-wide aluminum caps on flanges.

a. Structural Classification: Intermediate-duty system [Heavy-duty system]
b. Cross Tee/Main Beam Interface: Flush fit
c. Face Design: Flat
d. Cross Tee End Connection: "Stab T"
e. Cap Finish: White unless noted otherwise. See Reflected Ceiling Plan.
f. Gasket System: Clean-room type, factory applied.

2.6 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.
c. [Insert manufacturer's name; product name or designation]

2. Acoustical Sealant for Concealed Joints:

a. Henkel Corporation; OSI Sealants Pro-Series SC-175 Rubber Base Sound Sealant.
b. Pecora Corporation; AIS-919.
c. Tremco, Inc.; Tremco Acoustical Sealant.
d. [Insert manufacturer's name; product name or designation]

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall[have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).] [comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]

2.7 MISCELLANEOUS MATERIALS

A. Acoustical Tile Adhesive: Type recommended by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.

1. Adhesive shall[have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).] [comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."]

B. Staples: 5/16-inch- (8-mm-) long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected in a manner acceptable to the Installer, and in compliance with manufacturer's warranty requirements.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

B. Sprayed Fire-Resistive Materials: Coordinate the installation of acoustical panel ceiling assemblies with the applied fireproofing so both elements of Work remain complete and undamaged. Patch or replace applied fire-resistive materials removed or damaged during installation of acoustical panel ceilings assemblies. Comply with requirements specified in Division 07 Section “Applied Fireproofing.”

C. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of wire hanger brackets and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of four tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
12. Verify the maximum length and size of anchors with structural engineer.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down and impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Resilient cove base
2. Resilient sculptured base
3. Resilient molding accessories and chair rail
4. Adhesive and related accessories
6. Related Sections:
    a. Division 07 Section “Joint Sealants” for single-component and multi-component elastomeric, latex, silicone, urethane and other joint sealants.
    b. Division 09 Section "Resilient Sheet Flooring" for resilient sheet floor coverings.
    c. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.03 ACTION SUBMITTALS

A. Submit items in accordance with Division 01 Section “Submittal Procedures.”

B. Product Data: For each type of product indicated, submit two (2) copies of manufacturers’ product data, installation instructions, and accessories specified and/or required by manufacturer.

C. Samples for Verification: Submit two (2) samples for each type of product indicated in manufacturer's standard-size, but not less than 12 inches long, of each resilient product color, texture, and pattern required.

D. Product Schedule: See Finish Material Listing in Finish Drawings.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials/attic stock that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than [10 linear feet] for every [500 linear feet] or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Mockups: Provide resilient products with mockups specified in other Sections.

C. Concrete Sealer Installer Qualifications: Installer trained and certified by sealer manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.07 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 RESILIENT COVE BASE

A. Resilient Cove Base:

1. Manufacturers: Subject to compliance with requirements, see Finish Material Listing for Basis of Design. See Preferred Vendor List for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 Section “Product Requirements.”

B. Resilient Base Standard: ASTM F1861

1. Material Requirement: Type TP (rubber, thermoplastic)
2. Manufacturing Method: [Group I (solid, homogeneous)]
3. Style: See Finish Material Listing in Finish Drawings.

C. Minimum Thickness: See Finish Material Listing in Finish Drawings.

D. Height: See Finish Material Listing in Finish Drawings.

E. Lengths: [Coils in manufacturer's standard length]

F. Outside Corners: [Job formed]

G. Inside Corners: [Job formed]

H. Finish Colors and Patterns: See Finish Material Listing in Finish Drawings.

2.02 RESILIENT SCULPTURED BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, see Finish Material Listing for Basis of Design. See Preferred Vendor List for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 Section “Product Requirements.”

B. Resilient Base Standard: ASTM F1861

1. Material Requirement: Type TP (rubber, co-extruded thermoplastic)
2. Manufacturing Method: [Group I (solid, homogeneous)]
3. Style: See Finish material Listing in Finish Drawings.

C. Minimum Thickness: See Finish Material Listing in Finish Drawings.

D. Height: See Finish Material Listing in Finish Drawings.

E. Lengths: [Coils in manufacturer's standard length].

F. Outside Corners: [Job formed]

G. Inside Corners: [Job formed]

H. Finish Colors and Patterns: See Finish Material Listing in Finish Drawings.

2.03 RESILIENT MOLDING ACCESSORY:

A. Resilient Molding Accessory:

1. Products: Subject to compliance with requirements, see Finish Material Listing for Basis of Design. Also see Preferred Vendor List for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 Section “Product Requirements.”

B. Description: See Finish Material Listing and floor transition details in Finish Drawings.

C. Material: As standard with manufacturer.

D. Profile and Dimensions: See Finish Material Listing and floor transition details in Finish Drawings.

E. Colors and Patterns: See Finish Material Listing and floor transition details in Finish Drawings.

2.04 RESILIENT SCULPTURED CHAIR RAIL

A. Resilient Sculptured Chair Rail:

1. Products: Subject to compliance with requirements, see Finish Material Listing for Basis of Design. Also see Preferred Vendor List for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 Section “Product Requirements.”

B. Description: See Finish Material Listing mounting height in Finish Drawings.

C. Material: As standard with manufacturer.

D. Profile and Dimensions: See Finish Material Listing and mounting height in Finish Drawings.

E. Colors and Patterns: See Finish Material Listing and mounting height in Finish Drawings.

2.05 INSTALLATION MATERIALS

A. Substrate Preparation Products:

1. Trowelable Leveling and Patching Compounds: Portland cement-based or blended hydraulic cement-based formulation provided or approved by floor covering manufacturer for applications indicated. Products for manufacturers' consideration are Armstrong S-184 or S-194 (leveling or patching), Ardex SP-F Feather Finish (patching), K-15 (leveling) or Concure Feather Cement (patching), SL-1 (leveling).
2. For concrete testing over 90% RH:
    a. Moisture Mitigation Products - Concure Vapor Barrier Two-Step System; Concure Corporation, Collingdale, PA. Or select from approved alternates:
        1) Ardex Rapid MC; Ardex Americas, Aliquippa, PA.
        2) Koster vap I 2000; Koster American Corporation, Virginia Beach, VA.
        3) Stauf Moisture Mitigation; Stauf USA, Arlington, TN.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
    1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.
    2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Accessories: Prepare according to ASTM F710.
    1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
    2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
    3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after all substrates pass testing.
    a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate allowed by manufacturer(s) for each product specified in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum relative humidity level measurement allowed by manufacturer(s) for each product specified.
    c. If required, apply the moisture mitigation product per the manufacturer's recommendations and provide any additional calcium chloride testing of the prepared substrate per moisture mitigation manufacturer's recommendations prior to installation of floor covering and register results with the moisture mitigation manufacturer, General Contractor, Owner and Architect.
        1) After installation of vapor sealer and before flooring installation, conduct 72 - hour bond test to verify adhesion of each required type of flooring adhesive to concrete vapor sealer. Provide written report on such testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.
    1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:
    1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
    2. Inside Corners: Use straight pieces of maximum lengths possible.

3.04 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of all resilient floor covering that would otherwise be exposed per floor transition details.

C. Resilient Sculptured Chair Rail: Comply with manufacturer's written instructions for installing resilient sculptured chair rail.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.

a. Sweep and vacuum surfaces thoroughly.

b. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Joint Sealant: Coordinate with floor finish material for requirements concerning applying sealant at door frames and other joints and penetrations.

E. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Vinyl sheet floor covering, without backing
   2. Adhesive and related accessories
   3. Surface-applied moisture mitigation and related products

B. Related Sections:
   1. Division 07 Section “Joint Sealants” for single-component and multi-component elastomeric, latex, silicone, urethane and other joint sealants.
   2. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.
   3. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.03 SEQUENCING

A. Install sheet flooring after other finishing operations, including painting, have been completed.

B. Install sheet flooring before installation of base cabinets.

1.04 ACTION SUBMITTALS

A. Submit items in accordance with Division 01 Section “Submittal Procedures.”

B. Product Data: For each type of product indicated, submit two (2) copies of manufacturers’ product data, installation instructions and accessories specified and/or required by manufacturer.

C. Shop Drawings: Submit Drawings for each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns, type, locations and direction. See Finish Drawings.
   2. Transition details to other floor materials.

D. Samples for Verification: Submit two samples of each specified color of flooring. If products other than those specified are proposed, provide a sample of the specified item with the proposed sample. Label samples with finish designations included on the Finish Legend (SVF- 1, SRF-2, etc.) - failure to label as such will be cause for rejection of the submittal for the entire Section. Note: if the submitted items are not the specified items, not matching the specified colors will be cause for rejection of the submittal for this Section. Submit samples in the following minimum sizes:
   1. Sheet Goods: 4 x 4 inch
   2. Welding rods: 4 inches long

E. Seam Samples: For each flooring product, provide a seam running lengthwise and in center, and one inside and one outside corner of integral base. Sample to be on rigid backing and prepared by Installer for this Project.

F. Product Schedule: See Finish Materials Listing in Finish Drawings.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor covering, provide maintenance manuals including manufacturers' written instructions for cleaning and maintenance.

B. Manufacturers' warranties.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials/attic stock that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Covering: Furnish quantity not less than [10 linear feet] for every [500 linear feet] or fraction thereof, in roll form and in full roll width for each color, pattern, and type of floor covering installed.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer with no less than three years' experience who employs workers for this Project who are competent in heat welding techniques required by manufacturer for floor covering installation with similar and successful installations within the last year. Provide documentation if requested.
   1. Engage an installer who employs workers for this Project who are trained or certified by floor covering manufacturer for installation techniques required.

B. Installer Qualifications: Concrete Vapor Sealer: Acceptable to manufacturer and employing factory-trained installers.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution including substrate preparation and required testing.
   1. Build mockups for floor coverings including resilient base and accessories.
      a. Size: Minimum 100 sq. ft. for each type, color and pattern in locations directed by Architect.
      b. Maintain accepted mock-up throughout the construction process.
      c. Accepted and approved mock-up may remain as part of the finished Work as a standard for subsequent Work.

D. Contractor to schedule pre-installation conference with flooring sub-contractor, Architect/Interior Designer and Owner to review seaming diagrams, adhesives, sealants, floor preparation procedures, moisture mitigation procedures, bond/adhesion tests, and installation procedures.

E. Convene a pre-installation conference covering the work of this Section
   1. Schedule the meeting at least one week prior to commencing the work of this Section, but not before:
      a. Submittals for the work of this Section have been approved by the Architect.
      b. The mock-up of the moisture mitigation system specified in this Section has been approved by the Architect.
      c. The floor bond test specified below shows acceptable results.
   2. Coincide the pre-installation conference with the construction of mock up samples of flooring and reviewing of submittals.
   3. Require attendance of parties directly affecting the work of these Sections, the following must be in attendance: Architect, Contractor, Flooring Sub-Contractor project manager, Flooring and Moisture Mitigation System Installers, Floor manufacturers' representatives and the Moisture Mitigation Systems' representatives. Notify the Architect of conference at least 7 days prior to meeting.
   4. Review conditions and degree of acceptableness of installation, installation procedures, and coordination required with related work. Use the following as a minimum agenda:
      a. Review specifications for flooring and mitigation systems
      b. Review approved submittals

c. Review schedule
d. Phasing and ordering of material
e. Review installation procedures
f. Inspect mockup(s) and review quality
g. Review acceptability criteria of substrate, discuss problem floor areas
h. Review acceptable environmental conditions
i. Material storage and acclimation
j. Verify acceptable trowels for each product
k. Verify testing requirements: Bond tests, Calcium chloride tests, Alkalinity
l. Review slab preparation requirements
    1) Shot blasting/scarifying
    2) Crack treatment
    3) Moisture mitigation installation
    4) Leveling - cement based
    5) Feathering/final prep - cement based
m. No use of wax or oil based sweeping compound
n. Protection and final cleaning

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.09 PROJECT CONDITIONS

A. Maintain ambient temperatures and humidity level within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive floor coverings during the following time periods:
    1. 48 hours before installation
    2. During installation
    3. 48 hours after installation

B. Until Substantial Completion, maintain ambient temperatures and humidity level within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to foot traffic for 48 hours and to rolling traffic for 72 hours after floor covering installation.

E. Install floor coverings after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 64 OR NFPA 253 by a qualified testing agency.
    1. Critical Radiant Flux Classification: Class I, not less the 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore Standard developed by the Resilient Floor Covering Institute (RFCI).

C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.02 VINYL SHEET FLOOR COVERING

A. Products: Subject to compliance with requirements, see Finish Materials Listing for Basis of Design and HCA Preferred Vendor List for acceptable manufacturer.

B. Unbacked Vinyl Sheet Floor Covering: ASTM F 1913, [0.080 inch (2.0 mm)] [Insert dimension] thick.

C. Wearing Surface: Smooth with embedded abrasives or Embossed with embedded abrasives. See Finish Materials Listing in Finish Drawings.

D. Sheet Width: See Finish Materials Listing in Finish Drawings.

E. Seaming Method: Heat welded

F. Colors and Patterns: See Finish Materials Listing in Finish Drawings.

2.03 INSTALLATION MATERIALS

A. Substrate Preparation Products:
   1. Trowelable Leveling and Patching Compounds: Portland cement-based or blended hydraulic cement-based formulation provided or approved by floor covering manufacturer for applications indicated. Products for manufacturers' consideration are Ardex SP-F Feather Finish (patching), K-15 (leveling) or Concure Feather Cement (patching), SL-1 (leveling).
   2. For Concrete Testing Over 90% RH:
      a. Moisture Mitigation Products - Concure Vapor Barrier Two-Step System; Concure Corporation, Collingdale, PA. Or select from approved alternates
         1) Ardex Rapid MC; Ardex Americas, Aliquippa, PA.
         2) Koster vap I 2000; Koster American Corporation, Virginia Beach, VA.
         3) Moisture Mitigation; Stauf USA, Arlington, TN.
   3. Adhesive - utilize a pre-applied, poly-acrylic adhesive system - EnviroSTIX (all resilient flooring types); Base King, Dalton GA.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
   1. Adhesives shall have a VOC content of not more than 50 or 60 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
   3. Refer to HCA / HPG Recommended Adhesive Chart for each type of resilient flooring. Contact the HCA National Account-Mannington Commercial rep for the most current chart:
      Terri Bailey
      terri_bailey@mannington.com
      (615) 427-8980

C. Seamless-Installation Accessories:
   1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
      a. Color: As selected by Architect/Interior Designer from manufacturer's full range to contrast with floor covering.

D. Integral-Flash-Cove-Base Accessories:
   1. Cove Strip: 3/4-inch (19-mm) radius provided or approved by manufacturer.
   2. Cap Strip: [Square metal] and [Rubber cap-see finish drawings for specific location of use] provided or approved by manufacturer.
   3. Corners: Metal inside and outside corners and end stops provided or approved by manufacturer.
   4. Joint Sealant: Apply sealant at top of integral base.

E. Floor Polish: Provide protective liquid floor polish products ONLY IF recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content, moisture vapor emission, temperature, alkalinity, installation tolerance, moisture mitigation, and other conditions affecting performance of the Work.

B. At areas which require moisture mitigation, brush blasting, bead blasting, shot blasting, scarifying or other substrate preparation, consult with Architect and Structural Engineer prior to performing Work.

C. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after all substrates pass testing.
      a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate allowed by manufacturer(s) for each product specified in 24 hours.
      b. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum relative humidity level measurement allowed by manufacturer(s) for each product specified.
      c. If required, apply the moisture mitigation product per the manufacturer’s recommendations and provide any additional calcium chloride testing of the prepared substrate per moisture mitigation manufacturer’s recommendations prior to installation of floor covering and register results with the moisture mitigation manufacturer, General Contractor, Owner and Architect.
   5. After installation of vapor sealer and before flooring installation, conduct 72 - hour bond test to verify adhesion of each required type of flooring adhesive to concrete vapor sealer. Provide written report on such testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor coverings until they are same temperature as space where they are to be installed.
   1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.03 FLOOR COVERING INSTALLATION

A. Comply with manufacturer's written instructions for installing floor coverings.

B. Unroll floor coverings and allow them to stabilize before cutting and fitting.

C. Lay out floor coverings as follows:
   1. As indicated in Finish Drawings.
   2. Maintain uniformity of floor covering direction.
   3. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
   4. Match edges of floor coverings for color shading at seams.
   5. Avoid cross seams.

D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

H. Adhere floor coverings to substrates using an application of adhesive applied as directed in manufacturer’s installation instructions. Follow instructions to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing marks, and other surface imperfections.

I. Seamless Installation:
   1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
   2. Vinyl Tile to Sheet Vinyl Transitions: Heat-Weld all joints between Vinyl Tile and Sheet Vinyl.
   3. Apply Seam Coater Pen. The Quantum Guard HP Pen is to provide topical protection to heat-welded seams.

J. At areas receiving integral base, extend flooring material or pre-molded base up the wall to the height indicated on the drawings. Carefully miter corners and heat seal seams. The cut style at mitered corners must be consistent throughout entire project (boot or butterfly) as approved at the pre-installation conference [and mock-up].
   1. Install integral base cove cap. Clean thoroughly and apply sealant between the cove cap and wall and to bottom of door frame to floor. See Division 07 Section “Joint Sealants.”

K. Protect flooring installations and do not allow walking traffic for 24 hours or rolling loads for 72 hours after completion of installation to allow for setting and drying of adhesive.

3.04 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

B. Perform the following operations immediately after completing floor covering installation:
   1. Remove adhesive and other blemishes from floor covering surfaces.

2. Sweep and vacuum floor coverings thoroughly.
3. Damp-mop floor coverings to remove marks and soil.

C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.
   1. Apply floor polish ONLY IF per manufacturers' recommendation.

END OF SECTION

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Solid (Luxury) vinyl floor tile

2. Adhesive and related accessories

3. Surface-applied moisture mitigation and related products

B. Related Sections:

1. Division 07 Section “Joint Sealants” for single-component and multi-component elastomeric, latex, silicone, urethane and other joint sealants.

2. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

3. Division 09 Section "Resilient Sheet Flooring" for resilient sheet floor coverings.

1.03 SEQUENCING

A. Install floor tile after other finishing operations, including painting, have been completed.

B. Install floor tile before installation of base cabinets.

1.04 ACTION SUBMITTALS

A. Submit items in accordance with Division 01 Section “Submittal Procedures.”

B. Product Data: For each type of product indicated, submit two (2) copies of manufacturers’ product data, installation instructions and accessories specified and/or required by manufacturer.

C. Shop Drawings: Submit Drawings for each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns, type, locations and direction. See Finish Drawings.

2. Transition details to other flooring materials.

D. Samples for Verification: Submit two samples of each specified color of floor tile. If products other than those specified are proposed, provide a sample of the specified item with the proposed sample. Label samples with finish designations included on the Finish Legend (VT-1, LVT-2, etc.) - failure to label as such will be cause for rejection of the submittal for the entire Section. Note: if the submitted items are not the specified items, not matching the specified colors will be cause for rejection of the submittal for this Section. Submit samples in the following minimum sizes:

   1. Tiles: 4 x 4 inch

   2. Welding rods: 4 inches long

E. Product Schedule: See Finish Material Listing in Finish Drawings.

1.05 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile, provide maintenance manuals including manufacturers' written instructions for cleaning and maintenance.

B. Manufacturers' warranties.

1.06 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials/attic stock that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Floor Tile: Furnish [1 box] for every [50 boxes] or fraction thereof, of each type, color, and pattern of floor tile installed.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Installer Qualifications: Concrete Vapor Sealer: Acceptable to manufacturer and employing factory-trained installers.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution including substrate preparation and required testing.

   1. Build mockups for floor tile including resilient base and accessories.

      a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect/Interior Designer.

      b. Maintain accepted mock-up throughout the construction process.

c. Accepted and approved mock-up may remain as part of the finished Work as a standard for subsequent Work.

D. Contractor to schedule pre-installation conference with flooring sub-contractor, Architect/Interior Designer and Owner to review seaming diagrams, adhesives, floor preparation procedures, moisture mitigation procedures, bond/adhesion tests, and installation procedures.

E. Convene a pre-installation conference covering the work of this Section

1. Schedule the meeting at least one week prior to commencing the work of this Section, but not before:

   a. Submittals for the work of this Section have been approved by the Architect.

   b. The mock-up of the moisture mitigation system specified in this Section has been approved by the Architect.

   c. The floor bond test specified below shows acceptable results.

2. Coincide the pre-installation conference with the construction of mock up samples of flooring and review of submittals.

3. Require attendance of parties directly affecting the work of these Sections, including manufacturers' representatives and installers of both the moisture mitigation system and the flooring. Notify the Architect of conference at least 7 days prior to meeting.

4. Review conditions of installation, installation procedures, and coordination required with related work. Use the following as a minimum agenda:

   a. Review specifications for flooring and mitigation systems

   b. Review approved submittals

   c. Review schedule

   d. Phasing and ordering of material

   e. Review installation procedures

   f. Inspect mockup(s) and review quality

   g. Review acceptability criteria of substrate, discuss problem floor areas

   h. Review acceptable environmental conditions

   i. Material storage and acclimation

   j. Verify acceptable trowels for each product

   k. Verify testing requirements: Bond tests, Calcium chloride tests, Alkalinity

l. Review slab preparation requirements

1) Shot blasting/scarifying

2) Crack treatment

3) Moisture mitigation installation

4) Leveling - cement based

5) Feathering/final prep - cement based

m. No use of wax or oil based sweeping compound

n. Protection and final cleaning

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.09 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.

2. During installation.

3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to walking traffic for 48 hours and to rolling traffic for 72 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 64 OR NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less the 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore Standard developed by the Resilient Floor Covering Institute (RFCI).

C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.02 SOLID (LUXURY) VINYL FLOOR TILE

A. Products: Subject to compliance with requirements, see Finish Material Listing for Basis of Design. Also see Preferred Vendor List for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Division 01 Section “Product Requirements.”

B. Tile Standard: ASTM F1700

C. Size, Seaming Method, Colors and Patterns: See Finish Material Listing in Finish Drawings.

2.03 INSTALLATION MATERIALS

A. Substrate Preparation Products:

1. Trowelable Leveling and Patching Compounds: Portland cement-based or blended hydraulic cement-based formulation provided or approved by floor covering manufacturer for applications indicated. Products for manufacturers’ consideration are Armstrong S-184 or S-194 (leveling or patching), Ardex SP-F Feather Finish (patching), K-15 (leveling) or Concure Feather Cement (patching), SL-1 (leveling).

2. For concrete testing over 90% RH:

    a. Moisture Mitigation Products - Concure Vapor Barrier Two-Step System; Concure Corporation, Collingdale, PA. Or select from approved alternates:

        1) Ardex Rapid MC; Ardex Americas, Aliquippa, PA.

        2) Koster vap I 2000; Koster American Corporation, Virginia Beach, VA.

        3) Stauf Moisture Mitigation; Stauf USA, Arlington, TN.

    b. Adhesives - utilize a pre-applied, poly-acrylic adhesive system – manufacture recommended.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

3. Refer to HCA/HPG Recommended Adhesive Chart for each type of resilient flooring. Contact the HCA National Account-Mannington Commercial rep for the most current chart:

   Terri Bailey

   terri_bailey@mannington.com

   (615) 427-8980

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.

   a. Color: As selected by Architect from manufacturer's full range to contrast with floor tile.

D. Floor Polish: Provide protective liquid floor polish products ONLY IF recommended by manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content, moisture vapor emission, temperature, alkalinity, installation tolerance, moisture mitigation, and other conditions affecting performance of the Work.

B. At areas which require moisture mitigation, brush blasting, bead blasting, shot blasting, scarifying or other substrate preparation, consult with Architect and Structural Engineer prior to performing Work.

C. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after all substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of allowed / permissible by manufacturer(s) for each product specified in 24 hours.

    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have the maximum relative humidity level measurement allowed by manufacturer(s) for each product specified.

    c. If required, apply the moisture mitigation product per the manufacturer's recommendations and provide any additional calcium chloride testing of the prepared substrate per moisture mitigation manufacturer's recommendations prior to installation of floor covering and register results with the moisture mitigation manufacturer, General Contractor, Owner and Architect.

    d. After installation of vapor sealer and before flooring installation, conduct 72 - hour bond test to verify adhesion of each required type of flooring adhesive to concrete vapor sealer. Provide written report on such testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

    1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

    1. Lay tiles as indicated in Finish Drawings.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

    1. Lay tiles as indicated in Finish Drawings.

D. Scribe, cut, seal and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using an application of adhesive applied as directed in manufacturer's installation instructions. Follow instructions to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing marks, and other surface imperfections.

I. At areas receiving integral base, extend flooring material or pre-molded base up the wall to the height indicated on the drawings. Carefully miter corners and heat seal seams. The cut style at mitered corners must be consistent throughout entire project as approved at the pre-installation conference or as per approved mock-up.

1. Install integral base cove cap. Clean thoroughly and apply sealant between the cove cap and wall and to bottom of door frame to floor. See Division 07 Section "Joint Sealants."

J. Protect flooring installations and do not allow walking traffic for 24 hours or rolling loads for 72 hours after completion of installation to allow for setting and drying of adhesive.

K. Seamless Installation:

1. Heat Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

2. Vinyl Tile to Sheet Vinyl Transitions: Heat-Weld all joints between Vinyl Tile and Sheet Vinyl.

3.04 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.

2. Sweep and vacuum surfaces thoroughly.

3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.

1. Verify manufacturer written instructions for floor polish.

2. Apply floor polish ONLY IF per manufacturer's recommendation.

E. Joint Sealant: Apply sealant to resilient tile flooring at door frames and at other joints and penetrations.

F. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13
CARPET TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Furnish labor, materials, tools and other equipment, and services necessary to provide surface preparation and the installation of carpet tile, including all components and accessory items required for a complete installation.

1. Modular Carpet

B. Work under this Section also includes moisture and alkalinity testing, and surface preparation of substrates as required for acceptance of carpet tile, including but not necessarily limited to, cleaning, small crack repair, patching, filling, any other Work required to provide an appropriate substrate.

C. This specification shall be supplemented by any applicable federal, state and local building codes, guidelines, regulations, and standards adopted in the immediate geographic area of the Project; insurance rating organizations; including all other Authorities Having Jurisdiction.

1.3 RELATED SECTIONS

1. Division 01 Section “Submittal procedures.”
2. Division 02 Section "Selective Structure Demolition" for removing existing floor coverings.
3. Division 09 Section "Resilient Base and Accessories” for resilient wall base and accessories installed with carpet tile.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site prior to commencement of field installation with Contractor, Subcontractor, Architect/Designer and others, as required.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations and accessories specified and/or required by manufacturer for each type of substrate.
3. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
4. Warranty: For each type indicated, copy of manufacturer's warranty.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type and color.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Submit two (2) full-size Samples.
2. Exposed Edge, Transition, and Other Accessory Stripping: Submit two (2) 12-inch long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.6 CLOSEOUT/MAINTENANCE MATERIAL SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 EXTRA MATERIAL

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.
2. Deliver usable carpet tiles to Owner. Neatly package and wrap such carpet tiles for storage protection. Do not include miscellaneous scrap pieces as part of the specified extra materials.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level. Verify Installer is approved by manufacturer, with a minimum of five years continuous, uninterrupted experience in successfully installing Work similar in material, design and extent to that indicated for this Project, whose Work has resulted in construction with a record of successful in-service performance, and who agrees to employ only skilled tradesmen with a minimum of five years experience.

B. Fire-Test-Response Ratings: Provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 or ASTM E648 by a qualified testing agency.

C. Carpet shall have smoke density development of 450 or less per NBS Smoke Chamber Test NFPA 258 or ASTM E 662.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Factory Runs: Produce carpet tile, of each type specified, in one factory run and from one dye lot. Guarantee colors and shades to be uniform throughout the run of material.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

B. Arrange, in advance of delivery, with General Contractor for secure, clean, dry storage space.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet Work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Install carpet tile after other finishing operations, including all painting, ceilings, and any overhead work have been completed.

E. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: Minimum 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: Subject to compliance with requirements, See Finish Materials Listing for Basis of Design. Also see preferred Vendor List for manufacturers that may be considered acceptable substitutions and must be submitted in accordance with Divison 01 Section "product requirements".

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips: See Floor Transition Details in the Finish Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

4. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

C. For metal subfloors, verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. For painted subfloors, verify the following:

1. Perform bond test recommended in writing by adhesive manufacturer.

E. Proceed with installation only after substrates pass testing and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: **[Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive]**

C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

F. Install pattern parallel to walls and borders. See Finish Drawings per patterns and layouts.

G. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

H. Install edge strips and trim in accordance with manufacturer's written instructions concealing exposed edges.

I. Do not place furniture or heavy objects on carpeted surfaces for a minimum of 2 hours or until adhesive has set.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile with non-staining building material paper, hard board or plywood to comply with CRI 104, Section 16, "Protecting Indoor Installations." Do not use plastic sheeting.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 099100

EXTERIOR PAINTING, INTERIOR PAINTING, HIGH-PERFORMANCE COATINGS, STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish labor, materials, tools and other equipment, and services necessary to provide the surface preparation and the application of paints, high performance coatings, stains and transparent finish systems, including all accessory items as required for a complete installation:
   1. Interior and exterior, vertical and horizontal substrates:
      a. Concrete
      b. Clay masonry
      c. Concrete masonry units (CMU)
      d. Steel (ferrous metal)
      e. Galvanized and nonferrous metal
      f. Aluminum (not anodized or otherwise coated)
      g. Stainless steel flashing
      h. Wood (Exposed glue-laminated beams and columns, exposed dimension lumber, dressed lumber, exposed wood panel products)
      i. Gypsum board (Interior and Exterior)
      j. Plaster
      k. Spray textured ceilings
      l. Cotton or canvas insulation covering
      m. ASJ insulation covering (mechanical pipe insulation)
      n. Plastic trim fabrications

B. Work under this Section also includes moisture and alkalinity testing, and surface preparation of substrates as required for acceptance of finishes, including but not necessarily limited to, cleaning, small crack repair, patching, sanding, caulking, any other work required to provide smooth substrates, and specific pre-treatments such as sealing and priming of surfaces to the limits defined within the Master Painters Institute's (MPI) "Architectural Painting Manual" and/or "Maintenance Repainting Manual."

C. Related Requirements:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary/permanent climate requirements.
   2. Division 03 Section "Cast-In-Place Concrete" for special finishes.
   3. Division 04 Section "Unit Masonry" for paints and sealers over concrete or clay units.
   4. Division 05 Sections for shop priming of metal substrates such as exposed structural steel, decking and miscellaneous metal which is not scheduled to have fire-resistive materials with primers and finish paints specified in this Section.
   5. Division 06 Sections for shop priming carpentry with primers specified in this Section.
   6. Division 07 Section "Traffic Coatings" for pedestrian traffic coatings, vehicular traffic coatings, equipment room floor coatings, and pavement-marking paints.
   7. Division 08 Sections for factory priming wood windows and doors with primers specified in this Section.
   8. Division 09 Section "Gypsum Board" for surface preparation of gypsum board.
   9. Division 09 Painting Sections for special-use coatings.
   10. Divisions 22, 23 and 26 for additional painting, color coding and stenciling requirements.
   11. Division 32 for alkyd-resin and glass bead pavement-marking paints and decorative concrete staining.

1.03 REFERENCE STANDARDS

A. The following reference standard shall be used in conjunction along with additional more stringent information stated herein:
   1. Master Painters Institute (MPI)
      a. MPI Architectural Painting Specification Manual
   2. This specification shall be supplemented by any applicable federal, state and local building codes, guidelines, regulations, and standards adopted in the immediate geographic area of the Project; insurance rating organizations; including all other Authorities Having Jurisdiction.

1.04 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.05 ACTION SUBMITTALS

A. Submit items in accordance with Division 01 Section “Submittal Procedures.”

B. Product Data: For each type of product indicated, submit two (2) copies of manufacturers’ product data, installation instructions and accessories specified and /or required by manufacturer.

D. Samples for Verification:
   1. For each type of paint and high-performance coating system and in each color and gloss of topcoat:
      a. Submit two (2) Samples on rigid backing, 8 inches square.
      b. Step coats on Samples to show each coat required for system.
      c. Label each coat of each Sample.
      d. Label each Sample for location and application area.
   2. For each type of stain and transparent finish system and in each color and gloss of finish indicated.
      a. Submit two (2) Samples on representative samples of actual wood substrates, 8 inches square.
      b. Label each Sample for location and application area.

E. Product List: For each product indicated, submit two (2) copies. Include the following:
   1. Indicate each product and cross-reference to finish system color including locations of application areas. Use same designations indicated on Drawings and in schedules. Provide Final Product List and include Finish System Chart in closeout documents.
   2. VOC content of each product specified.
   3. Include product list in closeout Submittals.

1.06 MISCELLANEOUS MATERIALS

A. Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint, high-performance coatings, stains and transparent finishes: 1 gal. of each material, color and finish applied.

B. Oils, Turpentine, Mineral Spirits and other materials required to accomplish this work shall be first quality materials.

C. Thinners shall be of a type as recommended by the paint manufacturer for each product specified.

1.07 QUALITY ASSURANCE

A. Applicator Qualifications: A company or individual, qualified and approved by Manufacturer/Supplier, with a minimum of five years of continuous, uninterrupted experience in successfully applying work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance, and who agrees to employ only skilled tradesmen with a minimum of three years' experience.

B. Mockups: Apply mockups of each finish system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions including lighting for application of each finish system specified in Part 3.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Pre-Installation Conference: Conduct conference at Project site prior to commencement of field installation with Contractor, Subcontractor, Architect/Designer and others, as required.
   1. Review requirements for substrates and for preparation by other trades.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers with original labels in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F nor greater than 90 deg F and/or more restrictive requirements as per manufacturer.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

B. Conform to requirements of local Authorities Having Jurisdiction in regard to the handling, mixing, application and disposal of all paint materials, related waste materials, and/or hazardous materials.

1.09 FIELD CONDITIONS

A. Apply paints, high performance coatings, stains and transparent finishes only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F and/or more restrictive requirements as per manufacturer.

B. Do not apply paints, high-performance coatings, stains and transparent finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp, wet and/or unprepared surfaces. Coordinate any more restrictive requirements with manufacturer.

C. Only apply paints when atmosphere is relatively free of airborne dust and contaminates.

D. When dry abrasive blasting carbon steel surfaces, the dew point temperature in the space must be maintained at least 17 deg F. lower than the temperature of the surface being prepared or greater as per manufacturers' recommendations.

E. During paint and coating application, the dew point temperature in the space must be maintained at least 10 deg F. lower than the temperature of the surface being painted along with additional more stringent parameters set forth by paint and coating manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The “Basics of Design” is the Sherwin-Williams Co., as listed in Section 3.06, Painting Schedule. These establish performance requirements and a standard of quality, unless otherwise specified. Substitutions shall be manufactures as listed in the Manufacturers: Subject to compliance with requirements, provide products by manufacturers listed in Document 002150 - Owner’s Preferred Vendor List. No substitutions permitted.

2.02 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
   3. Provide products of same manufacturer from each coat in a finishing system and prepare paints as per manufacturer’s recommendations.

B. VOC Content: Products shall comply with VOC limits of Authorities Having Jurisdiction [and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
   1. Flat Paints and Coatings: 50 g/L
   2. Nonflat Paints and Coatings: 150 g/L.
   3. Dry-Fog Coatings: 400 g/L.
   4. Primers, Sealers, and Undercoaters: 200 g/L.
   5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
   6. Zinc-Rich Industrial Maintenance Primers: 340 g/L
   7. Pretreatment Wash Primers: 420 g/L
   8. Floor Coatings: 100 g/L

D. Colors: See the Finish Materials Listing in the Finish Drawings.

2.03 SOURCE QUALITY CONTROL

A. Testing of Finish Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint, high-performance coatings and wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints, high-performance coatings and wood finishing if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces if, on refinishing with complying materials, the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows (or less as per manufacturer):
   1. Concrete: 12 percent
   2. Masonry (Clay and CMU): 12 percent
   3. Wood: 15 percent
   4. Portland Cement Plaster: 12 percent
   5. Gypsum Board: 12 percent
   6. Plaster: 12 percent

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Interior and Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Plaster Substrates: Verify that plaster is fully cured.

F. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

G. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

H. Verify gypsum board finish level prior to application of paints and high-performance coatings.
   1. Gloss, semi-gloss and high-performance coatings - Level 5 Drywall Finish
   2. Satin, eggshell and flat paints - Level 4 Drywall Finish

I. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and finish systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing finish operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, high-performance coatings, stains and transparent finishes including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce finish systems indicated.

D. Concrete Substrates: Allow concrete to cure for 28 days. Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
   1. Concrete Floors: Prepare concrete floors by abrasive blast cleaning and/or mechanically profiling in accordance with manufacturer’s recommendations. Acid etching may be used if specifically recommended by manufacturer.
   2. High Performance Coatings:
      a. Clean surfaces with pressurized water. Use pressure range in accordance with MPI Manual.
      b. Abrasive blast clean surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."

E. Masonry Substrates: Allow masonry to cure for 28 days. Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
   1. High-Performance Coatings:
      a. Clean surfaces with pressurized water. Use pressure range in accordance with MPI Manual.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. Paints:
      a. SSPC-SP 2, "Hand Tool Cleaning."
      b. SSPC-SP 3, "Power Tool Cleaning."
      c. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
      d. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
   2. High-Performance Coatings:
      a. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
      b. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
      c. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
      d. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
      e. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints or high-performance coatings. Damaged galvanized areas shall be cleaned as per manufacturers' recommendations and shall be coated with zinc rich paint prior to and additional finish painting.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:
   1. Wood substrates to be finished with paint or high-performance coatings.
      a. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for use in paint system indicated.
      b. Sand surfaces that will be exposed to view, and dust off.
      c. Prime edges, ends, faces, undersides, and backsides of wood.
      d. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   2. Wood substrates to be stained:
      a. Exterior Wood Substrates:
         1) Scrape and clean knots, and apply coat of knot sealer before applying primer.
         2) Prime edges, ends, faces, undersides, and backsides of wood.
            (a) For varnish coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
         3) Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

L. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

M. Mold and/or Mildew: Notify Owner and Architect of all locations where mold/mildew is discovered prior to proceeding with application of any finish systems. Removal of substrate material will be required at all gypsum product locations and at other areas as per Owner/Architect's direction.

3.03 APPLICATION

A. Apply paints, high-performance coatings, stains and transparent finishes according to manufacturer's written instructions and recommendations in "MPI Manual."
   1. Use applicators and techniques suited for finish system and substrate indicated.

2. Finish surfaces behind movable items same as similar exposed surfaces. Before final installation, finish surfaces behind permanently fixed items with prime coat only.
3. Finish both sides and edges of doors and entire exposed surface of door frames.
4. Finish front and back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
5. Prime glazing stops and glazing beads before glass is installed.
6. Finish entire exposed surface of window frames and sashes.
7. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
8. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply finishes to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Apply a minimum of four coats of paint or high-performance coating to surfaces specified to receive deep or bright colors.

F. Backprime exterior and interior woodwork which is to receive paint finish, with exterior primer.

G. Remove grilles, covers, and access panels and paint separately.

H. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following Work where exposed in equipment rooms:
      a. Equipment, including panelboards, switch gear tanks, stands and supports
      b. Uninsulated metal piping
      c. Uninsulated plastic piping
      d. Pipe hangers and supports
      e. Metal conduit
      f. Plastic conduit
      g. Tanks that do not have factory-applied final finishes
      h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      i. Equipment, stands, supports, intake bonnets, flutes and all factory-primed items to receive final paint that are exposed to view in equipment rooms, on the roof or outside the building.
   2. Paint the following Work where exposed in occupied spaces:
      a. Equipment, including panelboards
      b. Uninsulated metal piping
      c. Uninsulated plastic piping
      d. Pipe hangers and supports
      e. Metal conduit
      f. Plastic conduit
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material
      h. Other items as directed by Architect.
      i. Equipment, stands, supports, intake bonnets, flutes and all factory-primed items to receive final paint that are exposed to view in equipment rooms, on the roof or outside the building.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces with primer and one coat of “black” (non-reflecting) paint recommended by manufacturer.
4. Paint disconnect switches for fire alarm system and exit light systems in ‘red’ enamel, unless factory finished in specified color.
5. Keep all sprinkler heads and escutcheons free of paint.
6. Backprime and paint face and edges of fire-retardant plywood service panels for telephone and electrical equipment before installation, to match adjacent wall surface. Leave equipment in original finish except for touch up as required, and paint conduits, mounting accessories and other unfinished items.
7. Any code required fire-retardant wood/plywood used for electrical and/or telephone equipment shall retain one grade/label stamp free from paint.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test finishes for dry film thickness.
   1. Contractor shall touch up and restore finished surfaces damaged by testing.
   2. If test results show that dry film thickness of applied finish does not comply with manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with manufacturer's written recommendations.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered finishes by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted or finished surfaces.

3.06 EXTERIOR PAINTING AND FINISH SCHEDULE

A. **EPS-1** Concrete, Dense Masonry, Porous Block, Brick or Stucco [TEXTURED FINISH]
   1. Acrylic Aggregate
   2. Finish: Fine, Medium or Coarse Texture [EDIT]
   3. 1st Coat: Concrete, Dense Masonry, Brick and Stucco - Loxon Acrylic Primer #LX02W0050
      Block, Split Face and Fluted Block - Loxon Block Surfacer #LX01W0200
   4. 2nd Coat: Ultracrete Textured Masonry Topcoat #CF17W0811 Series

   [OR]

B. **EPS-1** Concrete, Dense Masonry, Porous Block, Brick or Stucco [SMOOTH FINISH]
   1. Acrylic Coating
   2. Finish: Flat
   3. 1st Coat: Concrete, Dense Masonry, Brick and Stucco - Loxon Acrylic Primer #LX02W0050
      Block, Split Face and Fluted Block - Loxon Block Surfacer #LX01W0200
   4. 2nd & 3rd Coat: ConFlex Acrylic Coating #CF13W0051 Series

C. **EPS-2** Concrete, Dense Masonry, Porous Block, Brick or Stucco [TEXTURED FINISH -WATERPROOFING SYSTEM TO BE USED WITHIN 100 MILES OF THE COAST OR WHERE WATERPROOFING IS REQUIRED]
   1. Elastomeric Coating
   2. Finish: Fine, Medium or Extra Coarse Texture [EDIT]

3. 1st Coat: Concrete, Dense Masonry, Brick and Stucco - Loxon Acrylic Primer #LX02W0050
   Block, Split Face and Fluted Block - Loxon Block Surfacer #LX01W0200
4. 2nd & 3rd Coat: Conflex Flexible Concrete Waterproofer Textured #CF15- Series

[OR]

D. **EPS-2** Concrete, Dense Masonry, Porous Block, Brick or Stucco [SMOOTH FINISH - WATERPROOFING SYSTEM TO BE USED WITHIN 100 MILES OF THE COAST OR WHERE WATERPROOFING IS REQUIRED]
   1. Elastomeric Coating
   2. Finish: Matte
   3. 1st Coat: Concrete, Dense Masonry, Brick, and Stucco - Loxon Acrylic Primer #LX02W0050
      Block, Split Face and Fluted Block - Loxon Block Surfacer #LX01W0200
   4. 2nd & 3rd Coat: Conflex Flexible Concrete Waterproofer #CF15- Series

E. EPS-3 Steel, Galvanized Steel or Nonferrous Metals
   1. Acrylic Coating
   2. Finish: Semi-Gloss
   3. 1st Coat: Pro Industrial Pro-Cryl Universal Primer #B66W1310
   4. 2nd & 3rd Coat: Pro Industrial Acrylic coating #B66-600 Series

F. **EPS-4** Existing Painted or Factory Finished Metal Surfaces [MECHANICAL EQUIPMENT, PRE-PAINTED SURFACES]
   1. Alkyd Enamel
   2. Finish: Gloss
   3. 1st Coat: Kem Kromik Universal Metal Primer #B50NZ6 or #B50WZ1
   4. 2nd Coat: Industrial Urethane Alkyd #B54-150 Series

G. **EPS-5** Steel, Galvanized Steel or Non-Ferrous Metals, Existing Painted or Factory Finished Metal Surfaces [HIGH PERFORMANCE COATING SYSTEM - HANDRAILS, EXPOSURE TO SALT-SPRAY, REPAINTING FACTORY FINISHED METAL AREAS HARD TO RE-COAT.]
   1. Acrylic Aliphatic Polyurethane
   2. Finish: Semi-gloss
   3. 1st & 2nd Coats: Macropoxy 646 Fast Cure Epoxy Mastic #B58 Series
   4. 3rd Coat: Pro Industrial Acrolon 100 HS Waterbased Urethane #B65-520 Series
      [IF USING BRIGHT/DEEP COLORS, AN ADDITIONAL TOPCOAT MAY BE REQUIRED. CONSULT WITH MANUFACTURER.]

H. **EPS-6** Drywall or Plaster
   1. Acrylic Latex
   2. Finish: Flat or Satin [EDIT]
   3. 1st Coat: Exterior Latex Primer #B42W8141
   4. 2nd & 3rd Coat: SuperPaint Exterior Latex Flat #A80- Series [OR]
      SuperPaint Exterior Latex Satin #A89- Series

I. **EPS-7** Wood, Painted
   1. Acrylic Latex
   2. Finish: Flat or Satin [EDIT]
   3. 1st Coat: Exterior Latex Primer #B42W8141
   4. 2nd & 3rd Coats SuperPaint Exterior Latex Flat #A80-Series [OR]
      SuperPaint Exterior Latex Satin #A89-Series

J. **EPS-8** Wood, Semi-Transparent Stain [LASTS LONGER, LOOKS BETTER - REVIEW WITH MANUFACTURER.]
   1. Polyurethane
   2. Finish: Flat
   3. 1st & 2nd Coats: WoodScapes House Stain #A15T5 Series

[OR]

K. **EPS-8** Wood, Semi-Transparent Stain [PROVIDES A MORE UNIFORM LOOK ON WOODS WITH IRREGULAR GRAINING PATTERN AND WHEN TOUCHING UP EXISTING IN ADDITION TO STAINING ADJACENT NEW WORK - REVIEW WITH MANUFACTURER.]
1. Alkyd
2. Finish: Flat
3. 1st & 2nd Coats: Woodscapes Exterior Premium Translucent #A15C104 Series

L. **EPS-**9 Concrete Floors, Clear Sealer
1. Alkyd
2. Finish: Flat
3. 1st Coat: H & C Concrete and Masonry Waterproofing Sealer #50.043.054 - Applied at manufacturer's recommended application rate. Conduct water test to assure proper seal on concrete. If water does not "bead up" on concrete, apply second coat.

M. **EPS-10** Concrete, Opaque Sealer [AVAILABLE IN ANY SHERWIN WILLIAMS COLOR]
1. Silicone Acrylic
2. Finish: Satin
3. 1st & 2nd Coats: H & C Concrete Sealer #10.104.01

3.07 INTERIOR PAINTING SCHEDULE

A. **IPS-3** Steel, Galvanized Steel or Non-Ferrous Metal Substrates [MEETS LEED REQUIREMENTS]
1. Acrylic Enamel
2. Finish: Semi-Gloss
3. 1st Coat: Pro-Cryl Universal Primer #B66-1310 Series
4. 2nd & 3rd Coat: Pro Industrial Acrylic Semi-Gloss #B66-650 Series

B. **IPS-4** All Substrates in Overhead Decking [WET ENVIRONMENTS, SKYLIGHTS - REVIEW COATINGS WITH MANUFACTURER - WET AREAS REQUIRE SPECIAL ATTENTION.]
1. Acrylic Urethane
2. Finish: Gloss
3. 1st Coat: Pro-Cryl Universal Primer #B66-1310 Series
4. 2nd Coat: Pro Industrial Acrolon 100 HS Water-Based Urethane #B65 Series

C. **IPS-5** All Substrates in Overhead Decking [DRY ENVIRONMENTS ONLY]
1. Waterborne Acrylic Dry Fall
2. Finish: Eggshell
3. 1st Coat: Pro-Cryl Universal Primer #B66W1310 Series
4. 2nd Coat: Waterborne Acrylic Dry Fall Eg-Shel #B42W82 Series [WHITE]

D. **IPS-6** Gypsum Wallboard - Ceilings
1. Acrylic Latex
2. Finish: Eggshell
3. 1st Coat: ProMar 200 Zero VOC Interior Latex Primer #B28W12600
4. 2nd & 3rd Coat: ProMar 200 Zero VOC Interior Latex Eg-Shel #B20-Series

E. **IPS-7** Gypsum Wallboard - Walls
1. Acrylic Latex
2. Finish: Eggshell
3. 1st Coat: ProMar 200 Zero VOCInterior Latex Primer #B28W12600
4. 2nd & 3rd Coats: ProMar 200 Zero VOC Interior Latex Eg-Shel #B20-Series

F. **IPS-8** Gypsum Wallboard [VERY HARD AND SCRUBBABLE, USE IN WET ENVIRONMENTS -WHEN USING EPOXY PAINT ON AN EXTERIOR WALL IN AREAS WITH HIGH HUMIDITY, DISCUSS PERMEABILITY REQUIREMENTS WITH ARCHITECT.]

1. Waterbased, Catalyzed, Epoxy Resin High-Performance Coating
2. Finish: Low Gloss
3. 1st Coat: ProMar 200 Zero VOC Interior Latex Primer #B28W12600
4. 2nd & 3rd Coat: Waterbased Catalyzed Epoxy #B73 Series
   [FOR SUSTAINED WET ENVIRONMENTS, REVIEW COATINGS WITH MANUFACTURER - WET AREAS REQUIRE SPECIAL ATTENTION]

G. **IPS-13** Concrete Floors
1. Polyamide Epoxy Coating
2. Finish: Gloss
3. Primer: Armorseal 8100 Primer Water Based Epoxy Floor Coating #B70 Series
4. 2nd & 3rd Coat: Armorseal 8100 Water Based Epoxy Floor Coating #B70 Series [with SharkGrip] Additive]

H. **IPS-15** Pipe Identification
1. All piping or piping insulation within each mechanical room, fan room, boiler room, powerhouse and other exposed areas shall be painted in its entirety with Pro Industrial Acrylic coating #B66-650 Series.
2. Plumbing:
   a. Natural Gas - Venture Violet, SW6970
   b. Propane - Safety Orange
   c. Fuel Oil - Nomadic Desert, SW6107
   d. Fire Protection Standpipe and Sprinkler Piping - Safety Red
   e. Steam Condensate - Osage Orange, SW6890
   f. Chilled Water - Safety Green
   g. Condenser Water - Synergy, SW6938
   h. Hot Water Piping - Merry Pink, SW6844
   i. Domestic Cold Water - Safety Blue
   j. Domestic Hot Water - Rose Chintz, SW1587
   k. Chemical Feed Piping - Safety Yellow
3. Medical Gases:
   a. Oxygen - Greens, SW6748
   b. Nitrous Oxide - Nitrous Oxide - Blueblood, SW6966
   c. Nitrogen - Nitrogen - Black background with white letters
   d. Vacuum - White
   e. Medical Air - Sunrise, 6668
4. Elevator:
5. Hydro Lines - Acapulco Sun, SW1607
   a. Stenciling of all exposed and concealed piping shall be applied in “black” letters and in accordance with Division 22 - Plumbing - using the same coating materials.

F. Interior Barrier And Partition Stenciling
1. Stencil in contrasting color to background, all corridor partitions, smoke, fire, horizontal exit, exit enclosures and other rated partitions with permanent 3” high letters identifying the name and hour rating of the partition, approximately 8” above the ceiling every 20 feet on both sides of partition, or 10 feet from corners, and identified once in each space having fire-rated or smoke walls. Plenum areas below access flooring shall be stenciled in the same manner as areas above ceilings; however, paint finishes must go all the way down to substrate, not the demarcation line of access flooring. Identify walls as applicable, “1-HOUR FIRE,” “2-HOUR FIRE, ETC.”

END OF SECTION

SECTION 101405
EXTERIOR SIGNAGE

PART 1 GENERAL

1.01 GENERAL NOTES

A. Refer to Section 101419 for additional Signage info.

B. The following Performance Requirements and General Conditions are an important preamble to the technical specifications for signage which are referred to as the “Design Intent Drawings”.

C. The party responsible for program management, manufacture, construction, production and installation, as well as their agents, and any sub-contractors are referred to as the “Sign Contractor (SC)”.

D. Shop drawings shall be provided by the SC to be used as the final construction documents and shall include complete construction and installation details required for implementing the designs described herein. Stamped engineering drawings will be provided by the SC as locally required by a landlord or city authority. This must be included in all original quotes/bids.

E. The SC is responsible to review and follow the General Conditions terms and the Design Intent Drawings.

F. “Client/HCA Healthcare” or “Client Representative/BrandActive” referred to as the “Owner”. Any exclusions or substitutions to the General Conditions or the Design Intent Drawings must be approved by the Owner.

G. The Designs and plans indicated or presented by the Design Intent Drawings are property of the Owner.

H. In all cases where local engineering is required, the Engineer shall be licensed to practice in the applicable area and be in good standings. The acceptance of these drawings by the SC constitutes the acceptance of the following conditions:
   1. The SC is entirely responsible for working drawings, shop drawings and contract documents including permit documents and submissions.
   2. The Owner will review the SC’s documentation for adherence to strictly design intent only:
      a. Not to be interpreted as an approval of engineering/structural elements or construction purposes.
      b. Not to alter the requirement to produce artwork that is consistent with the approved site recommendation document.
      c. Not part of the accuracy of the SC’s message copy.

1.02 WORK INCLUDED

A. Sign Contractor (SC) shall furnish all labor, materials, equipment, tools, supplies and services necessary and incidental to complete fabrication, installation and delivery of sign(s) as specified. SC shall be responsible for a complete and thorough job. Materials not specifically described but required for a complete and proper installation shall be identified and provided for by the SC. SC shall be responsible for the quality of all materials and workmanship of any firms or individuals who act as SC’s subcontractors. SC shall be responsible for providing subcontractors with complete and up-to-date drawings, specifications, sign schedules and other information issued for this project. SC shall be responsible for coordinating final review and approval of all copy wording with designer prior to submittal of shop drawings.

B. The Owner reserves the right to add and otherwise modify sign text and lettering layout during the shop drawing review at no additional cost to the Owner.

C. The SC shall provide complete and comprehensive fabrication/installation liaison with all other trades. Where the SC is providing graphics only, it shall be the SC’s responsibility to schedule his work to coincide with other trades’ fabrication, finishing and installation schedules.

D. The SC shall provide dimensioned shop drawings for all signs clearly showing materials, typographic layouts, fabrication methods, external finishes, anchorage, electrical connections and other details of construction as well as details related to engineering and other construction responsibilities. SC shall be responsible for all construction, installation and internal supports for a safe and permanent installation of all signs. SC shall provide location detail drawings for signs supported or anchored to other construction. SC is responsible for providing stamped engineering drawings where required.

E. Prior to any sign fabrication, SC shall provide samples of each sign product and material samples showing finishes, typography, letter spacing, colors and surface textures shown in the Design Intent Drawings.

F. The SC shall provide manufacturer's technical data and installation instruction for each type of sign required.

G. SC to verify ALL site conditions prior to production, verify all power requirements are properly met at all signage locations.

H. All fasteners used are to be concealed and shall not be visible from any viewing angle/direction, unless noted in drawings.

1.03 LIGHTING

A. All lighting hardware such as transformers/ballasts/light control modules, are to be placed inside sign system. If a remote placement is required, fabricator to coordinate with the Owner concerning the remote location required.

1.04 FIELD DIMENSIONS

A. The SC shall be responsible for field measurements as required to verify or supplement dimensions indicated herein and shall be responsible for accurate fit of signs upon installation.

B. ALL lighting levels to be uniform. All lighting efects to be consistent with no hot-spots and/or shadows to be cast. Color to match Brand Standard Colors and to be approved by the Owner prior to fabrication and install. Illumination to be provided by appropriate exterior grade LED lighting with on/of timer or photocell.

1.05 QUALITY ASSURANCE

A. The intent of the drawings and contract documents package is to provide all information necessary for a complete contract. In the event of a discrepancy, or an error, neither one rules over the other. Notify the Owner if any discrepancies arise for direction on how to proceed.

B. The Owner must be notified of any variations of conditions as shown on these drawings. It shall be the SC's responsibility to obtain and utilize the most current and up-to-date plans and specifications for all construction and installation work.

C. Work done and material furnished shall be of superior quality in every respect. Signs and sign panels shall be at, plumb, and without oil-canning. All edges, and surfaces to be smooth and free from burrs.

D. The Owner shall reserve the right to reject any shop drawings, samples, or other submittals, as well as any finished product or installation that does not meet or exactly equal the standard of quality established. Any such decision will be considered final and not subject to recourse.

E. All electrical components shall display required manufacturer's safety and/or electrical labels (UL/Hydro) or approved equal standards as acceptable by the Owner. Such labels and equipment shall not be displayed or positioned so as to detract from the aesthetic quality of each sign.

F. The SC must guarantee that only new materials are being used for this work.

G. Products must be made accessible for quality control inspection at any time.

H. Any claims for work carried out on instructions by others will not be accepted or honored.

I. All materials to be painted with Matthews Paint (or approved equivalent) according to the paint supplier directions and standards, for high-quality finish.

1.06 SUBSTITUTIONS

A. Bidders shall submit (with bids), written notification of all proposed substitutions from specifications. Substitutions of any kind shall be approved prior to any sign fabrication or installation. No substitutions will be considered without samples.

1.07

A. The SC is responsible for visiting the site and familiarizing themselves with its conditions prior to submitting a bid.

B. The SC must familiarize themselves with sub-soil conditions which may affect engineering of footings/sign supports.

C. All necessary sign permits are to be obtained by the SC.

D. The SC is responsible for 'locates' (i.e. gas, phone, power lines, etc.) which may affect sign supports/footings and locations.

E. The SC is responsible for electrical and communications hookup and all internal wiring, and supply of appropriate components (e.g., outdoor ballasts, etc.) for all signs. For this tender assume that 120V primary power will be made available by the Owner, to a point at the location of any illuminated signs. Final hookup will be the responsibility of the SC.

F. The SC is to protect goods supplied by them from damage during installation with appropriate insurance against fire, theft, or other damage. He shall also protect from injury the property of the Owner, which may be adjacent, or with which he may come in contact, and he shall make good any such damage occurring through his fault.

G. The SC shall not use any hazardous substances in the manufacture of the signs, nor bring on site any hazardous substances, regulated under any environmental laws, without the express written consent of the Owner.

H. Upon completion of the project the SC shall provide the Owner with a manual and/or instructions on the care and maintenance of the signs and replacement of component parts.

1.08 CONFIDENTIALITY

A. Care must be taken to not leave drawings in view such that they may be seen by unauthorized parties. The SC and their sub-contractors are responsible for carefully maintaining possession of all drawings and associated information (electronic or hard copy) and may be held accountable for damages that result from disclosure of confidential information.

1.09 ARTWORK

A. Electronic artwork as required by the SC for symbols or custom designed graphic components (e.g., logos, logo types, arrows and patterns) will be provided electronically in vector format and should not be altered.

B. All artwork scaling without distortion or loss of scale is the responsibility of the SC.

C. The SC may request full scale artwork, if that will reduce the risk of scaling errors and the Owner may provide this where willing and able.

D. Issues such as messages being too long to fit into the required formats, difficulty accurately reproducing logo or logotype components, etc., must be brought to the attention of the Owner prior to execution. It is required that the SC not resolve any discrepancies without consulting the Owner.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

3.03 SCHEDULES (REFER TO DESIGN DRAWINGS)

END OF SECTION

SECTION 101419
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

B. Illumination system.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
   2. Show locations of electrical service connections.
   3. Include diagrams for power, signal, and control wiring.

D. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of selection charts or chips.

E. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package dimensional letter signs as required to prevent damage before installation.

B. Store under cover and elevated above grade.

C. Store tape adhesive at a normal room temperature of 68 to 72 degrees F (20 to 22 degrees C).

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.02 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: Aluminum sheet, flat.
   2. Letter Height: As indicated on drawings.
   3. Text and Typeface:
      a. Character Font: Refer to Client's design guidelines.
   4. Finish: Anodized.
   5. Color: As selected.

6. Mounting: Projected mount with collars.
7. Illumination System: Full-lit plastic letters.
    a. Provide products that are listed and labeled as complying with UL 879, where applicable.
    b. Power: 120 V, 60 Hz, 1 phase, 15 A.

2.03 ACCESSORIES

A. Electrical Components and Devices: Listed and labeled as defined in NFPA 70 by a qualified testing agency.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that electrical service is correctly sized and located to accommodate dimensional letter signs.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 101423
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Verification Samples: Submit samples showing colors, materials, and finishes specified.

F. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store under cover and elevated above grade.

D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. REFER TO INTERIOR DESIGNER'S CONSTRUCTION DOCUMENTS.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Room and door signs.
   2. Description: Flat signs with injection molded panel media, tactile characters.
   3. Sign Size: As indicated on drawings.
   4. Total Thickness: 1/8 inch (3 mm).
   5. Sign Edges: Bevelled.
   6. Letter Edges: Squared.
   7. Corners: Radiused.
   8. Color and Font, unless otherwise indicated:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper and lower case (title case).
      c. Background Color: As scheduled.
      d. Character Color: Contrasting color.
   9. Material: One-piece injection molded acrylic plastic with raised letters and braille.
   10. Profile: Flat panel without frame.
   11. Tactile Letters: Raised 1/32 inch minimum.
   12. Braille: Grade II, ADA-compliant.
   13. One-Sided Wall Mounting: Tape adhesive.

2.04 SIGNAGE APPLICATIONS

A. Room and Door Signs:
   1. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section for replaceable occupant name.
   2. Conference and Meeting Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section with sliding "In Use/Vacant" indicator.
   3. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
   4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

2.05 ACCESSORIES

A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

END OF SECTION

SECTION 101426
EXTERIOR P&P SIGNAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior Signage Systems:
   1. Post and Panel Signage.

1.02 REFERENCES

A. Americans with Disabilities Act (ADA).

B. American National Standards Institute (ANSI):
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities Standards.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be installed.

C. Shop Drawings: Shop drawings with letter style, dimensions, materials, finishes and general layout for each sign type, with sizes, edge and corner treatment, and mounting methods shown.

D. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors, patterns and finishes.

E. Sustainable Design Submittals:
   1. Recycled Content – Provide documentation from Manufacturer verifying percentage of recycled and post-consumer content.
   2. Regional Materials – Provide documentation form manufacturer/distributor showing location where materials were obtained from for each component.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have five years experience manufacturing and fabricating products of similar type and scope as those specified in this section.

B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1 and Unified Federal Accessibility Standards (UFAS)

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's recommendations for delivery, storage and handling.

B. Materials shall be delivered to the location in unopened, labeled factory containers. Upon delivery, materials shall be inspected for damage. Deficient materials shall not be used.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Corpus Christi Stamp Works Inc. DBA/ National Signage Affiliates, which is located at: P. O. Box 2189 502 S. Staples (78401) ; Corpus Christi, TX 78403; Toll Free Tel: 800-322-4515; Email: (sales@ccswsignsystems.com); Web: www.nationalsignageaffiliates.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 POST AND PANEL SIGNAGE

A. H2.3 Series Post and Panel Signage System
   1. Model No: As indicated on Drawings;

2. Description: Non-illuminated Post and panel signage using Aluminum posts with two layers of panels of either Dibond or Aluminum; can be constructed with different frames (body) for the panels and either 0 inch, 3/8 inch or 3/4 inch reveal.
    a. Size: As indicated on Drawings.
3. Posts: Aluminum
    a. 3 ¼ inch (83 mm) square posts
    b. Shape as Indicated on Drawings
    c. Length/Height: As Indicated on Drawings.
    d. Finish: Paint
        1) Color: As Indicated in Drawings.
4. Body Type (Select One)
    a. Bleed Body: Framing Component to attach panels to posts providing an edgeless look.
5. Reveal Size: As Indicated on Drawings.
6. Panels:
    a. 1/8 inch Aluminum Panel
    b. Text and Graphics: As indicated on Drawings.
    c. Size: As indicated on Drawings.

B. Hardware:
1. Hardware to be countersunk stainless steel.
2. Paint or otherwise protect the metal components from galvanic action according to Engineer's instructions.
3. Size: Per Engineer's specification

C. Footing:
1. Construct footings for signage per Engineer specification or as indicated on Drawings.

2.03 GRAPHIC APPLICATION METHODS

A. GP6 - Digital Print
1. Description: Printing from a digital based image directly to paper or vinyl

PART 3 - EXECUTION

3.01 EXAMINATION

A. Installer shall examine signs for defects, damage, and compliance with specifications. Installation shall not proceed until satisfactory conditions are achieved.

B. Inspect conditions of substrate and other conditions which may affect installation of signage.

C. Do not begin installation until substrates are within manufacturer's specified tolerances and have been prepared in accordance with manufacturer's instructions.

D. If substrate preparation is the responsibility of another installer, do not proceed with installation. Notify Architect of any unsatisfactory conditions immediately.

E. Commencement of work is deemed as acceptance of installation conditions.

3.02 PREPARATION

A. Verify mounting heights and locations for signage will comply with specified requirements, including accessibility requirements.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Clean mounting locations of dirt, dust, grease or similar conditions that would prevent proper installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's printed installation instructions, and in proper relationship with adjacent work.

B. Use mounting methods and fasteners as recommended by the manufacturer.

C. Set level, plumb, rigid and at heights indicated with surfaces free from defects.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 102123
CURTAIN TRACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface mounted overhead curtain track and guides.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carriers: Ten.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept curtain materials on site and inspect for damage.

B. Store curtain materials on site and deliver to Owner for installation when requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cubicle Track and Curtains:
   1. A. R. Nelson Co: www.arnelson.com/#sle.
   2. Construction Specialties, Inc; Track Systems: www.c-sgroup.com/#sle.
   3. Imperial Fastener Co., Inc: www.imperialfastener.com/#sle.
   4. Inpro: www.inprocorp.com/#sle.

2.02 TRACKS AND TRACK COMPONENTS

A. Tracks: Extruded aluminum sections; one piece per track run.
   1. Profile: Channel.
   2. Mounting: Surface.
   3. Structural Performance: Capable of supporting vertical test load of 50 lbs (23 kg) without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
   4. Track End Stop: To fit track section.
   5. Track Bends: Minimum 12 inch (300 mm) radius; fabricated without deformation of track section or impeding movement of carriers.
   6. Finish on Exposed Surfaces: Clear anodized.

B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.

C. Installation Accessories: Types required for specified mounting method and substrate conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.

3.02 INSTALLATION

A. Install curtain track to be secure, rigid, and true to ceiling line.

B. Tracks shall be independently supported of the ceiling grid to the structure above.

C. Secure track to ceiling system.

D. Install end cap and stop device.

E. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 26 00
WALL PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish labor, materials, tools and other equipment, and services necessary to provide surface preparation and the application of wall protection, including all components and accessory items required for a complete installation:
   1. Wall guards.
   2. Impact-resistant handrails.
   3. Corner guards.
   4. Impact-resistant wall coverings.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for [metal angle corner guards] [pipe guards] [wheel guards].
   2. Section 087100 "Door Hardware" for metal armor, kick, mop, and push plates.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Uniform load of 50 lbf/ft. applied in any direction.
   2. Concentrated load of 200 lbf applied in any direction.
   3. Uniform and concentrated loads need not be assumed to act concurrently.

1.04 ACTION SUBMITTALS

A. Submit items in accordance with Division 01 Section "Submittal Procedures."

B. Surface Burning Characteristics Tests: Submit test results showing compliance with testing for regulatory requirements specified above.
   1. Any one of the following circumstances will be cause for rejection of the submittals for the work of the Section:
      a. Failure to test products on actual substrates as specified above.
      b. Failure of the products to achieve the surface burning characteristics specified herein.
      c. Failure to include surface burning characteristics tests as part of the submittal package for the work of this Section.

C. Product Data: For each type of product indicated, submit two (2) copies of manufacturer's product data including construction details, material descriptions, impact strength, fire-test- response characteristics, dimensions of individual components and profiles, finishes for each impact-resistant wall protection unit and installation instructions.

D. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. [Include Samples of accent strips to verify color selected.]
   1. [Wall] [and] [Corner] Guards: 12 inches long. Include examples of joinery, corners, [end caps,] [top caps,] and field splices.
   2. Handrails: 12 inches long. Include examples of joinery, corners, and field splices.
   3. Impact-Resistant Wall Covering: 6 by 6 inches square.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified [Installer] [testing agency].

B. Material Certificates: For each impact-resistant plastic material, from manufacturer.

C. Material Test Reports: For each impact-resistant plastic material.

D. Warranty: Sample of special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
   1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. [Wall-Guard] [and] [Handrail] Covers: Full-size PVC plastic covers of maximum length equal to [2] <Insert number> percent of each type, color, and texture of units installed, but no fewer than [two, 8-foot]<Insert number and size> long units.
   2. Corner-Guard Covers: Full-size PVC plastic covers of maximum length equal to [2] <Insert number> percent of each type, color, and texture of units installed, but no fewer than [two, 4-foot-] <Insert number and size> long units.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: Verify Installer is qualified and approved by Manufacturer with a minimum of five years of continuous, uninterrupted experience in successfully installing work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who agrees to employ only skilled tradesmen with a minimum of five years of experience.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Section 014000 "Quality Requirements."

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units.

E. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NRPA 255, or UL 723 by UL or another qualified testing agency.
   1. Tests for determining compliance for surface burning characteristics specified herein must have been performed on the substrates indicated in the Construction Documents as required by NFPA 101, Chapter 10
   2. Tests performed on material substrates other than the substrates indicated in the Contract Documents will not be accepted as valid tests.

F. Regulatory Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines] [and] [ICC/ANSI A117.1].

G. Pre-installation Conference: Conduct conference at [Project site] <Insert location>.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
   2. Keep plastic sheet material out of direct sunlight.
   3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
      a. Store corner-guard covers in a vertical position.
      b. Store [wall-guard] [and] [handrail] covers in a horizontal position.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.11 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Deterioration of plastic and other materials beyond normal use.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: InPro Corporation, sole source vendor. See Finish Material Listing for Basis of Design.

B. National Buying Contracts: See Preferred Vendor List for manufacturers contact information and Contract number for special pricing.

2.02 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact resistant PVC or acrylic-modified vinyl plastic with integral color throughout; [extruded] [and] [sheet] material, thickness as indicated.
   1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
   2. Chemical and Stain Resistance: Tested according to ASTM D 543 and ASTM D 1308.
   3. Self-extinguishing when tested according to ASTM D 635.
   4. Flame-Spread Index: 25 or less.
   5. Smoke-Developed Index: 450 or less.

B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5. (PVC or PETG retainers are not considered as an equal product.)

C. Stainless-Steel Sheet: ASTM A 240/A 240M.

D. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.
   1. Certified Wood: Fabricate products from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

E. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

F. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.03 WALL GUARDS

A. Bumper Rail: Assembly consisting of continuous snap-on plastic cover installed over concealed, continuous retainer; designed to withstand impacts.
   1. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; in dimensions, profiles, colors and textures indicated on Drawings.
   2. Continuous Retainer: Minimum 0.080-inch thick, one-piece, extruded aluminum.
   3. Retainer Clips: Manufacturer's standard impact-absorbing clips.
   4. Bumper: Continuous rubber or vinyl bumper cushion(s).
   5. End Caps and Corners: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
   6. Accessories: Concealed splices and mounting hardware.
   7. Mounting: As indicated on the Drawings. [THERE MAY BE MORE THAN ONE WAY TO MOUNT THE SPECIFIED BUMPER RAIL. COORDINATE WITH MANUFACTURER AND INDICATE IN WALL PROTECTION LEGEND.]

2.04 HANDRAILS

A. Impact-Resistant Plastic Handrails: Assembly consisting of snap on plastic cover installed over a continuous retainer.

1. Cover: Minimum 0.078-inch thick, extruded rigid plastic; in dimensions, profiles, colors and textures indicated on Drawings.
2. Retainer: Minimum 0.080-inch thick, one-piece, extruded aluminum.
3. Mounting Bracket: Extended mounting on injection-molded plastic mounting brackets.
4. End Caps and Corners: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
5. Accessories: Concealed splices, cushions, and mounting hardware.

2.05 CORNER GUARDS

A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135- degree turn to match wall condition.
   1. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; in dimensions, profiles, height, colors and textures indicated on the Drawings.
   2. Retainer: InPro Blunose.
   3. Retainer Clips: Manufacturer's standard impact-absorbing clips.
   4. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.06 END-WALL GUARDS

A. Surface-Mounted, Resilient, Plastic End-Wall Guard: Assembly consisting of snap-on plastic cover installed over continuous retainer at each corner, with end of wall covered by semi-rigid, impact-resistant sheet wall covering; including mounting hardware.
   1. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; in dimensions, profiles, height, colors and textures indicated on Drawings.
   2. Retainer: InPro Bluenose.
   3. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.07 IMPACT-RESISTANT WALL COVERINGS

A. Impact-Resistant Sheet Wall Covering: Fabricated from plastic sheet wall-covering material.
   1. Size: As indicated on the Drawings.
   2. Sheet Thickness: As indicated on the Drawings.
   3. Color and Texture: As indicated on the Drawings.
   4. Height: As indicated on the Drawings.
   5. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color for top cap, color match sealant preferred for vertical seams (CONFIRM TRIM PREFERENCE WITH END-USER)
   6. Mounting: Adhesive.

2.08 DOOR PROTECTION SYSTEMS

A. General: Comply with BHMA A156.6.
   1. For fire-rated doors, provide door protection systems that are UL listed and labeled.

2.09 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Preform curved semi rigid, impact-resistant sheet wall covering in factory for radius and sheet thickness as follows:
   1. Sheet Thickness of 0.040 Inch: 24-inch radius.

2. Sheet Thickness of 0.060 Inch: 36-inch radius.

C. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

E. Miter corners and ends of wood handrails for returns

2.10 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Remove tool and die marks and stretch lines, or blend into finish.
   2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
   3. Run grain of directional finishes with long dimension of each piece.
   4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, labeling requirements and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
   1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

A. General: Install impact-resistant wall protection units as level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
   2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
      a. Provide anchoring devices to withstand imposed loads.

b. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
c. Adjust end and top caps as required to ensure tight seams.

B. Impact-Resistant Wall Covering: Install top and edge moldings, corners, divider bars or optional color match sealant as required for a complete installation.

3.04 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 102800
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: American Accessories, Inc.; www.aaiusaonline.com.

B. Other Acceptable Manufacturers:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Georgia-Pacific Professional: www.blue-connect.com/#sle.
   4. Bobrick.
   5. Substitutions: Section 016000 - Product Requirements.

C. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide two keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

D. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Owner Furnished, Contractor Installed.

B. Soap/Foam Dispenser: Owner Furnished, Contractor Installed.

C. Paper Towel Dispenser: Owner Furnished, Contractor Installed.

D. Waste Receptacle Cans: Owner Furnished, Contractor Installed.

E. PPE Dispensers: Owner Furnished, Contractor Installed.

F. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   1. Minimum capacity: 250 seat covers.
   2. Product: CO-1 manufactured by AAi.
      a. AJW #U851
      b. ASI # 0477-SM
      c. Bobrick # B-221
      d. Bradley # 5831

G. Grab Bars: Stainless steel, peened surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
      b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Products:
         1) GA-2 series manufactured by AAi.
         2) AJW # UG2X-A.
         3) ASI # 3700-P
         4) Bobrick # B-5806.99
         5) Bradley # 832-2

2.05 OTHER ACCESSORIES

A. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Product: OR-5153 manufactured by AAi.
      a. AAI # OR-5153
      b. AJW # UX 110-SF
      c. ASi # 7340-S
      d. Bobrick # B-6717
      e. Bradley # 9114

B. Mirror: 24x36, channel framed
   1. Product: AAi # AR-2436
      a. AJW# U711
      b. ASI #0620
      c. Bobrick # B-165 2436
      d. Bradley # 780

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 061000 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
   1. Grab Bars: 34-1/2" AFF from center of grab bar
   2. Mirrors: 40 inch (_____ mm), measured from floor to bottom of mirrored surface.
   3. Other Accessories: As indicated on drawings.
   4. No accessories shall be mounted higher than 48" AFF to operable element of device.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

B. FM (AG) - FM Approval Guide; Current Edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

F. Confirmation from facility that the extinguisher brand is acceptable.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
   2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   3. Potter-Roemer: www.potterroemer.com/#sle.
   4. Purchase extinguisher brand that is acceptable to the hospital responsible for maintaining the project..

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group - JL Industries: www.activarcpg.com/#sle.
   2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   3. Larsen's Manufacturing Co: www.larsensmfg.com.
   4. Potter-Roemer: www.potterroemer.com.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 10 pound (4.54 kg).

3. Finish: Baked polyester powder coat color as selected.
4. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (___ degrees C).

C. Carbon Dioxide Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
1. Class: B:C type.
2. Size: 10 pound (4.54 kg).
3. Finish: Baked enamel, color as selected.
4. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
1. Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.

C. Fire Rated Cabinet Construction: One-hour fire rated.
1. Steel; double wall or outer and inner boxes with 5/8 inch (15.9 mm) thick fire barrier material.

D. Cabinet Configuration: Semi-recessed type.
1. Size to accommodate accessories.
2. Trim: Flat rolled edge, with 1.5 inch (____ mm) wide face.
3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.

F. Door Glazing: Tempered glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

J. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: Equal to Brady model # 45368. "V" shaped projecting signage 5-1/2" tall by 10" wide.

C. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced red lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 60 inches (____ mm) from finished floor to top of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

E. Position cabinet signage at 84" AFF.

F. Install high security key box plumb and level on exterior wall surface, where shown on drawings, per manufacturer's specific instructions and installation procedures. GC to coordinate exact model and final placement with the local AHJ.

3.03 SCHEDULES

A. Corridors: MP Dry Type ABC, placed in semi-recessed cabinet.

B. Electrical and Telecom Closets: CO2 Type BC, mounted on wall bracket hardware

C. Mechanical Rooms: MP Dry Type ABC, mounted on wall bracket hardware

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.02 REFERENCE STANDARDS

A. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2002a (Reapproved 2010).

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2015.

D. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
   2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of all affected installers.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, and mounting dimension requirements for each product and condition.
   1. Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

J. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum 3 years of documented experience and acceptable to the manufacturer.

1.06 MOCK-UP

A. Mock-Up: Provide full size mock-up of window shade complete with selected shade fabric including sample of seam when applicable.
   1. Full-sized mock-up may become part of the final installation.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Roller Shade Hardware and Shadecloth: 25 years, non-depreciating.
   2. Electric Motors: 5 years.
   3. Electronic Control Equipment: 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roller Shades:
   1. Basis of Design: Manufacturer and Product(s) as indicated on the Drawings..
   2. Substitutions: See Section 016000 - Product Requirements.

B. Shade Fabric:
   1. Basis of Design: Fabric as indicated on the Drawings.
   2. Substitutions: See Section 016000 - Product Requirements.

C. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories; fully factory-assembled; double roller configuration where double shades are indicated and single roller where single shade is indicated.
   1. Drop: Regular roll.
   2. Size: As indicated on drawings.

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation;

   1. Flammability: Pass NFPA 701 large and small tests.

   2. Fungal Resistance: No growth when tested according to ASTM G21.

C. Roller Tube: As required for type of operation, extruded aluminum with end caps.

   1. Dimensions: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.

   2. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.

   3. Finish: Baked enamel; color from manufacturer's standards.

D. Hembars and Hembar Pockets: Wall thickness designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.

   1. Style: Full wrap fabric covered bottom bar, flat profile with closed ends.

   2. Finish: Baked enamel.

   3. Color: As selected from manufacturer's standard colors.

2.03 ACCESSORIES

A. Fascias (All Units): Size as required to conceal shade mounting.

   1. General: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners and without notch for chain clearance.

   2. Style: As selected by Architect from shade manufacturer’s full selection.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.04 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate shades to fit openings within specified tolerances.

1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.

2. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 0.75 inches total.

3. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
2. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 24 00

SECTION 123623.13
PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ANSI A208.1 - American National Standard for Particleboard; 2022.

C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. PS 1 - Structural Plywood; 2023.

1.02 SUMMARY

A. Section includes plastic-laminate countertops.

B. Related Requirements:
   1. Section 064020 Casework Hardware and Accessories."
   2. Section 064116 "Plastic-Laminate-Faced Architectural Cabinets" for custom shop-fabricated casework.
   3. Section 079200 "Joint Sealants" for sealing gaps between countertops and building components.
   4. Section 123216 "Manufactured Plastic-Laminate-Faced Casework."
   5. Section 123570 "Healthcare Casework."
   6. Section 123661 “Simulated Stone Countertops."
   7. Division 22 Plumbing Fixtures and Trim.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product , including.
   1. For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of cutouts and holes for plumbing fixtures installed in plastic-laminate countertops.
   2. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches (254 mm), for each type, color, pattern, and surface finish, with one sample applied to core material.
   2. Wood-grain plastic laminates, 12 by 24 inches (609.6 mm), for each type, pattern and surface finish, with one sample applied to core material.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of product.
   1. Composite wood and agrifiber products.
   2. High-pressure decorative laminate.
   3. Chemical-resistant, high-pressure decorative laminate.
   4. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 degrees Fahrenheit (32.22 degrees Celsius) and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 PRODUCTS

2.01 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
   1. Provide labels from AWI certification program indicating that countertops , including installation, comply with requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
   1. Products: For each laminate type, manufacturer, series and color, see Finish Legend on Finish Drawings. Also coordinate with Section 002150 and the Owner’s Preferred Vendor List for other manufacturers that may be considered acceptable. Substitutions shall be submitted in accordance with Division 01 section "Product Requirements".

D. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP, and as follows:
   1. Laminate has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.9.5:
      a. Nitric Acid (30 Percent): Moderate effect.
      b. Sulfuric Acid (77 Percent): Moderate effect.
      c. Hydrochloric Acid (37 Percent): Moderate effect.
      d. Phosphoric Acid (75 Percent): No effect.
      e. Acetic Acid (98 Percent): No effect.
      f. Formaldehyde: No effect.
      g. Ethyl Acetate: No effect.
      h. Ethyl Ether: No effect.

i. Phenol (85 Percent): Moderate effect.
j. Benzene: No effect.
k. Xylene: No effect.
l. Butyl Alcohol: No effect.
m. Furfural: No effect.
n. Methyl Ethyl Ketone: No effect.
o. Sodium Hydroxide (25 Percent): No effect.
p. Sodium Sulfide (15 Percent): No effect.
q. Ammonium Hydroxide (28 Percent): No effect.
r. Zinc Chloride: No effect.
s. Gentian Violet: No effect.
t. Methyl Red: No effect.

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Formica Corporation; Lab Grade 840 Black.
   b. Panolam Industries International, Inc.; Pionite Chemguard.
   c. Wilsonart International, Div of Premark International, Inc, Chemserf.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As indicated on Drawings.
   2. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: 3-mm PVC edging.

G. Core Material: Particleboard or medium-density fiberboard.

H. Core Material at Sink Locations: marine-grade plywood.

I. Core Thickness: 3/4 inch (19.05 mm).

J. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

K. Paper Backing: Provide paper backing on underside of countertop substrate.

2.02 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
   1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than <> percent.
   2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
   3. Particleboard: ANSI A208.1, Grade M-2.
   4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Environ Bicomposites Manufacturing LLC; Biofiber Wheat.
         2) Sorm Incorporated; Primeboard Premium Wheat.
   5. 5. Softwood Plywood: DOC PS 1.

2.03 ACCESSORIES

A. Accessories and accessory materials associated with simulated stone countertops are specified in Section 064020 "Casework Hardware and Accessories.".

2.04 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

C. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Multipurpose Construction Adhesives: 70 g/L.
   3. Structural Wood Member Adhesive: 140 g/L.
   4. Architectural Sealants: 250 g/L.

2.05 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25.4 mm) over base cabinets. Ease edges to radius indicated for the following:
   1. Solid-Wood (Lumber) Members: 1/16 inch (1.59 mm) unless otherwise indicated.

B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

PART 3 EXECUTION

3.01 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.

3.02 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
   1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (152.4 mm) of front and back edges and at intervals not exceeding 24 inches (609.6 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm).

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   1. Install countertops with no more than 1/8 inch (3.18 mm) in 96-inch sag, bow, or other variation from a straight line.
   2. Secure backsplashes to tops with concealed metal brackets at 16 inches (406.4 mm) o.c. and to walls with adhesive.
   3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 123661
SIMULATED STONE COUNTERTOPS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. PS 1 - Structural Plywood; 2023.

1.02 SUMMARY

A. Section Includes:
   1. Solid-surface-material countertops and backsplashes.
   2. Quartz agglomerate countertops and backsplashes.

B. Related Sections:
   1. Section 064020 Casework Hardware and Accessories."
   2. Section 064116 "Plastic-Laminate-Faced Architectural Cabinets."
   3. Section 079200 "Joint Sealants" for sealing gaps between countertops and building components.
   4. Section 102116 "Solid Surface Showers and Vanities".
   5. Section 123216 "Manufactured Plastic-Laminate-Faced Casework."
   6. Section 123570 "Healthcare Casework."
   7. Section 123623.13 "Plastic Laminate-Clad Countertops."
   8. Division 22 "Plumbing Fixtures and Trim" for non-integral sinks.

1.03 ACTION SUBMITTALS

A. Product Data: For countertop materials and integral sinks.
   1. For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

B. Shop Drawings: For countertops. Show materials, finishes, edge, and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Verification: For the following products:
   1. Countertop material, 6 inches (152.4 mm) square.

1.04 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.05 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 PRODUCTS

2.01 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:
   1. Front: Straight, slightly eased at top.
   2. Backsplash: Straight, slightly eased at corner.
   3. Endsplash: Matching backsplash.

B. Countertops: 3/4-inch- thick, solid surface material with front edge built up with same material.

C. Backsplashes: 3/4-inch- thick, solid surface material .

D. Install integral sink bowls in countertops in the shop.

2.02 QUARTZ AGGLOMERATE COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:
   1. Front: Straight, slightly eased at top.

2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

B. Countertops: 3/4-inch- thick, quartz agglomerate with front edge built up with same material.

C. Backsplashes: 3/4-inch- thick, quartz agglomerate .

2.03 COUNTERTOP MATERIALS

A. Particleboard: ANSI A208.1, Grade M-2.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

C. Adhesives: Adhesives shall not contain urea formaldehyde.

D. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
1. Products: For each solid surface type, manufacturer, series, color and pattern, see Finish Legend on Finish Drawings. Also coordinate with Section 002150 and the Owner's Preferred Vendor List for other manufacturers that may be considered acceptable. Substitutions shall be submitted in accordance with Division 01 section "Product Requirements".
2. Type: Provide Standard Type or Veneer Type made from material complying with requirements for Standard Type, as indicated unless Special Purpose Type is indicated.
3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a pre-coated finish.

E. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.
1. Products: For each quartz surface type, manufacturer, series, color and pattern, see Finish Legend on Finish Drawings. Also coordinate with Section 002150 and the Owner's Preferred Vendor List for other manufacturers that may be considered acceptable. Substitutions shall be submitted in accordance with Division 01 section "Product Requirements".

2.04 ACCESSORIES

A. Accessories and accessory materials associated with simulated stone countertops are specified in Section 064020 "Casework Hardware and Accessories.".

PART 3 EXECUTION

3.01 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch (3.18 mm) in 8 feet (243.84 cm).

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
1. Install backsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
2. Seal edges of cutouts in particleboard sub-tops by saturating with varnish.

END OF SECTION

SECTION 275310
EMPLOYEE TIME CLOCK

PART 1 – GENERAL

1.01 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Section 26 01 00.

B. Time clock(s) shall be furnished by owner.

C. Contractors to provide rough-in for time clock(s).

1.02 RELATED WORK

A. Section 26 05 34: Raceways and Conduit Systems.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. The owner will furnish a Kronos Time Keeper 4500 time clock(s) for location(s) shown on drawings.

B. Contractor to furnish necessary rough-in material as shown on drawings to include 1” conduit.

C. Contractor to provide power conductors as shown on drawings.

D. Cabling Contractor to provide a Category 6 cable from each time clock to nearest Communications Room. Belden Part Number 2412010A1000.

E. Cabling Contractor shall terminate each cable on a black Category 6 jack. Belden Part Number AX101066.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The contractor shall provide and install in conduit a 120 volt, grounded, dedicated circuit at each clock(s) location(s) shown on drawings. Circuit shall have redundant ground to a water pipe or structural member.

B. Final connections will be made by the clock manufacturer's representative.

C. The contractor shall provide and install in conduit the communication conductors from each clock(s) location(s) to the CRT location(s) shown on the drawings. Final connections of communication conductors to the clock(s) and CRT will be made by the clock manufacturer's representative.

D. Surge protection for the equipment will be provided by the contractor. See Section 26 43 00 Transient Voltage Surge Suppression.

E. Contractor to test power wiring to ensure that voltage supplied measured ground to hot and neutral to hot is between 108 to 125 volts A.C. Also, measured ground to neutral that voltage is less than 0.4 volts a.c.

END OF SECTION

SECTION 281300
ACCESS CONTROL SYSTEM

PART 1 GENERAL

1.01 RELATED WORK SPECIFIED UNDER OTHER SECTIONS (RELATED SECTIONS)

A. All work related to this specification shall be completed in strict accordance with these contract documents

B. The contractor shall perform all work described in this document along with any work not expressly mentioned in the specifications, but otherwise necessary, for the proper execution of the same. It is not the intent to delineate or describe all details and features of work. No additions or changes to the contract will be approved for any materials, equipment, and/or labor to perform work hereunder, unless it can be clearly shown to be beyond the scope and intent of the specifications and drawings and be absolutely essential to the proper execution of the work.

C. Work under this contract consists of the complete installation and includes, but is not limited to, furnishing of all labor, materials, tools, and equipment necessary to complete all of the work as specified herein.

D. Following items are specified in Door Hardware section 08 71 00: Electrified Locksets, Magnetic Locks, Electric Strikes, Key Switches, Push Buttons, Schlage Card Readers, and electrified exit devices. Power for electrified exit devices as scheduled in Door Hardware section 08 71 00.

1.02 WORK INCLUDED

A. Lenel OnGuard is the HCA enterprise access control system. Exceptions to this only apply with written approval from the HCA Corporate Physical Security team.

B. The work includes furnishing all labor, materials, licenses, tools, equipment, and documentation required for a complete installation of or expansion to an existing Lenel OnGuard brand Access Control System (ACS) or approved alternative.

1. Refer to the drawings, schedules, specification section, and the approved door hardware for specifics, but in general:
    a. Lenel OnGuard PRO servers have been installed within the HCA data centers. New Lenel servers do not need to be installed at facilities – only reader and workstation licenses are required.
    b. Again, refer to drawings, but Dual Proximity and Keypad will be placed at Pharmacy, Hot Lab, Behavioral Health Unit exterior dept doors including stairwells, and Data Centers due to higher security levels. Keypad (digital code) readers will be placed at Ambulance Bay and designated Physician entry points
    c. Electrified door hardware, with integrated door position switches and request-to-exit functionality are provided by the door hardware contractor.
    d. Strikes must be grade 1 or 2 and have an anti-pick guard/function.
    e. Life safety power is provided at each door by the electrical contractor.
    f. Power supplies are provided by the Access Control System contractor at each door.
    g. Maglocks must utilize a greater than 1000 lbs magnet.
    h. Door contacts are required on restricted and secure domain doors and stairwell doors that lead out of a facility.
    i. Where required, Blue Diamond, SargentIN120, or Lenel LNL-XF card readers are provided by the Access Control System contractor. Some of these will be wall mounted, and some will be integrated into the electrified door hardware.
2. Client computer hardware, if required, shall be provided by the Owner. Provide and install client software and licenses in the quantities specified in the drawings.
3. Badge making hardware may or may not be required based upon what, if anything, is present currently. If required, the following must be used:

Model	Description
CAM-24C7808AF-SYS	Camera with mount and flash

089680– HPD5000	Dual Sided HCA Printer with Lamination
FRGO-84052 – HDP5000	Full Color Ink Ribbon (500 Prints)
FRGO-84053 – HDP5000	Clear Film (1500 per Roll)
086004	Cleaning Rollers (10 Pack)

1) Additional approved hardware includes:

a. Badges: MiFare Classic – provided by Convergint Technologies – whether they are the Access Control System Contractor or not.
b. Readers: Blue Diamond, SargentIN120, & Lenel LNL-XF
c. Controllers: LNL-x2220, LNL-x3300

1.03 SUBMITTALS

A. The contractor shall submit all items in accordance with the requirements of Division Submittals and shall include but not be limited to the following:
1. Submittals due within 30 days of contract award, requiring approval commencing construction:
a. Manufacturer's catalog data sheets for all components.
1) SPECIFIC PART NUMBERS USED MUST BE CIRCLED, NOT HIGHLIGHTED.
b. Input power requirements for all components
c. Complete vendor specific engineered drawings indicating:
1) Manufacturer model numbers and specifications
2) Dimensions, layouts, installation details
3) Point-to-point wiring diagrams for all devices
4) Termination details for all devices
5) Single-line system drawings representing the entire system
6) Interfaces with all sub-systems, if any
d. Course outlines for each of the end user training programs. The course outlines shall include the course duration, location, pre-requisites, and a brief description of the subject matter.
2. Submittals required after substantial completion, but a pre-requisite for final acceptance:
a. Two (2) printed, loose-leaf bound sets of the Manufacturer's User's Manuals, Record Drawings, and Installation Manuals.
b. One (1) electronic (PDF) set of the Manufacturer's User's Manuals, Record Drawings, and Installation Manuals.
c. Record drawings in DWG format shall be made available if required.

1.04 REFERENCE STANDARDS

A. Design and operation of the system shall conform to the following referenced codes, regulations, and standards as applicable:
1. National Electrical Code (NEC)
2. UL294
3. FCC & IC Rules and Regulations
4. Subpart J of Part 15, Radio Frequency Devices
5. National Electrical Manufacturers Association (NEMA)
6. Section 26 01 00
7. Section 27 37 00 Low Voltage Rough In Specification
8. Applicable Federal, State, and Local laws, regulations, and codes.

1.05 QUALIFICATIONS

A. The manufacturer of the access control system must be Lenel or match the existing system and be specifically approved by HCA Corporate Physical Security.

B. The provider of the proposed system shall factory trained, certified, and currently authorized by the manufacturer to sell, install, and service the system. This subcontractor shall be referred to as the Access Control System Contractor, or ACS Contractor.

C. Though any qualified ACS Contractor may be awarded the work, any programming required within the Lenel Pro Servers in the HCA Data Centers must be performed by Convergint Technologies.

D. The ACS Contractor shall have a fully staffed office of sales and technical support representatives within a one half day travel time to the project.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications to be new and UL listed for their purpose.

2.02 SYSTEM CHARACTERISTICS

A. The ACS shall consist of integrated hardware and software modules for the following:
   1. Access Control
   2. Alarm Monitoring.
   3. Event logging and viewing.

2.03 COMPUTER SYSTEM HARDWARE

A. Workstations shall be provided by the Owner as needed.

2.04 INTEGRATION TO OWNER SUPPLIED EQUIPMENT

A. Infant Protection System: The ACS shall interface with the Infant Protection System (IPS), if present.
   1. It is expected that this means that the IPS will be wired to each of the doors in its scope with the ability to override the ACS door control and lock down a door. The ACS contractor shall coordinate wiring efforts with the IPS contractor to this end.
   2. If offered by the IPS, the ACS contractor shall take an input from each of these IPS doors to create door-specific secondary infant protection event/alarms on the ACS system.

B. Alarms / Event notification: The ACS shall be integrated to the Owner's email system to allow the Owner to notify key personnel of ACS events or alarms via email.

C. The access control system shall be interfaced to the hospital fire alarm system. Locking devices, required by code or the AHJ to do so, shall be released upon activation of the fire alarm system or sprinkler system.

D. When access is controlled in the path of egress, loss of power to the part of the access control system that locks the door leaves shall automatically unlock the door leaves in the direction of egress.

E. At delayed egress doors, the Access Control Contractor shall coordinate with other trades to insure that presentation of an authorized card at the reader of each respective delayed egress door resets that door's delayed egress alarm, without the use of a key.

F. Generally, where combination card reader/keypads are shown, the system shall be programmed such that EITHER presentation of a valid credential OR entry of a valid PIN grants entry.
   1. Exceptions to this that require dual authentication are: Pharmacy, Hot Lab, Behavioral Health Unit exterior dept doors including stairwells, and Data Centers.

2.05 SYSTEM SOFTWARE

A. Early in the construction process, in coordination with the General Contractor, Convergint Technologies shall meet with the Owner's stakeholders, and lead the Owner in the decisions regarding the configuring of all the needed reader groups, cardholder groups, time codes, holidays, client permissions, and cardholder permissions.
   1. Once these decisions are made, the Convergint shall document the decisions and procure written approval from the Owner.
   2. Once the Owner has provided written approval, the Convergint shall program the system to those parameters.

3. The Convergint shall make the entry of cardholders a part of the Owner training. Once successfully trained the Owner shall perform enter the cardholders.
    a. The Convergint shall instruct and assist the Owner with the importation of cardholders, if that data can be provided in a clean, ASCII, delimited format.

B. ELEVATOR CONTROL
1. For elevator cabs having card readers, presentation of a valid credential shall be required to call restricted floors.
2. For elevator lobbies having card readers, presentation of a valid credential shall be required to call the elevators.
3. The ACS contractor is required to coordinate with the General Contractor and the elevator contractor to accomplish these functions. The elevator contractor shall provide the elevator control hardware, software, and travel cable conductors for the card readers. The ACS contractor shall provide integration cable and any hardware required by their system for elevator control. The ACS contractor shall terminate cable on their equipment. The elevator contractor shall terminate cable on the elevator equipment.

C. EVENT / ALARM MANAGEMENT
1. The ACS contractor shall train the Owner on the key decision points on this functionality, and program the system per the Owner's request.

D. DOCUMENTATION AND HELP FACILITY
1. The system shall provide context sensitive help screen windows to insure the user's ability to receive on-line informational text pertinent to the task being performed. Access to these help screens shall be controlled with a dedicated function key or via the mouse and pull-down menus.
2. System Administrator, Operator and Installation manuals shall be available on CD-ROM and as bound printed manuals.

2.06 ACS CONTROL EQUIPMENT

A. SYSTEM CONTROLLERS
1. The equipment shall be manufactured by Lenel for the Lenel OnGuard system. Head end equipment shall be provided in locking steel enclosures, all keyed the same as the existing head end equipment.
    a. Provide battery backup for the head end equipment sufficient for a minimum run time of 6 hours with normal door traffic.

B. LOCK POWER SUPPLIES
1. Central (communications room) based lock power supplies are not expected to be required. In the event they are, the standard part numbers follow:
    a. ALTRONIX, AL400ULACM, Door Lock Power Supply W/ Fire Alarm Interface.
    b. ALTRONIX, AL600ULACM, Door Lock Power Supply W/ Fire Alarm Interface.

2.07 PERIPHERAL EQUIPMENT

A. CABLING
1. The ACS Contractor shall provide and install all cable required for the desired functionality. This cable shall meet or exceed the requirements of the manufacturer.
    a. The cabling SHALL NOT be "banana peel" style cable, where jacketed components are bonded to central member.
        1) It may be "access control composite" where several, individually jacketed multi conductor cables are enclosed in an overall jacket.
        2) It may be individual multi conductor cables. This is less desirable.
2. IDENTIFICATION
    a. In addition to requirements in this article, comply with application requirements in Section 26 05 52 Identification for Electrical Systems" and with TIA/EIA 606-A.

b. Using software specified in “Cable and Asset Management Software” Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designation for facilities architectural arrangement.
c. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
1) All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the device as shown.
2) Each wire connected to building-mounted devices is not required to be numbered at the device is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.
d. At completion, cable and asset management software shall reflect as-built conditions.

3. The Owner has a preferred special pricing arrangement with Accu-Tech, particularly with Belden products. The ACS Contractor is strongly encouraged to seek pricing from Accu-Tech.
4. All doors having card readers, or being roughed in for future card readers, or have electrically controlled locks, are to have cabling to support the following:
a. Lock power control.
b. Request-to-Exit, (plus two spare conductors)
c. Card reader.
d. Door position switch.
e. ONE EACH 18 AWG, 2-CONDUCTOR, STRANDED, NON-SHIELDED CABLE RESERVED FOR CONNECTING THE FIRE ALARM SYSTEM MODULE IN THE COMM ROOM, TO THE FIRE ALARM INTERFACE ON THE DOOR POWER SUPPLY.
1) This cable shall be provided at every door where locks are electrically controlled, whether interlocking to the fire alarm system is required by code or not. Unused cables shall be labeled at both ends and neatly secured. The purpose of this is to have the ability to meet any last minute requirement by the AHJ easily.
f. Delayed egress doors shall be cabled to also be able to support resetting of the delayed egress alarm by the ACS control equipment in the communications room.

B. ACCESS CARDS - PROXIMITY CARDS
1. Verify the type and quantity of badges needed with the Owner prior to construction via the submittal process. If a quantity of badges are needed, they must be provided by Convergint.
2. The card shall be the approximate size and weight of a standard credit card, 2.125" x 3.375", (540mm x 857mm).
3. The card shall be suitable for direct printing with a video badging system.
4. The card shall accept a slot for either horizontal or vertical hanging, without affecting card operation.
5. Provide 100 each.
a. At Doors 101, valid credential at card reader, pressing actuator or remote release unlocks electric strike for a preset time interval and engages auto operator. Door closes and electric strike locks when time interval expires.

C. DOOR POSITION SWITCH
1. The ACS Contractor and General Contractor shall review the Door Hardware Specification (08 71 00), its referenced specifications, the approved door hardware submittal, and the noted architectural floor plans prior to bid. For every access controlled (card reader), or monitored door leaf where the door hardware contractor is NOT specified to provide the door position switch and/or compatible End-of-Line EOL supervision resistors, the ACS Contractor shall provide the door position switch and/or EOL resistors:

a. In these cases, provide a flush mounted SPDT door position switch such as Sentrol part number 1078CWM or approved equivalent. EOL resistors shall be of the type and configuration as required by the ACS system for line supervision.

D. PASSIVE INFRARED MOTION REQUEST-TO-EXIT DEVICE
   1. Provide a Passive Infrared (PIR) motion sensor as shown on the drawings, plus on any door having a card reader where no form of request-to-exit signal is generated.
      a. If required, provide part Bosch part number DS150i with trim plate TP160.

E. DOOR 100A – MONITORING RELAY AND AUDIBLE DEVICE
   1. Provide door monitoring relay at door 100A by door manufacturer. Relay shall connect to access control system and programmed as directed by the owner to activate only during the hours chosen. Door relay alert to be audible at the nurse station with a dedicated speaker. Confirm door relay specification with owner prior to procurement and install.

PART 3 EXECUTION

3.01 COORDINATION

A. Intent:
   1. These sections of specifications and drawings form a complete set of documents for the electrical work of this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
   2. The intent of these specifications and drawings is to form a guide for a complete electrical installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner.
   3. Electrical layouts indicated on drawings are diagrammatical only. Exact location of outlets to be governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing-in of such without additional cost to Owner.

B. Deviations:
   1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
   2. Should Contractor find during progress of work that conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

C. Insofar as it is possible to determine in advance, leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required to be done is at this contractor's expense.

D. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.

E. Designer to be mediating authority in all design related deviations and disputes arising on the project.

3.02 INSTALLATION

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
   1. System installer must comply with all Federal, State, and Local laws, regulations, and codes as prescribed by these entities in accordance with the scope of the project.
   2. Cable installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service international.
      a. Electrical components, Devices, and Accessories: listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
      b. Comply with NFPA 70, “National Electric Code.”

c. Comply with NFPA 101 “Life Safety Code”
d. Comply with TIA-569-B “Commercial Building Standards for Telecommunications Pathways and Spaces”.

B. Install system per the supplier's guidelines.

C. Verify the operational compatibility and configuration requirements of all locking devices not supplied by the Access Control System supplier with the Access Control System supplier.

D. ACS contractor to terminate the necessary Fire Alarm Interface cables to the door power supply. The Fire Alarm Contractor will terminate as needed at the fire alarm end in the communications room.

E. Maps shall be imported and populated with the new doors and duress buttons.

F. At the Security Desk, designated by the Owner, provide a client seat on one of the Owner provided workstations, configured with typical permissions for security guard operators, but per the Owner’s desire as documented previously. This workstation must clearly annunciate all the new and existing duress buttons, both visually and audibly, and have clear descriptions of the locations of each. It must also report and annunciate alarms and events such as “access granted”, “wrong card”, “wrong time”, “forced door”, “door held open”, etc.

G. At doors with automatic operators, and actuators, integrate them to function as follows:
1. If the door is in an unlocked state, either pressing the actuator, presenting an authorized credential, or entering an authorized code will cause the door to open.
2. If the automatic door operator is designed to open via a motion detector, then the motion detector shall not operate when the door is secured, and shall operate only when a valid credential is presented.
3. If the door in in a locked state, either presenting an authorized credential, or entering an authorized code will cause the door to open. Pressing the actuator will not be necessary.
4. Door 100A will not operate when lock down button is engaged, refer to wiring diagrams included in door hardware specifications.

3.03 TESTING AND COMMISSIONING

A. The ACS contractor shall be responsible for final system hardware hook-up and checkout prior to commissioning the system to the end-user, and shall furnish documentation of commissioning to the Contractor and the Designer.

3.04 TRAINING AND INSTRUCTION

A. The access control system provider shall customize a training program to be implemented at the customer site as described herein and in the drawings. Training period shall be as noted in the drawings.

3.05 PROGRAMMING SERVICES

A. Additional programming services shall be available from Convergint Technologies in the following areas:
1. Database/data importation
2. Customized system programming
3. Operational programming
4. Custom report design / development generation
5. Custom video badge design
6. Graphical map design/development and test

3.06 WARRANTY

A. The system Software shall be warranted for a period of 90 days from date of delivery.

B. The product (as distinguished from Software) shall be warranted to be free from defects in material and workmanship under normal use for a period one year from the date of first beneficial of all or any part of the product or 12 months after product shipment, whichever is earlier.

C. Designer reserves right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.

D. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED
A. Clearing, grubbing, removal and disposal of vegetation, rocks, roots and debris, stripping surficial organic-laden soils and topsoil, undercutting unsuitable surface materials within the limits of the work except objects designated on the drawings to remain.
B. Preserve from injury or defacement all vegetation and objects to remain.

1.02 RELATED WORK
A. Section 02 41 16: Demolition
B. Section 31 22 13: Site Excavation
C. Section 31 23 40: Backfilling and Finish Grading

1.03 LIMITS OF WORK
A. Construction area established by drawings.
B. Approved borrow pit areas.
C. Designated stockpiles of construction material other than borrow material.

1.04 PROTECTION
A. Protect living trees not marked for removal and outside the construction area. Treat cut or scarred surfaces of trees or shrubs with a paint prepared especially for tree surgery.
   1. Trees shall be protected by fencing to be located around the entire perimeter of the tree at the approximate dripline location.
   2. Shrubs and bushes shall be protected by fences or barricades.
   3. Shallow-rooted plants shall be protected at ground surface under and in some cases outside the spread of branches by ground cover protection consisting of 6-inch additional soil or crushed rock to be removed at completion of project.
B. Protect benchmarks and existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic.
C. Maintain designated temporary roadways, walkways and detours, for vehicular and pedestrian traffic.

PART 2 PRODUCTS
A. Fence shall be plywood or dimension lumber; suitable salvaged materials are acceptable.
B. Wound paint shall be a standard bituminous product.
C. Barricades shall be in accordance with local governing authority.

PART 3 EXECUTION

3.01 PREPARATION
A. Maintain benchmarks, monuments and other reference points. Re-establish if disturbed or destroyed at no cost to Owner.

3.02 CLEARING AND GRUBBING
A. Clear and grub areas required for access to site and execution of the work. The clearing operations shall extend at least ten feet beyond the perimeter of the proposed building and parking/drive areas.
B. Stumps and roots should be completely removed from beneath the proposed building and parking/drive areas, and voids created should be cleaned and backfilled with compacted structural fill.

B. Remove low hanging, unsound or unsightly branches on trees or shrubs designated to remain.
C. Trim approximately ten feet.
D. Grub borrow pit and stockpile areas of all objectionable material. Strip overburden before placing material in stockpile areas.
E. Perform clearing and grubbing well in advance of construction or material removal activities.

3.03 PRUNING

A. If trees, shrubs and other perennial growth are damaged in the course of Work of this Contract, prune damaged branches back to the first health (i.e., the nearest undamaged forks in branches or to the trunk) in accordance with standard practices of the industry.
   1. Where branches are cut back to the trunks, completely remove branches so there is no stub to become infected, and so that bark can heal itself over the cut.
   2. "Head-Back" cuts (cuts at right angles to the line of growth) of branches away from a fork will not be permitted.
B. Paint wounds over 1 inch in diameter.

3.04 DEBRIS REMOVAL

A. Promptly remove cleared debris from site.
B. Obtain permission from applicable regulatory authority for disposal of debris to waste disposal site.
C. Do not burn or bury materials on site.

3.05 REPAIRS

A. Should utilities to remain or other physical property be damaged by work of this Section, the damage shall be repaired at the contractor's expense.
B. Backfill all excavations opened as a result of the work of this Section with the type of fill specified in Section 31 23 40 for the individual locations.

END OF SECTION

SECTION 31 22 13
SITE EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavating and grading for:
   1. Roadways & Parking areas.
   2. Building pads.
   3. Embankment areas.
   4. Waterways and ditches (including inlet structures and outlet ditches, channels, ponds, waterways, etc.)

B. Excavating of unsuitable material from beneath structured areas and fill embankment areas.

1.02 RELATED WORK

A. Division One: Testing Laboratory Services
B. Section 22 14 00: Storm Drainage Systems
C. Section 31 11 00: Clearing and Grubbing
D. Section 31 23 35: Excavating and Backfilling for Service Utilities
E. Section 31 23 40: Backfilling and Finish Grading
F. Section 31 71 15: Proof Rolling

1.03 QUALITY ASSURANCE

A. Testing Firm and Geotechnical Engineer:
   1. The Geotechnical Engineer and Testing Firm's fees will be paid by the Owner except when the Geotechnical Engineer or Testing Firm personnel are notified by the Contractor that work will be in progress, and they (Geotechnical Engineer or testing personnel) mobilize to job site and work is not in progress or not ready for testing. In these cases, the Contractor shall pay for Geotechnical Engineer's or testing firm personnel's time and mileage.
   2. Contractor shall pay for all retesting as required.
   3. Have earth borrow fill and structural fill tested and approved by designated geotechnical engineering and construction materials testing firm before moving materials to the job site.
   4. Areas where building and paved areas will be located shall be thoroughly proof-rolled as per Section 31 17 15.
   5. Compaction testing of fill, backfill, and in-place soil shall be performed by Testing Firm .
   6. Document quantities of materials where unit prices are involved.
   7. A representative number of in-place field density tests shall be performed in the compacted existing soils and in each lift of structural fill or backfill to confirm that the required degree of compaction has been obtained.
   8. In-place density tests shall be performed at representative locations in the bearing level soils in the footing excavation bottoms.
   9. Field density tests shall be performed within fill areas at a frequency of not less than one (1) test per 2,500 square feet per lift in the building areas, or at a minimum of two (2) test locations, whichever is greater.
   10. For compacted fill placed beneath pavements, field density tests shall be performed at a frequency of not less than one (1) test per 5,000 square feet per lift, or at a minimum of two (2) tests per lift, whichever is greater.
   11. Field density tests shall also be performed as follows:
      i. At least one (1) density test for every 100 feet of wall footing.
      ii. At least one (1) density test for each column footing.
      iii. At least one (1) density test per lift for every 200 linear feet of utility trenches.

1.04 EXISTING CONDITIONS

A. Known underground, surface and aerial utility lines, and buried objects are indicated on the Drawings.
B. Do not interrupt existing utilities service to facilities occupied and used by the Owner or others, except when permitted in writing, by Owner's Representative and then only after temporary utility services have been provided.

1.05 PROTECTION

A. Protect trees, shrubs and lawns, rock outcroppings and other features remaining as part of final landscaping.
B. Protect benchmarks, existing structures, fences, roads, sidewalks, paving and curbs against damage from equipment and vehicular traffic.
C. Protect aerial, surface, or underground utility lines and appurtenances which are to remain.
D. Repair damage.
E. Erosion control must be maintained. Refer to notes on General Note's sheet and Erosion and Sediment Control Details plan.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas. Keep excavations free of water during the entire progress of the work, regardless of the case, source, or nature of the water. Refer to the geotechnical report for details regarding the sensitivity of existing soils to moisture.
B. Trees shall be left undisturbed, insofar as possible, as shown on drawings.

1.07 SEDIMENT AND EROSION CONTROL

A. Install all erosion control measures prior to beginning site grading operations.
B. Protect newly graded areas from erosion. Where necessary, temporarily seed disturbed areas with Bahia or annual rye grass at a rate of 4 lbs/1000 sq. Ft. If seeding is necessary in summer months, contact the Owner's Representative for an approved seeding application.
C. Repair settlement and erosion which occurs prior to acceptance of work.
D. Temporary Ditch Checks: Place two unbroken straw bales in a "V" formation, with open end upstream in ditches as directed by Owner' Representative. Place ditch check at 50 foot intervals for ditches, with slopes between 1.0 percent and 3.0 percent. For ditches steeper than 3.0 percent, place at 25 foot intervals and stake each bale firmly with a 2" x 4" wood stake or other means as directed by the Owner's Representative.
E. Leave straw bale ditch checks in place throughout construction except when ditches are fine graded, and seeded or sodded.
F. Perform periodic maintenance on ditch checks to remove sediment and replace straw bales as necessary so as not to inhibit flow or runoff.

1.08 REFERENCE STANDARDS

A. Determine the maximum dry density and optimum moisture in accordance with ASTM D1557 of all proposed fill soils, as well as natural ground to be compacted.
B. Soil and rock borings, soundings, and other geotechnical information if provided, are:
    1. For information purposes only.
    2. No guarantee of existing conditions.
    3. No substitute for investigations deemed necessary by Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Excavated materials, graded free of roots, subsoil, debris, large weeds, toxic substances, and rocks greater than 1 inch.

PART 3 EXECUTION

3.01 PREPARATION

A. Establish and identify required lines, levels, contours and datum.
B. Maintain benchmarks, monuments, and other reference points. Reestablish if disturbed or destroyed, at no cost to Owner.
C. Before start of grading, establish the location and extent of utilities in the work areas. Notify utilities to remove and relocate lines which are in the way of construction.
D. Maintain, protect, reroute or extend as required existing utilities to remain which pass through the work area.
E. Upon discovery of unknown utility or concealed conditions, discontinue affected work and notify the Architect.

3.02 REMOVAL OF TOPSOIL

A. Remove topsoil of horticultural value from areas to be excavated and regraded, and stockpile in designated area.
B. Do not permit topsoil to be mixed with soils to be reused as fill or backfill.
C. Do not strip topsoil when wet.

3.03 EXCAVATION DEWATERING

A. All excavations and below-grade construction shall be conducted “in the dry.” Prior to excavation, the groundwater level shall be lowered and maintained at least two feet below the bottom of the excavation to limit the potential for instability.
B. The contractor shall be responsible for verifying groundwater levels during construction.
C. The contractor shall be responsible for the design, installation and maintenance of a properly functioning dewatering system. The design of the dewatering system shall be in conjunction with the design of any excavation support system.

3.03 GENERAL SITE EXCAVATION

A. Do not excavate wet subsoil materials.
B. Excavate subsoil required to allow placement of compacted backfill under paving and site structures, and to accommodate construction operations.
C. Machine slope banks to angle of repose or less until shored.
D. Removed lumped subsoil, boulders and rock.
E. Completely remove stumps, roots over 1 inch in diameter, and similar on-grade and below-grade obstructions within the area to be covered by new construction and for a distance of 10 feet beyond area in all directions. In other areas disturbed by grading, remove such obstructions to a depth of 2 feet below subgrade.
F. Correct unauthorized excavation, including areas over-excavated by error, at no extra cost to the Owner.
G. Stockpile excavated material in designated area on site to a depth not exceeding 8 feet and protect from erosion. Remove from site excess material not being reused. Stockpile areas are to be identified during a pre-construction meeting of the jobsite.
H. Excavations shall be backfilled with suitable compacted Structural Fill.

3.04 PREPARATION OF NATURAL GROUND

A. Proof-Roll in accordance with section 31 71 15. Owner's Representative is to identify any unstable areas.
B. C. Exposed subgrade soils at the bottoms of excavations shall be compacted to at least 95% of the modified Proctor maximum dry density (ASTM D1557) for a depth of at least 12” below the surface.
D. Continuous wall footing trenches and individual footing pits shall be excavated to footing line and bottom grade. Exposed bearing soils at the bottoms of footing excavations shall be compacted to at least 95 percent of the modified Proctor maximum dry density to a depth of at least 2 feet below the bottom of the footing. If necessary, the bottom of footing excavations shall be recompacted, or it shall be overexcavated, refilled with structural fill, and compacted to achieve the minimum field density to the required depth.

3.05 REMEDIAL WORK

A. Exposed subgrade soils at the bottoms of excavations shall be evaluated by the Owner's testing firm prior to backfilling and prior to steel and concrete placement. If unsuitable soils or soils that cannot be readily moisture conditioned and compacted are encountered at the bottoms of excavations, then these soils shall be over-excavated at least two feet beneath the bottom of the foundation and replaced with compacted structural fill.
   1. Notify the Engineer to obtain approval prior to beginning undercutting operations.
   2. Keep records of material quantities removed and replace as specified in Division 1and have materials verified by the Owner's testing agency.

B. Excavate shallow temporary drainage ditches to facilitate removal of excess moisture from subgrade areas.

C. Backfill and compaction of areas excavated under this Section is specified in Section 31 23 35.

3.06 CLEAN-UP AND DISPOSAL OF DEBRIS

A. Remove surplus materials and debris from site.

END OF SECTION

SECTION 31 23 18
EARTHWORK FOR STRUCTURES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Division 1 Sections

1.02 REFERENCES

ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.

ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).

ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.03 DEFINITIONS

A. Granular Subbase: Fill directly beneath slabs-on-grade.

B. Backfill: Fill immediately behind foundation elements or retaining walls.

C. Structural Fill: Fill under the structure other than the granular subbase.

1.04 SUBMITTALS

A. Upon request, submit soil test reports performed by the Structural Testing/Inspection Agency.

1.05 QUALITY ASSURANCE

A. Refer to the Structural Quality Assurance Plan in the Structural Drawings.

1.06 SURVEY

A. Prior to construction, have structure location staked and certified by a licensed surveyor. If discrepancies between actual lines and elevations exist, notify Architect/Structural Engineer before proceeding with layout of structure.

1.07 SUBSURFACE CONDITIONS

A. Copies of a subsurface investigation of the site will be made available upon request. The data is not intended as a representation or warranty of the continuity of such conditions. Owner will not be responsible for interpretation or conclusions drawn by the Contractor. The data is made available for the convenience of the Contractor and is not guaranteed to represent all conditions that may be encountered.

B. Contractor may examine the site and make his own subsurface explorations at no additional cost to the Owner. Notify Owner prior to making any subsurface explorations.

1.08 EXISTING UTILITIES

A. Locate existing underground utilities by careful hand excavation. If utilities are to remain in place, provide protection from damage during construction operations.

B. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Do not interrupt existing utility service facilities occupied and used by Owner or others, unless written permission is given by the Architect and then only after temporary utility services have been provided.

C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect immediately for directions.

D. Repair damaged utilities to satisfaction of utility owner.

1.09 NOTICE

A. Notify the Architect/Structural Engineer 48 hours prior to the beginning of any excavation work.

PART 2 PRODUCTS

2.01 GRANULAR SUBBASE

A. Granular Subbase: Sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.02 BACKFILL

A. Backfill: Sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

2.03 STRUCTURAL FILL

A. Structural Fill: Sound and free-draining, such as sand, gravel or crushed stone with less than 10% passing the 200 sieve. Maximum diameter shall be 1-1/2 inches.

B. Structural Fill shall be free of organics, debris and deleterious materials.

PART 3 EXECUTION

3.01 STRIPPING

A. Strip vegetation, topsoil, roots, and other unsuitable material to a depth determined by the Structural Testing/Inspection Agency but not less than one foot, nor less than 10 feet outside the perimeter of the structure.

B. Stockpile sufficient amounts of topsoil as required to cover areas to be landscaped with a minimum of six inches of material.

3.02 EXCAVATION

A. Excavation shall be considered unclassified. Excavations shall comply with U.S. Department of Labor, Occupation Safety and Health Administration (OSHA) regulations.

B. Perform excavation to the depths and limits on the Drawings and as specified herein.

C. Do not excavate to full depth when there is probability of frost forming or ground freezing in excavation before concrete is placed.

D. Ground water may be encountered during the foundation excavation. Provide a system for controlling the ground water to a level at least three feet below the lowest point of the excavation.

E. Keep excavations dry by sloping ground away from holes and trenches.

3.03 PROOFROLLING

A. After stripping or excavation and before any fill placement, fill areas shall be proofrolled with a minimum of two coverages of a loaded dump truck or scraper in each of two perpendicular directions.

B. Areas found to be soft or pumping shall have the soft soil removed and replaced with structural fill and compacted as outlined herein.

C. Exposed subgrade soils within the building footprint and 10 feet beyond should be compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D1557) to a depth of at least 12 inches. Regardless of the degree of compaction achieved, a minimum of eight complete overlapping coverages should be made with the compaction equipment, divided evenly into two perpendicular directions. Conduct compaction with lightweight walk-behind vibratory equipment or rollers in static mode within 75 feet of existing building.

3.04 PLACEMENT OF STRUCTURAL FILL

A. Do not place structural fill on subgrade that contains frost, mud or is frozen.

B. Structural fill shall be placed and compacted in 12 -inch thick loose layers with heavy, self propelled compaction equipment and 6-inch thick loose layers with hand-guided equipment.

C. Compact structural fill to 95 percent of the maximum dry density as measured by Modified Proctor, ASTM D1557, with water content within +2/-2 percent of the optimum moisture content.

3.05 PLACEMENT OF BACKFILL

A. Backfill behind wall shall be placed in layers of six inches.

B. Compact backfill behind walls to 95 percent of the maximum dry density as measured by Modified Proctor, ASTM D1557, with water content within +2/-2 percent of the optimum moisture content

3.06 PLACEMENT OF GRANULAR SUBBASE

A. Do not place granular subbase on subgrade that contains frost, mud or is frozen.

B. Compact granular subbase to 95 percent of the maximum dry density as measured by Modified Proctor, ASTM D1557, with the water content within +2/-2 percent of the optimum moisture content.

3.07 CLEAN UP

A. Remove excess excavated materials from job site and upon completion leave site in clean condition.

END OF SECTION 31 23 18

SECTION 31 23 35
EXCAVATING AND BACKFILLING FOR SERVICE UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Excavation for piped utility material.
B. Provide necessary sheeting, shoring and bracing.
C. Prepare trench bottom with appropriate materials.
D. Dewater excavation as required.
E. Place and compact granular beds, as required, and backfill.

1.02 RELATED WORK
A. Division One: Testing Laboratory Services
B. Division One: Project Close Out
C. Section 22 14 00: Storm Drainage Systems
D. Section 31 11 00: Clearing and Grubbing
E. Section 31 22 13: Site Excavation
F. Section 31 23 40: Backfilling and Finish Grading
G. Section 32 12 16: Asphaltic Concrete Paving
H. Section 33 11 20: Domestic Water & Fire Services
I. Section 33 30 00: Sanitary Sewage Systems

1.03 TESTS
A. Field density testing shall be performed in accordance with ASTM D6938, ASTM D4564, or other method recommended by the Owner's testing agency and acceptable to the Owner's Representative.

1.04 PROTECTION
A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation. The contractor shall be responsible for the design, installation and maintenance of any excavation support system. The design of the excavation support system shall be in conjunction with the design of any dewatering system.
B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases. The contractor shall be responsible for the design, installation and maintenance of any underpinning system.
C. Notify the Engineer of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
D. Provide surface drainage to keep excavations free of water. Grade the top perimeter of excavations to prevent surface water run-off into excavations. Pump if required.
E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
F. Protect Public utilities at project site property lines to prevent damage.

1.05 QUALITY ASSURANCE
A. Comply with requirements of the local department of public works.

1.06 COORDINATION
A. Schedule trench excavations so that those pipes passing under foundations are in place and trench backfill is properly placed and compacted before foundations are placed.
B. Coordinate with other trades affected by this work.

PART 2 PRODUCTS

2.01 MATERIALS
A. Pipe and structure bedding:

1. Compacted natural ground or Structural Fill as specified Section 31 23 40.
2. Coarse aggregate shall conform to the physical and gradation requirements provided by the State Highway Specifications Section 901 for No. 57 Stone.
3. Fine aggregate: Clean, natural or manufactured sand, washed, free of silt, loam, friable or soluble materials, and organic matter, with no more than 15% finer than a No. 200 sieve.

B. Trench and pit backfill:
1. Structural Fill shall be as specified in Section 31 23 40.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum under provisions of the Division 1 of the Specifications.

3.02 EXCAVATION

A. General:
1. Make excavations sufficiently wide to provide adequate working room for proper installation of pipes, buried structures, and any excavation support system, and to allow for inspection and testing. Hand trim excavation and leave free of loose matter.
2. Remove lumped subsoil, boulders, and rock.
3. Depths: Unless otherwise indicated, excavate to a depth which will allow placement of pipes below frost line, but in no case less than 2 feet below finished grade.
4. When excavation is in rock, over excavate at least 6 inches and backfill with compacted Structural Fill for bedding.
5. Do not allow excavation to interfere with normal 45^{o} bearing splay of foundations.
6. Correct unauthorized excavation at no cost to the Owner. Fill over-excavated areas under pipe bearing surfaces in accordance with direction by the Engineer.
7. Provide separate trenches for water lines and sewer lines. Provide separation specified in individual utility Sections.
8. Stockpile excavated material in an area designated on the site. Keep material separate from materials stockpiled for reuse as backfill for structures and lawn areas. Remove excess materials from the site.
9. Do not allow any pipe to be laid in wet, muddy or frozen trenches.

B. Trenches:
1. Bell and spigot type piping:
   a. Excavate trenches wide enough to allow for proper jointing, bedding and visual inspection of at least the top half of each side of pipe.
   b. Excavate to a depth below fill aggregate so that tops of all piping is at least one foot below bottoms of concrete slabs.
   c. Sewer and drain lines: Unless otherwise indicated, establish uniform rates lines will have a drop of 1/4 inch per foot inside of the building, and 1/8 inch per foot outside of the building.
   d. Excavate so that bottom is uniformly smooth, and with bell holes scooped out so that the barrel of each length of pipe is fully supported.
   e. Blocking to raise the pipe to grade shall not be used.
2. Copper pipe, PVC pipe and electrical conduit:
   a. Excavate to a depth below fill aggregate, or furrow out fill aggregate, as applicable, so that tops of all runs are at least 6 inches below bottoms of concrete slabs after bedding is accomplished.
   b. In earth fill below aggregate, excavate to a depth of at least 6 inches below bottoms of runs in final position and backfill with sand. Tamp sand to settle it and provide a smooth surface to uniformly support runs.

c. In furrowed out fill aggregate, line trenches with a layer of roofing felt. Place at least 3 inches of sand on top of felt and tamp it smooth.
d. Trenches may be narrow provided materials to be installed can be properly bedded, connected and inspected.

C. Pit Excavation:
1. Excavate pits for items such as, but not limited to, manholes, catch basins, and grease traps to depths required for proper installation of items.
2. Make bottoms smooth and level.
3. Over excavate sides of pit enough to provide space for construction of forms or masonry work, as required, for proper installation, backfilling and compacting, inspection and testing.

3.03 INSPECTION

A. Verify that stockpiled fill is approved.
B. Verify that adjacent construction is braced to support surcharge forces imposed by backfilling operations.
C. Verify areas to be backfilled are free of debris, snow, ice or water, and that ground surfaces are not frozen.

3.04 BACKFILLING

A. General:
1. Do not backfill until lines are installed, tested, and approved.
2. Support pipe and conduit during placement and compaction of bedding fill.
3. Backfill to contours and elevations. Backfill systematically, as early as possible, to allow maximum time for settlement. Do not backfill over porous, wet or spongy surfaces.
4. Place and compact fill materials in continuous layers not exceeding 6 inches in loose depth.
5. Maintain optimum moisture content of backfill materials to attain required compaction density.
6. Remove surplus backfill materials from the site.
7. Leave stockpile areas completely free of excess fill materials.

B. Backfilling pipe 4 inches in diameter and larger:
1. Bed pipe a minimum depth of 6 inches and extend pipe springline. Place bedding to uniformly support pipe along the entire length and tamp to a dense condition.
2. Backfill with approved materials to level of adjacent grades by placing in 6-inch maximum lifts and compacting each lift as specified herein.

C. Backfilling pipe less than 4 inches in diameter:
1. Bed pipe a minimum depth of 3 inches and extend to one foot above top of pipe. Place bedding to uniformly support pipe along the entire length and tamp to a dense condition.
2. Backfill with approved materials to level of adjacent grades by placing in 6-inch maximum lifts and compacting each lift as specified herein.

D. Backfilling pits:
1. Do not backfill pits until items have been completed and tested.
2. Concrete, masonry and cast iron items: Backfill with coarse aggregate. Place aggregate in one-foot layers and compact each layer after it is placed.
3. Where items are placed in lawn areas, fill aggregate to within 2 ft. Of finished grade, and finish backfilling to grade with earth fill. Tamp and compact earth fill to the same density as adjacent grade materials.
4. Where items are placed in areas covered by paving or other hard surfaced construction, fill with coarse aggregate to bottom of base course.

3.05 TOLERANCES

A. Top surfaces of backfilling: 1 inch.

3.06 COMPACTION

A. Structural areas (outside of building pad): Compact each lift to 95% of the modified Proctor (ASTM D1557) maximum dry density.
B. Lawn and landscape areas: Compact to 90% of the modified Proctor (ASTM D1557) maximum dry density.

3.07 CLEAN-UP

A. After work of this Section is completed, leave areas clean and free from debris.
B. After backfill is complete, remove excess earth fill material and spread on the job site in a designated area. Excess aggregate fill shall be removed from the job site and disposed of in accordance with local regulations.

END OF SECTION

SECTION 31 23 40
BACKFILLING AND FINISH GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Finish grade sub-soil.
B. Cut out areas to receive stabilizing base course materials for paving and sidewalks.
C. Place, finish grade and compact topsoil.

1.02 RELATED WORK
A. Division One: Testing Laboratory Services
B. Section 31 11 00: Clearing and Grubbing
C. Section 31 22 13: Site Excavation
D. Section 31 23 20: Excavation and Backfill for Structures
E. Section 31 23 35: Excavating and Backfilling for Service Utilities
F. Section 31 71 15: Proof-Rolling
G. Section 32 92 23: Sodding

1.03 PROTECTION
A. Prevent damage to existing trees to remain, bench marks, pavement, and utility lines. Correct damage at no cost to the Owner.

1.04 QUALITY ASSURANCE
A. Owner will employ a qualified geotechnical engineering and construction materials testing firm to observe this work and make tests, as required. Testing firm will:
   1. Have borrow fill, aggregate, sand and topsoil tested and approved before it is moved to the project site.
   2. Observe proof-rolling of site to assess adequacy of in-place soils.
   3. Test in-place soil and filled and compacted areas.
   4. Document quantities of materials removed and quantities of material placed, where Unit Prices are involved.

PART 2 PRODUCTS

2.01 FILL MATERIALS
A. Structural fill shall consist of cohesionless sands containing no more than 12 percent fines (Unified Soil Classification SP or SP-SM) that are free of organics, debris, roots, deleterious matter, and elongated or flat particles susceptible to degradation.
B. All material being used as fill and backfill shall be tested and approved by the geotechnical testing firm before placement.
C. Refer to the Geotechnical Engineering Report for an opinion of the suitability of on-site soils for reuse as fill and/or backfill. If suitable, the soils shall be observed and tested by the geotechnical testing firm to assess its suitability for use as fill and/or backfill.
D. Structural fill shall be placed and compacted in loose lift thicknesses appropriate for the compaction equipment being used. Each lift shall be compacted to a density of at least 95 percent of the modified Proctor maximum dry density. The upper 12 inches of fill in the building floor slab areas shall be compacted until densities of at least 95 percent of the modified Proctor maximum dry density are uniformly obtained.
E. Soil moisture content shall be adjusted as needed to facilitate placement and compaction.

PART 3 EXECUTION

3.01 BACKFILLING

A. Examination: Verify fill materials to be reused are acceptable under requirements of the Contract Documents.

B. Preparation:
   1. Proofroll subgrade prior to fill placement as specified in Section 31 71 15, and repair unstable subgrades prior to fill placement.
   2.

C. Backfilling:
   1. Backfill areas to required elevations with unfrozen specified materials and compact to density equal to or greater than requirements specified below.
   2. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
   3. Place and compact materials in continuous layers not exceeding the following thickness in compacted depth:
      a. Granular fill: 12 inches.
      b. Cohesive fill: 8 inches.
   4. Soil moisture content shall be adjusted as needed to facilitate placement and compaction. Maintain soil near optimum moisture content of backfill materials for structurally loaded areas within a range of -2 to +2 percentage points of the optimum moisture content value.

D. Slopes:
   1. Minimum slope grade away from building minimum 0.2 feet in 10 feet unless indicated otherwise. Achieve a slope of 0.5 feet in 10 feet, wherever possible.
   2. Make grade changes gradual. Blend slope into level areas.

E. Stockpile areas:
   1. Remove surplus backfill materials from the site or dispose of on-site in a designated area.
   2. Leave areas completely free of excess materials.

F. Field quality control:
   1. Field inspection and testing will be performed as defined in Division 1 of the specifications.
   2. Moisture-density testing of fill and backfill soils shall be in accordance with ASTM D1557 (modified Proctor).
   3. Field density testing shall be performed in accordance with ASTM D6938, ASTM D4564, or other method recommended by the Owner's testing agency and acceptable to the Owner's Representative.
   4. If tests indicates the work of this Section does not meet specified requirements, recompact in place or remove and replace, then retest materials at no cost to the Owner.
   5. Proofroll compacted fill surfaces under slabs-on-grade and paving for a distance of 10 feet beyond slabs and paving in all directions under provisions of Section 31 71 15.

3.02 PROTECTION OF FINISHED WORK

A. Recompact fills subjected to vehicular traffic.

3.03 SCHEDULE

A. The paragraphs below identify location, fill material to be used (identified from lower to upper fill material), compacted thickness of each fill, and compaction expressed as a percentage of maximum density and optimum moisture in comparison with soil Proctor specified above.

B. Areas under building: Refer to Structural specifications and drawings for fill requirements beneath the building envelope.

C. Seeded, sodded and landscaped areas: Structural Fill or suitable earth fill to 6 inches below finish grade, compacted to 90%.

D. Asphalt Paving: Structural Fill to bottom of subgrade compacted to 95%.

E. Concrete paving: Structural Fill to bottom of subgrade compacted to 95%.
F. Concrete walks and pads: Structural Fill to bottom walk or pad compacted to 95%.

3.04 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, and planting is to be performed. Place to the following minimum depths, up to finished grade elevations:
   1. 6 inches for seeded areas.
   2. 6 inches for sodded areas.

B. Use topsoil in relatively dry state. Place during dry weather.
C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles and contours of sub-grades.
D. Remove stone, roots, grass, weeds, debris and other foreign material while spreading.
E. Manually spread topsoil around trees and plants to prevent damage which may be caused by grading equipment.
F. Lightly compact placed topsoil.

3.05 CLEAN-UP

A. Upon completion of work of this Section, clean up and leave area free of debris, excess material, and equipment.
B. Any excess earth shall be disposed of on-site by the contractor in an area to be designated by the owner's representative.

END OF SECTION

SECTION 313116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Soil-applied chemical treatment.

1.02 PRICE AND PAYMENT PROCEDURES

A. Unit Prices:

B. See Section 012200 - Unit Prices, for additional unit price requirements.

C. Basis of Measurement for Soil Treatment: By square yard (square meter).

1.03 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2019.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

D. Test Reports: Indicate regulatory agency approval reports when required.

E. Manufacturer's Instructions: Indicate caution requirement.

F. Executed warranty.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Installer Warranty: Provide 2-year warranty for termite control commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.
   1. Include coverage for repairs to building and to damaged contents. Repair damage and, if required, re-treat.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Soil-Applied Chemical Treatment:
   1. Toxicant: Comply with Title 7, United States Code, 136 through 136y.
   2. Color: Synthetically dyed for visual identification of treated soil.
   3. Diluent: Recommended by toxicant manufacturer.
   4. Mixes: Mix toxicant in accordance with manufacturer's instructions.
   5. Manufacturers:
      a. Bayer Environmental Science Corp: www.bayer.com/en/agriculture/environmental-science/#sle.
      b. FMC Professional Solutions: www.fmcprosolutions.com/#sle.
      c. Syngenta Professional Products: www.syngentaprofessionalproducts.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen and dry to absorb toxicant, ready to receive treatment.

B. Verify final grading is complete; see Section 312200.

C. Verify utility trenches are wide enough to receive application.

3.02 PREPARATION

A. Identify presence of live termites or evidence of termite damage and map areas to receive application.

B. Removal:
   1. Remove woody materials from mapped areas.

3.03 APPLICATION

A. Comply with manufacturer's written instructions.

B. Soil-Applied Chemical Treatment:
   1. Comply with requirements of U.S. EPA and applicable state and local codes.
   2. Spray-apply toxicant in accordance with manufacturer's instructions.
   3. Apply toxicant at the following locations:
      a. Building footprint immediately prior to finish grading work outside foundations.
      b. At interior and exterior sides of foundation walls.
         1) Apply toxicant immediately prior to finish grading.
      c. Soil within 10 feet (3 m) of building perimeter immediately prior to finish grading.
      d. Along utility conveyances from foundation to 10 feet (3 m) of building perimeter.

3.04 PROTECTION

A. Do not permit soil grading over treated work.

B. Protect applications from damage after completion. Repair disturbances according to manufacturer's written instructions.

END OF SECTION

SECTION 31 71 15
PROOF-ROLLING

PART 1 - GENERAL

1.01 RELATED WORK
A. Division One: Testing Laboratory Services
B. Section 31 05 50: Site Excavation
C. Section 31 23 40: Backfilling and Finish Grading

1.02 QUALITY ASSURANCE
A. The Owner will employ a qualified geotechnical engineering and construction materials testing firm to observe proof-rolling operations and perform required tests.
B. The contractor shall not perform proof-rolling operations unless testing firm personnel are present.
C. Neither proof-rolling operations nor subsequent fill operations will be accepted for payment unless testing firm personnel observes proof-rolling operations.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Vehicle: Heavily-loaded, tandem-axle or similar rubber tired dump truck having weight of approximately 30,000 lbs, or similar equipment.

PART 3 - EXECUTION

3.01 PROOF-ROLLING AND COMPACTION
A. Proof-rolling shall occur after stripping and grubbing
B. Areas to proof-roll:
   1. Areas to be covered by construction.
   2. Areas to be covered with fill.
   3. Lawn areas attained by excavation.
   4. Areas 10 feet beyond the above areas in all directions.
C. Observation: Operate Vehicle at normal walking speed so that the testing firm personnel may observe the ground at all times. Testing personnel will conduct additional tests they deem necessary to assess conditions.
D. After stripping and proofrolling and prior to fill placement, exposed soils shall be uniformly compacted with overlapping passes of a vibratory drum roller with a drum diameter of at least 30 inches capable of exerting a minimum impact force of 40,000 pounds to densify the loose upper sands.
E. Densities of at least 95 percent of the modified Proctor (ASTM D1557) maximum dry density shall be obtained to a depth of at least 12 inches below the compacted surface.
F. Regardless of the degree of compaction achieved, a minimum of eight (8) complete overlapping coverages shall be made in the building pad area with the compaction equipment to help increase the density and improve the uniformity of the underlying sandy soils. The roller coverage shall be divided evenly into two (2) perpendicular directions.
G. Adjust moisture content as needed to facilitate the compaction process.

3.02 REMEDIAL WORK
A. Areas of unstable soils shall be undercut and backfilled with compacted structural fill, scarified and densified in place after adjusting the soil's moisture content as needed, or treated as recommended by the Geotechnical Engineer or his designated representative.

END OF SECTION

SECTION 32 05 23
SITE CONCRETE WORK

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Formwork complete with required shoring, bracing and anchorage.
B. Concrete reinforcing, complete with required supports, spacers and related accessories.
C. Cast-in-place concrete.
D. Construction, expansion and contraction joints.

1.02 RELATED WORK
A. Section 31 22 13: Site Excavation
B. Section 31 23 40: Backfilling and Finish Grading
C. Section 32 17 23: Pavement Marking
D. Section 03 35 19 Dry Shake Colored Concrete Hardener

1.03 QUALITY ASSURANCE
A. Perform work in accordance with ACI 301. Maintain one copy at the job site.
B. Obtain materials from the same source throughout.
C. Do not place concrete when base surface temperature is less than 40^{o}F or forecast to go below 40^{o} for 24 hours, and when surfaces are wet or frozen.

1.04 REGULATORY REQUIREMENTS
A. Comply with local codes and ordinances for concrete work on public property.

1.05 TESTS
B. Submit the proposed mix design of each type of concrete at least two weeks prior to commencement of concrete work.
   1. Base material proportions on ACI procedures.
   2. Show type of materials, slump range, air content, aggregate gradation and 28 day compressive strength.
C. The Owner's testing agency will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.
   1. Four test cylinders will be taken for every 75 (or less) cubic yards of concrete placed each day.
   2. One slump test and air entrainment test will be taken for each set of cylinders taken.
D. Verify results of tests for compliance with the Contract Documents.
E. Compressive strength test specimens shall be taken by the Owner’s testing firm during construction from the first placement of each class of concrete placed each day, and for each 75 cubic yards or fraction thereof each day.
F. Each set of test specimens shall consist of 5 cylinders. Specimens shall be made in accordance with ASTM C31. Specimens shall be 4-inch diameter by 8-inch high cylinders.
G. Compression strength tests shall be in accordance with ASTM C39. One (1) cylinder shall be broken at three (3) days, one (1) at seven (7) days, two (2) at 28 days, and the remaining cylinder shall be held to verify test results, if needed.
H. The acceptance of the test results shall be the average of the strengths of the two specimens tested at 28 days as per ACI 318. Evaluation and acceptance of the concrete shall be per ACI 318, Chapter 5.
I. Slump Tests: One (1) slump test shall be taken per truckload in accordance with ASTM C143.
J. Air Content: Air content shall be determined for each set of compressive strength test specimens taken in accordance with ASTM C231 or by ASTM C173.
K. Temperature: Concrete temperature shall be recorded in accordance with ASTM C1064.
L. Concrete that fails to meet the ACI requirements and these Specifications is subject to removal and replacement.

1.06 SUBMITTALS

A. Submit product data on joint filler, admixtures and curing compounds including properties, chemical composition and installation instructions.
B. Submit shop drawings showing sizes and locations of reinforcing, splicing details and other pertinent installation details.
C. Submit certification that concrete materials comply with referenced standards.
D. Use Materials and Resources Form to report materials' recycled content, local/regional content, and cost for MR Credits 4 & 5 per section 018113.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete materials:
   1. Cement: ASTM C150 Type I Portland cement, gray color.
   2. Aggregates: ASTM C33.
   3. Water: Clean and not detrimental to concrete.
B. Form materials:
   1. Forms: Wood or steel form material profiled to suit conditions.
   2. Joint filler: ASTM D994 bituminous type, 1/2 inch thick.
   3. Form release agent: Colorless mineral oil which will not stain concrete or absorb moisture.
   4. Fillets for chamfered corners: Wood or plastic strips sized to make a ¾ inch chamfered corner, maximum possible lengths.
C. Reinforcement:
   1. Reinforcing steel: ASTM A615 Grade 60, deformed billet steel bars, uncoated finish.
   2. Welded wire fabric: ASTM A185 plain type in flat sheets, uncoated finish.
   3. Tie wire: Minimum 16 gauge annealed steel.
   4. Dowels: ASTM A615 Grade 40 plain steel, uncoated finish.
D. Admixtures:
   1. Air entrainment: ASTM C260.
   2. Water reducing: ASTM C494 Type F high range.
   3. Accelerating: ASTM C494 Type C.
   4. Set-retarding: ASTM C494 Type B.
E. Joint sealer: ASTM D1190 hot poured elastic type.
F. Curing compound: ASTM C309, Type 1-D, Class 2, 30% solids.

2.02 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.
   1. Air entrained to result in a 4 percent plus/minus 1 percent air.
   2. Maximum slump of 4 inches.
B. Compressive strength:
   1. Sidewalks, pads, curbs and gutters: 3500 psi at 28 days.
   2. Vehicular pavements: 4000 psi at 28 days.
C. Accelerating Admixtures: Use in cold weather only when approved by the Architect. Use of admixtures will not relax cold weather placement requirements.
D. Set Retarding Admixtures
   1. Use set-retarding admixtures in hot weather only when approved by the Architect.
E. Do not add calcium chloride to concrete.

PART 3 - EXECUTION

3.01 PREPARATION OF BASE

A. Verify that the supporting base is properly prepared and compacted, and true to line and grade.
B. Moisten base to minimize absorption of water from fresh concrete.
C. Notify the Architect a minimum of 24 hours prior to commencement of concreting operations.
D. Frames of subsurface structures: Coat surfaces of new and existing frames with oil to prevent bonding with concrete.
E. Notify the Owner's testing agency a minimum of 72 hours prior to commencement of concreting operations.

3.02 FORM WORK

A. Form Setting:
   1. Place and secure forms to correct locations, dimensions and profiles.
   2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
   3. Construct forms sufficiently tight to prevent mortar leakage. Lock form section to be free from ply or movement in any direction.
   4. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.
   5. Provide chamfers at all exposed concrete edges.
   6. Apply form release agent to form surfaces in accordance with the manufacturer's printed instructions, before placing reinforcing and embedded items.
B. Grade and Alignment:
   1. Check and correct the alignment and grade elevation of the forms immediately before placing the concrete.
   2. When any form has been disturbed or any grade has become unstable, reset and recheck the form.

3.03 REINFORCEMENT

A. Ensure all reinforcing is clean, and free of rust, scale, oil, dirt or other materials which may reduce bonding.
B. Have required bends made in the shop without heat.
C. Place reinforcement in accordance with approved shop drawings.
D. Interrupt reinforcement at expansion joints.
E. Support reinforcing with precast concrete blocks, metal chairs or other method approved by the Architect. Supporting with gravel, brick or wood blocks is not permitted.

3.04 GENERAL CONCRETE PLACEMENT

A. Place concrete in accordance with ACI 301. When central or transit mixed concrete is used, place the mixture where it will require as little rehandling as possible.
B. Keep forms and subgrade moist during concrete placement.
C. Ensure reinforcement, embedded items and formed joints are not disturbed during concrete placement.
D. Do not allow concrete to free fall more than 3 feet.
E. Distribute and spread concrete as soon as possible. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
F. Thoroughly work concrete with suitable tools to remove coarse aggregate from the surface and to place mortar against the form. Work concrete to produce a smooth finish, free of air pockets, water pockets and honeycombs.
G. Consolidate concrete against and along the faces of all forms and along the full length and on both sides of all joint assemblies with a suitable mechanical vibrator. Do not permit the vibrator to come in contact with forms, joint assemblies or subgrade. Do not over vibrate concrete or use the vibrator to transport or flow concrete.
H. Ensure positive drainage to all drains and away from all window sills and door openings, unless specifically noted otherwise.

3.05 PAVEMENTS

A. Longitudinal lines: Sawed of preformed, 1-4 inch wide x 1-1/2 inch deep, at approximately 12 ft. o.c. with equal spacing between slabs and parallel to the direction of travel.
   1. Joint Face: Metal key-way type with metal or wood forms.
   2. Tie bars: 1/2 inch diameter bars at 48 inches o.c.
   3. Place joint sealant to a minimum depth of 1/2 inch with approved backer materials.
B. Transverse contraction and construction joints: 3/8 inch wide x 1/2 inches deep, at approximately 12 ft. o.c. and perpendicular to the direction of travel.
   1. Joints may be saw-cut, formed by hand of premolded filler.
   2. Provide load transfer device consisting of ¾ inch diameter smooth dowels at 12 inches o.c. Coat dowels with a thick film of heavy grease on one end. Minimum dowel embedment to be 6".
   3. Place joint sealant to a minimum depth of 1/2 inch with approved backer materials.
C. Isolation Joints: Isolate objects abutting or adjacent to paved areas with premolded filler extended the full depth of the slab.
D. Finishing:
   1. Finish concrete in the following sequence: Strike-off, consolidation, floating and removal of laitance.
   2. Provide light broom texture transverse to traffic flow direction.
   3. Round edges of each side of joints to an inch radius.
E. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturers printed instructions for the application.

3.06 CURBS AND GUTTERS

A. Joints: Construct edges and joints as indicated.
   1. Expansion joints: Premolded joint filler at no more than 50 ft. o.c. Extend to within 1/4 inch of the surface.
   2. Contraction joints: Score joints at minimum spacing of 10 ft. o.c.
   3. Construct edges and joints as indicated.
B. Provide for curb cuts, wheel chair ramps and drainage ways as indicated.
C. Install premolded joint filler where curbs adjoin adjacent structures.
D. Match existing curbs and curb and gutter sections flush.
E. Hand work curbs as necessary to match drainage structures flush.
F. Finishing: Finish with a light broom texture.
G. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the applications.

3.07 WALKS

A. Construct to general grade and spot elevations indicated. Wavy walks or walks that pond water are not acceptable.
B. Construct with turned-down edges where indicated.
C. Place short vertical curves where necessary and where change in grade exceeds 2%. Do not exceed 1/2 inch/ft. slope within 2 feet of top and bottom steps. Crown 1/4 inch/ft. or cross slope to maintain drainage.
D. Joints:
   1. Install 1/2 inch premolded joint filler at no more than 25 feet o.c., at walk junctions and intersections, at top and bottom of steps, and where walks abut curbs, building, slabs or other fixed objects. Extend to within ¼ inch of the surface.
   2. Install expansion joints in irregular walk sections at right angles to the walk centerline to create panels not exceeding 250 sq ft. Extend the full depth of the slab.
   3. Score joints at minimum spacing of 5 ft. o.c. With a suitable edging tool.
E. Finishing:
   1. Slopes exceeding 5%: Finish with a bolted or heavy broom texture.
   2. Other surfaces: Finish with a light broom texture.

3. Round edges, including each side of joints and grooves, to a 1/4 inch radius.
4. Finish walks to be 1/4 inch above curb, and with a neat bevel at termination with curbs.

F. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the application.
G. Protection: Do not remove forms until at least 24 hours after paving. Protect walks from pedestrian traffic and applied loads for at least three days after paving.

3.08 DUMPSTER PAD

A. Install pad in accordance with the general and spot elevations indicated. Provide a crown or cross slope at a minimum of inch/ft. across the pad.
B. Construct the leading edge to form an exposed 8-inch barrier wall.
C. Isolate footings from the pad with premolded joint filler.
D. Finish pad surface and exposed edges to a smooth trowel finish.
E. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacturer's printed instructions for the application.
F. Protection: Do not remove forms for at least 24 hours after completion of concrete placement. Do not allow any traffic or other loading on pad until test data reveals design strength has been attained.

3.09 EQUIPMENT PAD

A. Install pad in accordance with the general contours and spot elevations indicated. Provide a crown or cross slope at a minimum of 1/4 inch/ft. across the pad.
B. Place pad in minimum 4 inch thickness of granular fill, placed and compacted as specified in Section 31 23 40.
C. Chamfer exposed edges 3/4 inch.
D. Finish exposed surfaces to have a light broom texture finish.
E. Curing: Uniformly apply curing compound over the entire surface after finishing, initial set and removal of side forms, in accordance with the manufacture's printed instructions for the application.
F. Protection: Do not remove forms for at least 24 hours after completion of concrete placement. Do not allow any traffic or other loading on pad until test data revels design strength has been attained.

3.10 SIGN POST FOUNDATION

A. Post footings may be cast if excavations remain stable. Place forms if excavations will not remain stable.
B. Place concrete to level of adjacent grades with slight crown to shed water.
C. Ensure signposts are plumb prior to initial set.

3.11 PROTECTION

A. Protect installed items under provisions of Division 1 of the Specifications. In addition to specific protection measures specified above.
    1. Immediately after placement, protect pavement from premature drying, excessive temperatures and from mechanical injury. Maintain environmental and barrier protection for seven days after placement.
    2. Maintain concrete with a minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
    3. Protect concrete form paint and stains.

3.12 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with practices specified elsewhere in the specifications.
B. Maintain records of placed concrete items. Record:

1. Date.
2. Location of pour.
3. Quantity.
4. Air temperature.
5. Test samples taken.

END OF SECTION

SECTION 32 11 00
BASE COURSE FOR PAVEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Preparing subgrade to receive a base or pavement.
B. Placing and compacting base material.

1.02 RELATED WORK
A. Division 1: Testing Laboratory Services
B. Section 31 11 00: Clearing and Grubbing
C. Section 31 22 13: Site Excavation
D. Section 32 05 23: Site Concrete Work
E. Section 32 12 16: Asphaltic Concrete Paving

1.03 QUALITY ASSURANCE
A. Perform work in accordance with the State Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), hereinafter referred to as "State Highway Specifications."
B. Qualifications of Asphaltic Concrete Producer: Use only materials which are furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot-laid asphaltic concrete.
C. Owner will provide material testing and inspection for quality control during paving operations.

1.04 REFERENCE STANDARDS
A. Gradation of stone materials will be performed in accordance with ASTM C136.

1.05 SUBMITTALS
A. Use Materials and Resources Form to report materials' recycled content, local/regional content, and cost for MR Credits 4 & 5 per section 018113.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Mineral aggregate base (flexible base material, FBM) for asphaltic concrete pavement:
   1. Section 300, State Highway Specifications.

PART 3 - EXECUTION

3.01 PREPARATION
A. Verify compacted subgrade is dry and has been approved to receive the work of this Section.
B. Verify gradients and elevations of subgrade are correct.
C. Field Quality Control
   1. Proofroll subgrades that have been exposed to weather under provisions of Section 31 71 15. Repair any areas that show evidence of cracking or deterioration.
   2. Remove materials identified by Testing Firm Personnel as being unsuitable. Backfill and compact such areas as specified in Section 31 23 40.

3.02 PLACING BASE COURSE
A. Perform aggregate blending by approved stationary or travel plant methods. Mixing in stockpiles or on roadway will not be acceptable.
B. Spread base material uniformly over the area to produce required lines, grades and cross-sections after compaction.
   1. Indicated thickness of 6 inches or less may be constructed in a single course.

2. Spread and compact thickness greater than 6 inches in at least 2 courses.

C. Level and contour surfaces to the elevations and gradients indicated.
D. Compact each layer to 98% of the maximum dry density as determined by ASTM D1557.
   1. Adjust moisture content to achieve near optimum moisture content prior to compaction.
F. Moisture-density testing of base materials shall be in accordance with ASTM D1557 (modified Proctor).
G. Field density testing shall be performed in accordance with ASTM D6938, ASTM D4564, or other method recommended by the Owner's testing agency and acceptable to the Owner's Representative.
H. Field density tests shall be performed at a frequency of not less than one (1) test per 5,000 square feet per lift, or at a minimum of two (2) tests per lift, whichever is greater.
I. If tests indicates the work of this Section does not meet specified requirements, recompact in place or remove and replace, then retest materials at no cost to the Owner.
J. Use mechanical hand tamping equipment in areas inaccessible to compaction equipment.

3.03 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with a 10 ft straight edge.
B. Scheduled compaction thickness: Within 1/4 inch.
C. Variation from true elevation: Within 1/2 inch.

3.04 FINISHING AND MAINTENANCE

A. Finish surfaces by rolling with a smooth steel wheel roller. Water the surface and spread loose stones prior to rolling.
B. Repair soft, yielding areas that develop in the final rolling.
C. Maintain final surface in smooth and uniform condition until base course is covered by subsequent pavement construction.
D. Protect surface from silting or erosion until placement of final pavement construction.
E. Where areas are disturbed by traffic, weather or other means, grade and recompact as necessary.

END OF SECTION

SECTION 32 12 16
ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 WORK INCLUDED
A. Mixing, spreading, compacting and finishing of bituminous pavements for base, leveling and surface courses on roads, parking lots, and other areas.

1.02 RELATED WORK
A. Division One: Testing Laboratory Services
B. Section 31 22 13: Site Excavation
C. Section 32 11 00: Base Course for Pavement
D. Section 31 23 40: Backfilling and Finished Grading
E. Section 32 17 23: Pavement Marking

1.03 QUALITY ASSURANCE
A. Perform work in accordance with the State Department of Transportation, Road and Bridge Specifications, latest Edition, hereinafter referred to as "State Highway Specifications." Measurements and payments portions of those State Highway Specifications do not apply to work performed under this contract.
B. Mixing plant: Comply with requirements of State Highway Specifications.
C. Qualifications of Asphaltic Concrete Producer: Use only materials which are furnished by a bulk asphaltic concrete producer regularly engaged in production of hot-mix, hot-laid asphaltic concrete.

1.04 PAVING QUALITY REQUIREMENTS
A. General: In addition to other specified conditions, comply with the following minimum requirements.
   1. Test in-place asphaltic concrete courses for compliance with requirements for density, thickness and surface smoothness.
   2. Provide final surfaces or uniform texture, complying with required grades and cross-sections.
   3. Take not less than 4 in. diameter pavement specimens for each completed course, from locations as directed by Owner's Representative.
   4. Repair holes from test specimens as specified for patching defective work.
B. Density
   1. Compare density of in-place material against laboratory specimen of same asphaltic concrete mixture, when subjected to 50 blows of standard Marshall hammer on each side of specimen.
   2. Minimum acceptable density of in-place course material is 97% of the recorded laboratory specimen density.

1.05 REGULATORY REQUIREMENTS
A. Comply with applicable local standards, codes and ordinances for paving work on public property.

1.06 TESTS
A. Testing and analysis of asphaltic mix will be performed under provisions of Division One.

1.07 SUBMITTALS
A. Samples: Provide samples of materials for laboratory testing and job-mix design as required by Owner's Representative.
B. Certificates:
   1. Provide certificates, in lieu of laboratory test reports.
   2. Certify that materials comply with specification requirements.

3. Signed by asphaltic concrete producer and Contractor.

C. Use Materials and Resources Form to report materials' recycled content, local/regional content, and cost for MR Credits 4 & 5 per section 018113.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when the base surface temperature is less than 40° F.

B. Do not apply materials when substrate is wet or contains sufficient moisture to prevent uniform distribution and proper penetration.

PART 2 PRODUCTS

2.01 MATERIALS

A. Primer: Class MC-30 medium curing liquid asphalt in accordance with AASHTO M82.

B. Tack Coat: AASHTO M-140 emulsified asphalt, diluted with equal parts of water.

C. Asphalt Cement: ASTM D946, 60-70 penetration grade.

D. Aggregate: Sound and durable, angular crushed stone, sand or slag.
   1. Coarse aggregate: ASTM D692
   2. Fine aggregate: ASTM D1073

E. Mineral filler: Shall meet the requirements of AASHTO M17 finely ground particles of limestone, hydrated lime, portland cement, or other approved mineral dust, free from foreign matter.

2.02 ASPHALT PAVING MIX

A. Use dry materials to avoid foaming. Mix uniformly.

B. Mix designation: State Highway Specification Sections as follows:
   1. Asphaltic Concrete Surface Course: Division 300
   2. Asphaltic Binder Course: Division 300.

C. Job mix formula: Base on the Marshall design method for compaction of 50 blows each side of specimen and the following test criteria:
   1. Also refer to any specific criteria contained within the Geotechnical Report.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify compacted subgrade is dry, has been compacted to the project specifications, and is ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Beginning of installation implies contractor’s acceptance of subgrade.

3.02 PREPARATION

A. Prepare mix materials and place of deposit in accordance with referenced state highway specifications.

B. Prime Coat:
   1. Apply over substrate in accordance with the manufacturers printed instructions at the rate of .3 gal/sq. yd.
   2. Use clean sand to blot excess primer. Use only enough sand to prevent pick-up under traffic. Remove loose sand before paving.

C. Tack Coat:
   1. Apply to contact surfaces of concrete items which abut pavement.
   2. Apply to contact surfaces of existing asphalt or concrete pavement at the rate of .05 to .15 gal/sq yd of surface.

D. Frames of subsurface structures:
   1. Coat surfaces of new and existing frames with oil to prevent bond with asphalt paving.
   2. Set to be flush with finish surface and surround with a ring of compacted asphaltic concrete to one inch below top of frame. Adjust as required to meet paving.

3. Provide temporary covers over openings until completion of rolling operations.

3.03 PLACING ASPHALT PAVEMENT

A. Place materials in accordance with referenced State Highway Specifications.
B. Place, spread and strike-off to compacted thickness indicated with paving machine, except that inaccessible and small areas may be placed by hand.
C. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact area inaccessible to rolling equipment.
   1. Average relative density: Minimum of 97%.
   2. Individual relative density: Minimum of 94%.
D. Develop rolling with consecutive passes to achieve even and smooth finish of uniform texture, without roller marks.
E. Make joints between successive days work, or between old and new pavements in accordance with referenced State Highway Specifications. Ensure a continuous bond is attained.

3.04 TOLERANCES

A. Flatness: ±1/4-inch measured with a 10 ft. straight edge.
B. Compacted scheduled thickness: ±1/4-inch of design thickness.
C. Variation from true elevation: 0.05 feet.

3.05 PATCHING

A. Remove defective or deficient areas for full depth of course.
   1. Cut sides parallel and perpendicular to direction of traffic with edges vertical.
   2. Apply tack coat to exposed surfaces and place asphalt on prepared surfaces as specified above.
B. Repair and patch holes resulting from test cores as specified above.

3.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed as defined in Division 1 of the specifications.

3.07 PROTECTION

A. Immediately after placement, protect pavement for 7 days from mechanical injury.
B. Cover openings of substrate structures in paved area until permanent coverings are placed.

3.08 SCHEDULE OF PAVEMENT SECTIONS

A. Place and compact materials to the thickness shown on the Drawings.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKING

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Marking of pavement including surface preparation and painting on bituminous or concrete surface.

1.02 ACCEPTANCE PROCEDURE
A. Typical Sample Analysis
B. Certification that paint meets requirements

1.03 SUBMITTALS
A. Use Materials and Resources Form to report materials' recycled content, local/regional content, and cost for MR Credits 4 & 5 per section 018113.

PART 2 - PRODUCTS

2.01 READY-MIXED PAINT
A. Paint: Porter traffic paint, colors as follows.
   1. Parking lines and directional arrows: White.
   2. No parking striped islands: Yellow
   3. Handicapped symbols: Blue
   4. Fire Lane Striping: Red
B. Substitutions: Materials of the same function and performance are acceptable under provisions defined in Division 1 of the Specifications.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Prepare surface and apply paint with provisions of consistent agitation of paint with guns capable of applying a solid consistent marking.
B. Apply paint markings to have true, sharp edges and ends, with lines of correct lengths, widths and curvatures. Paint application to be performed in accordance with manufacturer's recommendations.
C. Protection:
   1. Take precautions necessary to ensure that paint does not soil adjacent surfaces.
   2. Place warning signs and traffic cones or similar devices to protect markings from being tracked by pedestrians or vehicles.
   3. Efface any tracked paint from adjacent areas and repair pavement markings.

END OF SECTION

SECTION 323500
SITE SCREENING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-Formed Panels: For screening or buffering trash enclosures, utility areas, privacy areas, mechanical units, etc.
   1. Plankwall PVC (Polyvinyl Chloride).

B. Aluminum Support Framing: For direct attachment of screen support columns to/into concrete pads, piers, or footings provided by others.

C. Operable gates for access through screens.

D. Not Included in This Specification:
   1. Touch-up painting required for scratches and screw heads.
   2. Field painting of prime painted screens

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM B 221 - Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire Profiles, and Tubes.

B. The Aluminum Association, Inc. (AA):
   1. AA ADM-1516166 - Aluminum Design Manual

C. American Society of Civil Engineers (ASCE):
   1. ASCE 7-18 - Minimum Design Loads for Buildings and Other Structures.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.
   5. Sufficient data and detail to indicate compliance with these specifications.

C. Verification Samples: Two representative units of each panel type.
   1. Color Selection: Submit paint chart with full range of colors available for Architect's selection. Custom color samples available upon purchase

D. Shop Drawings: Indicate layout heights, component connection details, and details of interface with adjacent construction.

E. Certification: Manufacturer's Certificate of Compliance certifying that panels supplied meet or exceed requirements specified.

F. Closeout Submittals: Warranty documents, issued and executed by manufacturer, countersigned by Contractor.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum one years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

B. Storage and Handling: Protect materials and finishes during handling and installation to prevent damage.

C. Protect from damage due to weather, excessive temperature, and construction operations.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Field Measurements: Take measurements of supporting paving, footings, or piers. Indicate measurements on shop drawings fully documenting any field condition that may interfere with the screen system installation.

1.07 COORDINATION

A. Installer for work under this Section shall be responsible for coordination of panel and framing sizes and required options with the Contractor's requirements.
   1. Request information on sizes and options required from the Contractor.

B. Submit shop drawings to the Contractor and obtain written approval of shop drawing from the Contractor prior to fabrication.

C. Confirm size, type, and location of supporting construction as adequate to resist column supports.

1.08 WARRANTY

A. If any part of the screen system fails because of a manufacturing defect within 1 to 5 years from the date of substantial completion, the manufacturer will furnish the required replacement parts without charge. Any local transportation, related service labor, or diagnostic call charges are not included.

1.09 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: CityScapes International Inc., which is located at: 4200 Lyman Ct., Hilliard, OH 43026; Toll Free: 877-SCREENS; Phone: 614-850-2549; Email: contact@cityscapesinc.com; Web: https://cityscapesinc.com/
   1. Basis of Design: Covrit Gates and Screening System by CityScapes International Inc.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

A. Regulatory Requirements: Comply with requirements of building authorities having jurisdiction in Project location.

B. Design Criteria: Manufacturer is responsible for the structural design of all materials, assembly, and attachments to resist snow, wind, suction and uplift loading at any point without damage or permanent set.
   1. Framing: Designed in accordance with the Aluminum Design Manual to resist the following loading:

a. ASCE 7-18 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.

2.03 MATERIALS

A. Paneling: Minimum Thickness: 0.050”
   1. Plankwall, PVC (Polyvinyl Chloride).

B. Operable Access Gates: Minimum Panel thickness: 0.050”
   1. ToughGate: Natural wood sheets.
   2. ToughGate: PVC (Polyvinyl Chloride) sheets.

C. Framing: Aluminum Plate, Shapes and Bar: ASTM B221, alloy 6005-T5, 6061-T5 or 6063-T5.

D. Threaded Fasteners: Screws, bolts, nut and washers to be Stainless Steel.
   1. Post Backer assembly fasteners shall be #10-16 stainless steel Self-Drilling screws.
   2. Provide lock washer or other locking device at all bolted connections.

2.04 FABRICATION

A. Factory-Formed Panel Systems: Continuous interlocking panel connections and indicated or necessary components.
   1. Form components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings.

B. Fabricate products to the following configurations:
   1. Panel Style: Plankwall horizontal.
   2. Panel Style: Metal louver.
   3. ToughGate Gate Style: Mission.
   4. Panel and Gate Height: Custom.
   5. Dumpster Layout: 13 x 13 ft (3962 x 3962 mm).
   6. Trim and Closures: Fabricated and finished with Manufacturer’s standard coating system, unless shown otherwise on drawings.

C. Framing: Fabricate and assemble components in largest practical sizes, for delivery to the site.
   1. Construct corner assemblies to required shape with joints tightly fitted.
   2. Supply components required for anchorage of framing. Fabricate anchors and related components of material and finish as required, or as specifically noted.

D. Gate Hardware: Provide manufacturer’s adjustable standard of size required to fit support pipe provided.
   1. Hinge Type: Barrel.

2.05 FINISHES

A. Aluminum Framing: Mill finish.

B. Panel Coating: Manufacturer's standard powder coating system, factory applied.
   1. Color: Selected from full range of manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed.
   1. Submit written notification to Architect and Screen manufacturer if such conditions are unacceptable.
   2. Beginning erection constitutes installer's acceptance of conditions.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install units in accordance with the manufacturer's instructions and approved shop drawings. Keep perimeter lines straight, plumb, and level. Provide brackets, anchors, and accessories necessary for complete installation.

B. Fasten structural supports to/into paving, footings, or piers at spacing as indicated on approved shop drawings.

C. Metal Separation: Where aluminum materials would contact dissimilar materials, insert rubber grommets at attachment points, thus eliminating where dissimilar metals would otherwise be in contact.

D. Do not cut or abrade finishes which cannot be restored. Return items with such finishes to shop for required alterations.

3.04 ERECTION TOLERANCES

A. Maximum misalignment from true position: 1/4 inch (6 mm).

3.05 CLEANING AND PROTECTION

A. Remove all protective masking from material immediately after installation.

B. Protection:
   1. Ensure that finishes and structure of installed systems are not damaged by subsequent construction activities.
   2. If minor damage to finishes occurs, repair damage in accordance with manufacturer's recommendations; provide replacement components if repaired finishes are unacceptable to Architect.

C. Prior to Substantial Completion: Remove dust or other foreign matter from component surfaces; clean finishes in accordance with manufacturer's instructions.
   1. Clean units in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 32 92 23
SODDING

PART 1 GENERAL

1.01 WORK INCLUDED
A. Provide all of the labor, materials, equipment, and services required to furnish and install the sodding. The work shall include, but not be limited to, the following:
   1. Soil preparation.
   2. Sodding lawns, and other indicated areas.

1.02 RELATED WORK
A. Section 32 80 00: Irrigation System
B. Section 32 93 10: Trees, Plants, and Groundcovers

1.03 QUALITY ASSURANCE
A. Comply with Section 01 40 00 requirements.
B. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.
C. Provide and pay for materials testing. Testing agency shall be acceptable to the Architect. Provide the following data:
   1. Test representative material samples proposed for use.
   2. Topsoil: pH factor Mechanical analysis Percentage of organic content Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

1.04 SUBMITTALS
A. Submit sod growers certification of grass species. Identify source location.

1.05 DELIVERY, STORAGE AND HANDLING
A. Cut, deliver and install sod within a 24-hour period.
   1. Do not harvest or transport sod when moisture content may adversely affect sod survival.
   2. Protect sod from sun, wind, and dehydration prior to installation.
   3. Do not tear, stretch, or drop sod during handling and installation.

1.06 PROJECT CONDITIONS
A. Work notification: Notify Architect at least 7 working days prior to start of sodding operations.
B. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.
C. Perform sodding work only after planting and other work affecting ground surface has been completed.
D. Provide hose and lawn watering equipment as required.
E. Where applicable, the irrigation system will be installed prior to sodding. Locate, protect, and maintain the irrigation system during sodding operations. Repair irrigation system components damaged during sodding operations at the Contractor's expense.

1.07 WARRANTY
A. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until final acceptance. Resod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Architect.

PART 2 PRODUCTS

2.01 SOD
A. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod

uniform in color, leaf texture, density, and free of weeds, undesirable grasses, stones, roots, thatch, and extraneous material; viable and capable of growth and development when planted.

B. An "approved" nursery grown blend of improved Bahia or St. Augustine varieties according to landscape plans.
   1. Sod containing, Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Timothy, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorrel, or Bromegrass weeds will not be acceptable.
   2. Furnish sod machine stripped in square pads or strips not more than 3'-0" long; uniformly 1" to 1" thick with clean cut edges. Mow sod before stripping.

2.02 SOIL AMENDMENT MATERIALS

A. Commercial Fertilizer: Granular, non-burning product compound of not less than 50% organic slow acting, guaranteed analysis professional fertilizer. Grade 6-12-12.

B. Lime: Ground limestone, dolomite type, with minimum of 95% carbonates.

2.03 WATER

A. Free of substance harmful to sod growth. Hoses or other methods of transportation furnished by Contractor.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine finish surfaces, grades, topsoil quality and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Limit preparation to areas which will be immediately sodded.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade lawn areas to a smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions as required to drain.

D. Apply fertilizer at a rate of 18 lbs per 1,000 sq. ft. Adjust proportions based upon recommendations resulting from soil test. Mix thoroughly into upper 2 inches of topsoil.

E. Dampen dry soil prior to sodding.

F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.

3.03 INSTALLATION

A. Sodding:
   1. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains, and seeded areas.
   2. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.
   3. Water sod thoroughly with a fine spray immediately after laying.
   4. Roll with light lawn roller to ensure contact with sub-grade.
   5. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.
   6. On slopes of two to one or steeper, pinning or pegging may be required to hold the sod in place.

3.04 MAINTENANCE

A. Maintain sodded lawns until completion and acceptance of the entire project.

B. Maintain sodded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Owner.
   1. Water sod thoroughly daily to establish proper rooting.
   2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
   3. Mow lawn areas as soon as lawn top growth reaches a (3") height. Cut back to (2") height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing.
C. Apply herbicides as required to control weed growth or undesirable grass species.
D. Apply fungicides and insecticides as required to control diseases and insects.

3.05 ACCEPTANCE

A. Inspection to determine acceptance of sodded lawns will be made by the Architect, upon Contractor's request. Provide notification at least 7 working days before requested inspection date.
   1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored Viable lawn is established, free of weeds, undesirable grass species, disease, and insects.
B. Upon acceptance, the Owner will assume lawn maintenance.

3.06 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, conduit markers, and equipment. Repair damage resulting from sodding operations. Cleaning shall continue until acceptance by Owner.

END OF SECTION

SECTION 32 93 10
TREES, PLANTS AND GROUNDCOVER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, equipment, materials and services necessary to complete the Work of this Section including:
   1. Providing and installing trees, shrubs, groundcovers, sod and seed for landscape planting.
   2. Fine grading of topsoil for all exterior areas to receive planting, mulch, seed or sod as specified.
   3. Specified Maintenance Period and One-Year Guarantee Period.
   4. Irrigation Work shall be provided as a subcontract to the Work of this Section.

1.2 RELATED WORK

A. Irrigation System: Section 32 80 00
B. Backfilling and Finish Grading: Section 31 23 40

1.3 QUALITY ASSURANCE

A. Codes and Standards:
   1. All plant materials to comply with State and Federal laws relating to inspection for disease and insect control.
   2. Plant material size and grades to conform to "American Standard for Nursery Stock." American Association of Nurserymen, Inc. Latest approved revision, ANSI Z-60-1.
   3. Plant material nomenclature to conform to:
      a. "Standardized Plant Names" as adopted by the Joint Committee of Horticulture Nomenclature, latest revision.
      b. Names not listed in the above standard to comply with those most commonly used in the trade.
      c. In all cases, botanical names take precedence over common names.

B. Qualification of Personnel: Use adequate numbers of skilled workmen trained and experienced in the Work and familiar with requirements and methods needed for performance of the Work. At all times during planting operations, have on the site in a supervisory role a man knowledgeable in horticultural practices as defined in 3.08 Maintenance D.1 a-c herein.

C. Inspection and Approval:
   1. All plant material is subject to inspection and approval in the field or nursery before digging, by the Landscape Architect.
   2. All plant materials and other materials are subject to inspection and approval at the site before planting or placing or at any other time.
   3. Attach secure, durable, legible waterproof labels, stating correct botanical and common names as specified, to at least one plant, bundle or container of each plant variety.
   4. Immediately remove from the site plant materials or other materials not complying with specified requirements.
   5. Approval is for visual qualities only and does not relieve the Contractor of his obligation to provide materials and workmanship in full compliance with all specifications.

1.4 SUBMITTALS

A. Materials Lists:
   1. On the bid date, bidder shall be prepared to submit a complete list of materials demonstrating source, availability, and conformance with requirements specified.
   2. For trees not specified as pre-selected and tagged, submit color photographs of representative plants with materials unit price list to the satisfaction of the Landscape Architect.
   3. Substitutions not permitted unless proof is submitted to Landscape Architect's

satisfaction that the material is unavailable as specified.

B. Maintenance Manual: In 3-ring binder, typewritten schedule and procedures for annual landscape maintenance, by Contractor to Owner and Landscape Architect.

1.5 PRECAUTIONS

A. Examine conditions under which Work is to be performed and notify the Landscape Architect of unsatisfactory conditions.

B. Determine locations of underground utilities and perform Work in a manner, which will avoid all possible damage. Hand excavate as required.

1.6 COORDINATION

A. Coordinate the Work of this Section with that of other trades.

B. Do not perform the Work until conditions are satisfactory and acceptable.

C. Maintain stakes set by others until all parties mutually agree upon removal.

D. Inform Landscape Architect in writing, prior to planting, of conditions existing which could be considered detrimental to the successful planting and growth of any plant material, including but not limited to subsurface drainage conditions, utility locations, subgrade compaction, percolation, rate and elevations.

1.7 HANDLING, DELIVERY AND STORAGE

A. Deliver packaged material in manufacturer's original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at the site.

B. Deliver all non-packaged or non-containerized materials to site in a manner that will prevent loss, damage, deterioration or contamination.

C. Store all materials in approved locations and to prevent loss, damage, deterioration or contamination.

D. Delivery, storage and handling of all plant materials shall conform to the following:

1. Do not prune prior to delivery.
2. Do not bend or bind trees or shrubs on such a manner as to damage bark, break branches or destroy natural shape.
3. Provide protective covering during delivery.
4. Deliver plants after preparations for planting have been completed and approved. Plant immediately.

1.8 SITE MAINTENANCE

A. Keep roads, paving and structures adjacent to planting operations clean and free of obstructions, mud and debris at all times.

B. Do not permit flushing of roads or disposal of dirt or debris into sewers or drainage ditches.

C. Control dust from planting operations.

D. Remove trash, debris and rejected materials from the site daily as the work progresses.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. Plant Material:

1. Definition: trees, shrubs and groundcover listed in the Plant Schedule in the Drawing.
2. General:
   a. Species, size, manner in which to be planted, and approximate quantities to complete planting as indicated are included in the Plant Schedule. It is the Contractor's responsibility to check these quantities to allow for the correct quantity of plants based on the plan. Any discrepancies should be pointed out to the Landscape Architect prior to bid.
   b. Plants shall remain the property of the Contractor until Substantial Completion.
   c. Scientific and common plant names conform to those given in Standardized

Plant Names or are those generally accepted in the nursery trade.

3. Quality:
   a. Grade No. 1 or better to name and type. Plants, which are not of the highest quality, will be rejected.
   b. Nursery-grown, unless specified otherwise.
   c. In compliance with State and Federal laws relating to disease.
   d. Having normal, well-developed branches and vigorous root systems.
   e. Healthy, vigorous, free from defects, decay and disfigurements, sunscald injuries, abrasions of the bark, plant disease, insect pests or eggs, borers, and all forms of infestations or objectionable disfigurements.
   f. Reject plants lacking compactness or proper proportions, plants that are weak or thin or are injured by too close planting in nursery rows.
   g. Plants which have been cut beck from larger grades to meet certain specified requirements will be rejected.
   h. Plants with undersized, dry, cracked or broken balls, or which are loose in their balls will be rejected.
   i. Container-grown material: Grown for one growing season in the container in which it is delivered; free from weeds and grasses. Root bound material will be rejected.
4. Size:
   a. Sizes and proportions shall be equal to those recommended by the "American Standard for Nursery Stock" for specified grades.
   b. Measure plants before pruning and with branches in normal position.
   c. Equal or exceed measurements specified in Plant Schedule, which are the minimum acceptable; provide at least 50% of the plant material at the maximum size specified.
   d. Height and spread dimensions: General body mass of plant, not from branch tip to tip.
   e. Well-proportioned as to height; reject plants which meet specified measurements but do not possess an overall balance.
   f. Take caliper measurements on trunk 6 inches above natural ground level up to and including 4-inch caliper size; 12 inches above natural ground level for larger sizes.
   g. Container-grown plants: conform to standards set forth in "American Standard for Nursery Stock for container-grown plants.
5. Quantity: Furnish plants in sufficient quantity to satisfy the intent of Drawings and Specifications. Locate in sufficient quantity so that time is not lost if some plants are rejected.

2.2 TOPSOIL MATERIALS AND AMENDMENTS

A. Topsoil: stockpiled by others on site for use in planting operation.
   1. Characteristics of approved topsoil:
      a. Fertile, friable, naturally occurring topsoil, free of stones, subsoil, clay lumps, hardpan, roots, stumps, branches, sticks and other debris larger than two inches in any dimension; free of noxious weeds, grasses, seeds, plants, extraneous matter and any substance harmful to plant growth.
      b. PH 5.0 to 7.0
      c. Organic Matter 5% to 10%
      d. Sand 50% to 70%
      e. Silt less than 30%
      f. Clay 10% to 25%
      g. Permeability Rate of 5 x 10 (-3) centimeters or greater at 85% compaction.

B. Testing for topsoil:
   1. Sample and test minimum of three samples of stockpiled topsoil for compliance with specified characteristics. Tests to be performed by soil testing lab approved in advance

by Landscape Architect, by Contractor at Owner's expense. Amend per recommendations of Soil Test Report and as approved to meet specified characteristics.

C. Commercial Fertilizer:
   1. Characteristics:
      a. Uniform in composition, dry and free flowing.
      b. Delivered in original, unopened containers each bearing the manufacturer's guaranteed analysis.
   2. Of the formulation recommended in the Soil Test Report as specified.
   3. Acceptable manufacturers:
      a. Sta-Green Plant Food Co.; Sta-Green
      b. O.M. Scott & Sons, Inc.; Scott's
      c. Approved equal

D. Lime:
   1. Ground or crushed agricultural lime.
   2. Containing not less than 85% of total carbonates.
   3. 90% passing 20-mesh screen.
   4. Not less than 50% passing a 60-mesh screen.
   5. Dry and free flowing.
   6. Apply at rate specified in Soil Test Report.

E. Topsoil Mix:
   1. Prepare all topsoil used in tree and shrub pits and groundcover beds and planters in the following proportions:
      a. 50% approved material excavated from the pits (0% if excavation is in rock).
      b. 50% prepared soil in the following proportions (100% if excavation is in rock):
      c. 2 parts by volume topsoil as specified in 2.02 A herein.
      d. 1 part by volume organic matter (peat moss and/or soil conditioner).
      e. 1 part by volume sand
   2. Add fertilizer at rate specified in Soil Test Report.

F. Peat Moss:
   1. Horticultural grade (fibrous type, finely shredded).
   2. Canadian or German stocks, consisting has partially composed vegetable pH between 4 and 6.
   3. Containing no minerals harmful to plant growth.

G. Pine Bark
   100% Shredded Pine Bark Fines:
   1. Free from wood, wood shaving, cambium, sawdust, leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any substance harmful to plant growth.

H. Soil Conditioner:
   1. Well-rotted organic matter of uniform composition.
   2. Containing no weeds, grasses, plants or their seeds nor any substance harmful to plant growth.
   3. Acceptable manufacturers:
      a. Klumb Company, "Soil conditioner," Tuscaloosa, AL
      b. Soil Products, "Metro-Nitro Humas Compost," Hermitage, TN.
      c. Approved equal.

I. Polymer Crystals:
   1. Nondegradable water-storing polymers 1.0 to 3.0 millimeters in size.
      Acceptable Product:
      a. Terrasorb AG as manufacturer by Industrial Services International, Inc., Bradenton, FL.

2.3 MULCH

A. 100% Pine Needle Mulch (tree, plant and groundcover pits and beds):

1. Free from wood, wood shavings, cambium, sawdust, leaves, twigs, insects, grasses, weeds, plants and their seeds, other foreign material and any other substance harmful to plant growth.

2.4 GUYING, STAKING AND WRAPPING

A. Wood Stakes:
   1. Pressure-treated Southern Yellow Pine, or other approved wood, 2" x 4" x length specified in the Drawings, pointed at one end.
   2. Above-ground portion painted black.
   3. Free from insects and fungi.
B. Wire: Pliable #10 or #12 gauge galvanized steel wire, double and twisted.
C. Turnbuckles: Galvanized turnbuckles, as detailed and approved by Landscape Architect.
D. Tree Strap:
   1. Polypropylene web straps with 2 brass eyelets.
   2. 2" minimum width.
   3. Olive in color.
E. Tree Wrap:
   1. Standard manufactured tree wrapping paper.
   2. First quality bituminous impregnated tape, corrugated or crepe paper, brown in color.
   3. Not less than 4" nor more than 6" wide.
   4. Tying material: Jute twine of at least 2-ply strength.

2.5 WATER

A. Fresh water, free of impurities or any substance harmful to plant growth.
B. Provided by Owner.
C. Provide all hose, attachments and accessories necessary to complete the Work as specified.

PART 3 - EXECUTION

3.1 GRADING

A. Topsoil shall be spread and rough graded by others in all areas indicated in the Drawings to receive planting, mulch, seed or sod.
B. Fine grade topsoil to form smooth grades, eliminating irregulations and ponding.
C. Remove extraneous matter measuring 1" or larger in any dimension from top four inches (4") of placed topsoil.
D. Eliminate all unwanted vegetative growth from topsoil by approved means before planting is commenced.
E. Obtain approval of finished grades before proceeding with planting operations; eliminate irregularities and ponding.

3.2 TOPSOIL MIXES

A. Prepare topsoil mixes as specified in 2.02 (E & F) herein.
B. Obtain approval of topsoil mix before commencing planting operations. Do not mix in place with placed topsoil.
C. Remove extraneous matter measuring 1" or larger in any dimension within topsoil mix.
D. Place topsoil mix as backfill for tree and shrub pits and ground cover beds as drawn.
E. Protect topsoil mix from erosion by force of wind or water, or damage by traffic.

3.3 PLANT LAYOUT

A. Stake plant locations and areas for approval prior to planting.
B. Do not dig plant pits prior to obtaining Landscape Architect's approval of plant locations.
C. Make adjustments in plant locations as directed.
D. If underground obstructions are encountered in planting areas, alternate locations may be selected by the Landscape Architect at no additional cost to the Owner.

3.4 PLANTING

A. Place plants which comprise a planting composition in approved staked locations for final approval by Landscape Architect.

B. Plant Pits and Beds:
   1. Drainage:
      a. Landscape contractor is responsible for achieving and maintaining adequate drainage from all plant pits and beds. Use specified or other approved means.
      b. 48 hours prior to planting, test each plant pit for adequate drainage.
      c. Drainage is considered inadequate if pit or bed holds water for 24 hours or more.
      d. Owner reserves the right to test tree or plant pits at any time for adequate drainage. Correct immediately any inadequate drainage encountered.
      e. Submit proposal for Contractor's preferred tree pit drainage method(s) with Bid Proposal.
   2. Pits are generally circular in outline with vertical sides.
   3. Tree pits 2' greater in diameter than ball or root spread.
   4. Shrub pits 1' greater in diameter than ball or root spread.
   5. Prepare as specified in detail Drawings.

C. Setting Plants:
   1. Set plants uniformly 2" to 4" height than surrounding grade or as necessary to provide adequate positive drainage away from roots. Slope soil gradually from saucer.
   2. Cut rope, wire or string from top of ball after plant has been set; turn down and bury burlap.

D. Backfilling Plants:
   1. Backfill to 2/3 full with specified topsoil mix.
   2. Water thoroughly to eliminate air pockets and settling before filling to grade.
   3. Form shallow saucer at plant pit edge to hold water.
   4. Water in thoroughly.

E. Staking and Wrapping:
   1. Inspect tree trunks for injury, improper pruning and insect infestation; take corrective measure before wrapping.
   2. Immediately after planting, stake and wrap trees as detailed.
   3. Wind wrapping material spirally from the ground line of the trunk to the second branch, allowing 50% overlap. Tie at no less than five places, including bottom, middle and top.
   4. Secure trees in rooftop planters via guys and turnbuckles to eyebolts provided with planters.

F. Pruning:
   1. Do not prune plants without approval of the Landscape Architect.
   2. Prune after plants are in place and ONLY at the direction of the Landscape Architect.
   3. Main leaders of trees to remain intact.
   4. Paint all cuts over 1/2" in diameter with approved tree wound dressing.

G. Finished Grading: Hand grade and rake planting areas so that grades conform to surrounding areas and surface water drains freely.

H. Mulching:
   1. Mulch all plant pits and beds with 4" deep specified mulch, uniform throughout.
   2. Spread mulch solid in planting beds.

3.5 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Continue maintenance for thirty calendar days following Substantial Completion.

C. Provide labor, materials, equipment and means for proper maintenance of all plant materials and workmanship.

D. Supervision:
   1. Maintenance program, schedule and operations shall be supervised by a person(s) having one or more of the following qualifications:

a. Is a Certified Nurseryman.
b. Is a Licensed Horticulturist?
c. Has a State Setting and Maintenance License.

2. Submit a written report and conduct joint inspection, with the Landscape Architect, of the maintenance program and procedures, at inspection for Substantial Completion and at end of Maintenance Period.

E. Maintenance of trees, shrubs and groundcovers:

1. Maintain all plants in a growing, well-formed, healthy condition by watering, fertilizing, pruning, weeding, spraying, wrapping, straightening, and replacement or by any other necessary maintenance operations.
2. Watering:
   a. Monitor Owner's automatic water system and schedule for proper watering of all plant material.
   b. Advise Landscape Architect immediately of recommended alterations due to weather or other conditions.
   c. Water landscaped areas not covered by automatic watering system as frequently as necessary to maintain proper moisture level, using the following schedule as a guide:
      1. Twice a month during March, April, May.
      2. Once a week during June, July, August, September.
      3. No watering from October through February, except in drought conditions.
   d. Arrange for activation in mid-March, unless otherwise directed.
3. Fertilizing:
   a. Mid-March application of 23-3-3 (slow release nitrogen).
   d. August 1 application of 15-0-15.
4. Pruning:
   a. Remove dead wood as it becomes evident.
   b. Remove living portions of plants only at the direction of the Landscape Architect.
5. Wilt-proofing: Apply approved anti-desiccant to all evergreen trees during first two weeks in December (except pines).
6. Spraying:
   a. For each spraying, combine approved insecticide and fungicide to provide maximum protection for all plant materials.
   b. Three sprayings annually: in March, May and August.
7. Weeding:
   a. Two applications (spring and fall) of approved insecticide and fungicide to provide maximum protection for all plant materials.
   b. Two applications (during growing season) of chemical contact spray (Round-up by Monsanto, or approved equal).
   c. Two days per month (every two weeks) manual weeding (by hand) during the period from March 1 through September 30; remove all visible weeks.
8. Mulching:
   a. Keep planting areas neat and uniformly mulched as specified.
   b. In addition to replacing and respreading mulch as necessitated during the maintenance period, completely replenish mulch in all planting areas one time (*during the last month of the One-Year Guarantee Period or as directed by the Landscape Architect).
9. Straightening:
   a. Maintain plants in their stable upright position and at the proper grade by straightening and tightening staking and guying apparatus, and by other necessary means.
   b. Remove staking and guying apparatus during the last month of the one-year guarantee period or earlier if guying begins to girdle tree.

F. Install and maintain temporary flags, signs, barricades, protection fences, and other precautions necessary to protect the Work and the general public, and as approved by the Landscape Architect.

G. Clean-Up:
   1. Keep all planting areas neat, weeded and uniformly mulched on a continuous basis.
   2. Clean-up adjacent walks, drives and other areas where littered as a result of landscape maintenance operations, on a continuous basis.

H. Submit request for payment monthly at end of month maintained.

3.7 SUBSTANTIAL COMPLETION, PAYMENT AND GUARANTEE

A. Substantial Completion and Payment:
   1. Submit request for inspection of Substantial Completion in writing to the Landscape Architect at least one week prior to anticipated date of inspection.
   2. Submit Maintenance Manual as specified in 1.04 (C) for Owner's information and Landscape Architect's approval, containing full details for care and maintenance of landscape work, personnel and procedures, and weekly schedule for maintenance.
   3. Review the Work jointly with the Landscape Architect for Substantial Completion.
   4. Upon completion of repairs and replacements found necessary at time of review, the Landscape Architect will confirm the date of Substantial completion of the Work.
   5. Upon receipt of confirmation of Substantial Completion, Contractor will be paid amount of money then due, less the value of the Maintenance Period, amounts already paid, and other deductions allowed to be made,
   6. Substantial Completion constitutes the beginning date of the Maintenance Period and One-Year Guarantee Period.

B. Basis of Acceptance:
   1. Planted trees, shrubs and groundcovers will be counted as individual units, complete, in place and planted in accordance with the plans and specifications. Each unit will include the installed plant, topsoil mix, mulch and staking apparatus.
   2. Maintenance Period will be counted as a lump sum item.
   3. Plant pit excavation in shot-rock (if required) will be counted as individual units. Necessity will be determined by Landscape Architect.
   4. The cost of mobilization (including all provisions of General Requirements and General and Supplementary Conditions), clean-up, guarantee and maintenance will Substantial Completion as specified herein are considered incidental to the Work and will not be counted as separate items for payment.

C. Guarantee:
   1. Guarantee all materials and workmanship for a period of one (1) year beyond the Date of Substantial Completion.
   2. When Work is substantially completed in parts, the Guarantee Period extends from each Substantial Completion date to the terminal date of the last Guarantee Period. thus, all Guarantee Periods terminate at the same time.
   3. During the period of the Guarantee, replace with no additional compensation, and as soon as weather permits, all dead plant materials and all plant materials not in a thriving condition; replace all other materials which are unsatisfactory in the opinion of the Landscape Architect; make good any other damage, loss destruction, or failure to flourish sufficiently as the result of inferior or defective materials or workmanship, including, but not limited to inadequate drainage.
   4. Repair grades and other Work necessitated due to planting replacements.
   5. If the replacement plant is not acceptable during or at the end of the Guarantee Period, the Owner may elect either subsequent replacement or credit.
   6. Guarantee applies to losses other than those due to Act of God, vandalism, or Owner neglect, as determined by the Landscape Architect. Contractor agrees to replace such plant material at original contract price when directed by Landscape Architect or Owner.

3.8 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the Guarantee Period submit request for inspection for Final Acceptance to the Landscape Architect at least one week prior to anticipated date of inspection. Include list of Work substantially completed list of Work replaced during Guarantee Period.

B. Upon request for Inspection, jointly review with Landscape Architect all guaranteed Work for Final Acceptance.

C. Upon completion by the Contractor of all required repairs and replacements, the Landscape Architect will confirm the date of Final Acceptance of the Work.

END OF SECTION

SECTION 33 11 20
DOMESTIC WATER AND FIRE SERVICES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS
A. Section 312335: Excavating and Backfilling
B. Section 331300: Disinfection of Water System
C. Section 333000: Sanitary Sewer System

1.02 SUBMITTALS
A. Submit items under provisions of Division One.
B. Submit manufacturers' installation instructions for pipe and fitting joints.
C. Submit certification from the manufacturer that materials meet the standards specified herein.

1.03 QUALITY ASSURANCE
A. Coordinate work on public property and easements with the local department of public works having jurisdiction, and comply with applicable requirements
B. Make arrangements with the authorities having jurisdiction to connect public utilities as indicated. Pay all fees.
C. Maintain one copy of each standard specified herein at the job site.
D. Ensure system is not used until system has been disinfected.

1.04 RECORD DOCUMENTS
A. Submit reproducible record drawings showing waterline construction under provisions of Division One.
B. Have record documents certified by a land surveyor or civil engineer licensed in the state where the Project is located.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Ductile iron piping:
   1. Pipe and Fittings: Pipe, except flanged pipe, shall conform to AWWA C151/A21.51 and shall be Pressure Class 350 for pipe sizes 12-inch and smaller and Pressure Class 250 for pipe sizes 14-inch and larger. Flanged pipe shall conform to AWWA C115/A21.15. Fittings shall conform to AWWA C110/A21.10 or AWWA C153/A21.53. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining conforming to AWWA C104/A21.4, standard thickness.
   2. Joints:
      a. Push-on type or mechanical joint shall conform to AWWA C111/A21.11.
      b. Flanged type shall be as recommended in the appendix to AWWA C115/A21.15
   3. Fittings: AWWA C-110, cement-mortar lined and seal coated in accordance with AWWA C-104/A21.4, with AWWA C-111mechanical joints.
B. PVC piping: AWWA C-900, SDR of 18, Class 150, with ASTM D3139 bell and spigot push-on joints with ASTM F477 gaskets.
C. Valves: AWWA C-500 resilient seated gate type with non-rising stem, 2 inch right opening (or as specified by local codes) operating nut, minimum working pressure of 200 psi, and AWWA C-111 mechanical joints.
D. Hydrants: Mueller Centurion Model A-423 or approved equal.
E. Marking tape: 2 inch wide utility marking tape, No. P802 Blue in accordance with AWPA Uniform Color Code.
F. Vault:
   1. Frame and lid: Galvanized steel with hinged lid, stamped with the word "WATER".

2. Cast-in-place concrete: 3500 psi at 28 days, as specified in Section 32 05 23.
3. Precast concrete: ASTM C478, 4000 psi at 28 days.

G. Valve boxes: In accordance with local utility entity's Standards and Construction Specifications.
H. Miscellaneous cast-in-place concrete: As specified in Section 320523, 2-4 inch slump, with 28 day compressive strengths as follows:
   1. Pipe encasement: 3000 psi.
   2. Pads and structures: 3500 psi.
I. Tapping sleeves and valves:
   1. Sleeve: Split-type ductile iron with mechanical joints.
   2. Valve: Resilient seated gate type with non-rising stem, Class 200.
J. Testing accessories: Pumps, connections, gauges, temporary plugs and blocking required.
K. Substitutions: Materials of the same function and performance are acceptable under provisions of Division One.

PART 3 - EXECUTION

Domestic and Fire water distribution systems shall be installed per local utility entity's Standards and Construction Specifications. The contractor is responsible for obtaining a copy of the specifications from the local utility entity.

3.01 PREPARATION

A. Notify Owner's Representative and local utility district prior to installation.
B. Layout intended work, verify burial depth and flag existing utilities. Notify the Owner's Representative of discovered discrepancies prior to installation.
C. Verify provisions of utility separation specified herein are possible before starting installation.
D. Verify trench has been properly excavated and bedded as specified in Section 312335.
E. Ensure Water control in trenches and pits is maintained under provisions of Division One.
F. Ensure water control in trenches and pits for soft or unstable materials. Where substrate is incapable of supporting piping or structures, over excavate down to solid bearing as directed by the Owner's Representative, and backfill excavation with crushed stone or gravel specified in Section 312335.

3.02 PIPE INSTALLATION

A. Install pipe and fittings in dry trenches and pits in accordance with the manufacturer's printed instructions, with a minimum cover of 36 inches from finished grade. Maintain minimum lateral separation between waterlines and new or existing storm or sanitary sewer lines of 10 ft., measured edge to edge.
   1. When crossing sewers, maintain 18 inches minimum between top of sewer and bottom of waterline where possible.
   2. Where installation above sewers is not feasible, maintain 18 inches minimum between bottom of sewer and top of waterline, and have sewer encased in concrete for a distance of 10 ft. on each side of water main. Encase water pipe joints within 10 ft. of crossing in concrete.
   3. When clearance above or below sewers specified above is not possible, encase pipe in concrete as approved by the Owners Representative.
B. Secure pipe in place with approved bedding tamped beneath haunches and along sides after each length is laid. Remove all foreign material and install suitable stoppers after each segment laid.
C. Provide restraint joints of sizes indicated for the application at all fittings and bends or where unbalanced line thrust exists.
   1. Verify suitability of soil bearing capacity. Where capacity is not suitable, install approved restraining assembly as directed by the Owners Representative.
   2. Do not cover outlets, bolts, nuts, restraint assemblies or other fittings.
D. Torque bolts with a torque limiting wrench in accordance with AWWA C-111.
E. Install marking tape in all trenches containing PVC piping in accordance with the manufacturer's printed instructions.

F. Have trenches backfilled in accordance with Section 312335.

3.03 VALVE AND VALVE BOX INSTALLATION

A. Set valves so that stems are plumb, and install joint restraints. Where operating nut is more than 3 ft. below finished grade, provide operating nut extensions to bring operating nut to within 12 inches below finished grade.
B. Provide a valve box for each valve. Place so that shock and stress are not transmitted to valve. Set valve box plumb, centered over operating nut and flush with finish grade. Install concrete pad around boxes in lawn areas.

3.04 TAPPING SLEEVE INSTALLATION

A. Only use sleeve manufactured for the specific outside diameter of main being tapped. Do not install sleeve closer than 48 inches from bell, coupling or fitting.
B. Check saddle for leaks by low pressure testing and soap prior to making tap.
C. Set tapping valve plumb with finished grade. Provide valve box.

3.05 HYDRANT INSTALLATION

A. Excavate a 3 x 3 ft. drainage pit below each hydrant and fill with 3/4 inch coarse gravel or crushed stone.
B. Install plumb, with pumper nozzle facing curb or street, to be a minimum of 18 inches from the face of the curb or edge of street with nozzles at least 16 inches above finished grade. Set so that traffic flange is no more than 6 inches nor less than 4 inches from finished grade. Provide approved hydrant extensions as required to meet elevation requirements.
C. Connect Hydrant to water main with restrained joints, with 6 inch lateral and 6 inch gate valve.
D. Install restraint joint at hydrant base and water main tee. Do not cover weep holes.
E. Test for leakage upon completion.

3.06 TESTS

A. Preparation:
    1. Notify the Owners Representative and the authority having jurisdiction at least 48 hours before testing operations are to begin.
    2. Verify restraint joints are tightened and that trenches are properly backfilled and compacted prior to testing.
B. Pressure testing:
    1. Test ductile iron mains in accordance with AWWA C-600 and local utility entity's Standards and Construction Specifications.
    2. Test PVC mains in accordance with AWWA Manual M-23 and local utility entity's Standards and Construction Specifications.
    3. Test piping at 125% of working pressure or at 150 psi, whichever is greater, for a period of 2 hours. Do not vary pressure more than $\pm$ 5 psi.
    4. Provide suitable air relief valves, corporation stops or other approved devices to expel air as line is filled with water.
    5. Remove and replace cracked or defective pipe, fittings and retest after replacement.
C. Leakage testing:
    1. Test ductile iron mains in accordance with AWWA C-600 and local utility entity's Standards and Construction Specifications.
    2. Test PVC mains in accordance with AWWA Manual M-23 and local utility entity's Standards and Construction Specifications.
    3. Leakage testing may be performed simultaneously with pressure testing.
    4. Leakage is determined from quantity of water that must be supplied to maintain test pressure after air in pipe has been expelled and pipe has been filled with water.
D. Acceptance:
    1. The system will be acceptable when able to maintain the specified minimum pressure and the maximum allowable leakage rate.
    2. Repair all visible leaks regardless of leakage amount.

3. Repair and retest as necessary to satisfy acceptance criteria.

END OF SECTION

SECTION 33 13 00
DISINFECTION OF WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS
A. Section 331120: Domestic Water & Fire Services
B. Disinfection of building domestic water piping system.

1.02 SUBMITTALS
A. Submit items under provisions of Division 1 of the Specifications.
B. Submit name of Treatment Company and evidence of qualification.
C. Submit name of testing agency and evidence of qualification.

1.03 QUALITY ASSURANCE
A. Company performing water treatment: Certified for disinfection by the authorities having jurisdiction, specializing in this work, with a minimum of 3 years experience.
B. Testing agency: Certified or approved, as required by the authorities having jurisdiction, for examination of drinking water in compliance with legislation of the state where the Project is located.

1.04 REGULATORY REQUIREMENTS
A. Comply with applicable code or regulations having jurisdiction for work of this Section.

1.05 PROJECT RECORD DOCUMENTS
A. Submit reports under the provision of Division 1 of the Specifications.
B. Disinfection report: Accurately record the following:
    1. Type and form of disinfectant used.
    2. Date and time of disinfectant injection start and time of completion.
    3. Test locations.
    4. Initial and 24 hour disinfectant residuals (quantity in treated water) in mg/L for each outlet tested.
    5. Date and time of flushing start and completion.
    6. Disinfectant residual after flushing in mg/L for each outlet tested.
C. Bacteriological report: Accurately record the following:
    1. Date issued, project name, and testing agency name, address and telephone number.
    2. Time and date of water sample collection.
    3. Name of person collecting samples.
    4. Test locations
    5. Initial and 24 hour disinfectant residuals in mg/L for each outlet tested.
    6. Coliform bacteria test results for each outlet tested.
    7. Certification that water complies, or fails to comply, to bacterial standards of authorities having jurisdiction.
    8. Bacteriologist's signature.

PART 2 - PRODUCTS – OMITTED

PART 3 - EXECUTION

3.01 PREPARATION
A. Verify that piping system has been cleaned, inspected and pressure tested.
B. Perform scheduling and disinfection activity with startup, testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

3.02 EXECUTION

A. Disinfect water distribution systems in accordance with AWWA C601 and applicable regulations of authorities having jurisdiction.
B. Provide and attach equipment required to execute the work of this Section.
C. Introduce treatment disinfectant into piping system at a point no more than 10 ft downstream from beginning of new main such that water will not have less than 25 mg/L free chlorine.
    1. Continue chlorine application until system is filled with chlorinated water and retain in main at least 24 hours to produce a minimum residual of 10 mg/L free chlorine.
    2. Flush and clean with municipal domestic water until chlorine residual is no more than that prevailing in the system or acceptable for domestic use.
D. Replace permanent system devices removed for disinfection.
E. Remove temporary system devices installed for disinfection.

3.03 TEST

A. Provide analysis and testing of treated water under provisions of Division 1 of the Specifications.
B. Test samples in accordance with AWWA C-601.

END OF SECTION

SECTION 33 30 00
SANITARY SEWAGE SYSTEMS

PART 1 GENERAL

1.01 RELATED WORK
A. Section 22 14 00: Storm Drainage System
B. Section 31 23 35: Excavating and Backfilling for Service Utilities
C. Section 32 05 23: Site Concrete Work
D. Building sanitary sewage piping and connection.

1.02 SUBMITTALS
A. Submit items under provisions of Division 1 of the Specifications.
B. Submit manufacturer's installation instructions for pipe and fitting joints.
C. Submit manufacturer's certifications that materials meet the standards specified herein.

1.03 PROJECT RECORD DOCUMENTS
A. Submit reproducible record drawings showing sewer construction.
B. Accurately record location of pipe runs, connections, manholes, cleanouts, and invert elevations. Also, identify and document discovery of uncharted utilities.
C. Have record documents certified by a land surveyor or civil engineer licensed in the state where the Project is located.

1.04 DELIVERY, STORAGE AND HANDLING
A. Deliver materials to the site and handle under provisions established in Division 1 of the Specifications.
B. Store and protect materials under provisions established in Division 1 of Specifications.

1.05 SITE PROTECTION
A. Protect existing utilities, sidewalks, curbs, pavements, slabs, and other structures from damage during the execution of work during this Section.
B. When necessary to remove or relocate existing utilities or structures to execute the work of this Section, repair or replace the items under the applicable provisions of the Contract Documents.
C. Any removal or replacement of existing facilities will be considered incidental to the scope of the work of this Section and no additional payment will be allowed.

PART 2 PRODUCTS

2.01 MATERIALS
A. PVC pipe: ASTM D3034, SDR 35 with ASTM D3212 bell and spigot joints and ASTM F477 rubber gaskets.
B. Ductile iron pipe: Pipe and fittings shall conform to the requirements of ANSI 21.51/AWWA C-151. Pipe class shall be 52.
C. Couplings for dissimilar pipe: Compression type rubber meeting test requirements of ASTM C425, Table 2.
D. Cleanouts:
    1. Pipe: ASTM D3034, SDR 35 long sweep 1/4 bend or combination wye and 1/8 bend, diameter same as main.
    2. Cover: Cast iron by Neenah or Josam.
    3. Concrete: 3000 psi at 28 days, as specified in Section 32 05 23.
E. Manholes:
    1. Frame and grate: ASTM A48 Class 30 grey iron with machined surface and smooth bearing by Model USF 225-AS, or approved equal.
    2. Cast-in-place concrete: 3000 psi at 28 days, as specified in Section 32 05 23.

3. Precast concrete: ASTM C478 4000 psi, reinforced, with preformed plastic gaskets meeting FS SS-S-00210.
4. Brick: ASTM C32 Grade MS
5. Mortar: ASTM C270 Type S, using ASTM C150 Type II portland cement, ASTM C33 sand and potable water
6. Ladder bars: Aluminum alloy or No. 3 reinforced baren capsulated in polypropylene.
7. Coal tar: Military Specification MIL-C-15203 C.
8. Resilient connectors: ASTM C93

F. Miscellaneous cast-in-place concrete: As specified in Section 32 05 23; 2-4 inch slump.
1. Pipe encasement: 2500 psi at 28 days.
2. Structural: 3500 psi at 28 days.

PART 3 EXECUTION

Sanitary sewerage systems shall be installed per the local utility entity's Standards and Construction Specifications for sanitary sewer installation. The contractor is responsible for obtaining a copy of the specifications from the local utility entity.

3.01 PREPARATION

A. B. Notify the Engineer prior to installation.
C. Layout intended work, verify installation depths and flag existing utilities. Notify the Engineer of discrepancies prior to installation.
D. Verify that trench has been properly excavated and bedding material placed and compacted in accordance with Section 31 23 35.
1. Where trench bottoms are at incorrect elevations, excavate as necessary and place specified bedding thickness, or place additional bedding as applicable.
2. Grade bedding to provide uniform support of pipe including allowance for pipe hubs.
E. Ensure water control in trenches and pits is maintained under provision of Division 1 of the Specifications.
F. Check bottom of trenches and pits for soft or unstable materials. If unsuitable soils or soils that cannot be readily moisture conditioned and compacted are encountered at the bottoms of excavations, then these soils shall be over-excavated at least two feet beneath the bottom of the foundation and replaced with compacted structural fill.
G. The bottoms of trenches and pits and each lift of backfill shall be compacted to at least 95% of the modified Proctor maximum dry density to a depth of at least 12 inches.

3.02 INSTALLATION OF PIPE

A. Installation of PVC pipe shall conform to ASTM D-2321. Installation of ductile iron pipe shall conform to requirements of ANSI 21.10/AWWA C-110. Install in dry trenches to line and grade indicated. Employ necessary means to maintain accurate grade control. Lay pipe from downgrade to upgrade with pipe bells facing upgrade. Maintain minimum lateral separating of 10 feet between water and 5 feet between all other utilities.
1. When crossing waterlines, maintain 18 inches minimum between top of sewer and bottom of waterline where possible.
2. Where above clearance cannot be attained by altering grade of sewer pipe or relocation of water pipe, relocate water line below sewer with 18 inches minimum between bottom of sewer and top of waterline, and encase sewer in concrete for a distance of 10 feet on each side of crossing. Encase water pipe joints in concrete within 10 feet of crossing.
3. If water control measures fail to maintain dry trenches, coarse granular material may be placed in trench bottoms as necessary to maintain water level below pipe invert.

B. Assemble pipe joints and fittings in accordance with the manufacturers, printed instructions for the application.
1. Coordinate connection of service laterals to building service lines.
2. Join dissimilar pipe with approved compression couplings.

3. Connect sewer mains into existing manholes by cutting into structure at required elevation and grouting pipe to be flush with inside edge of manhole. Reconstruct invert to provide a smooth flowline. Cover sewer line with concrete capping at least 6 inches above and around sides of pipe where cover is less than 36 inches.

3.03 INSTALLATION OF MANHOLES

A. Install in dry pits to line and grade indicated.
B. Construct inverts of cast-in-place concrete or brick and masonry fill. Make changes in invert cross section gradually from side to side of manhole. Make changes in flow direction with true curves of as large a radius as possible.
C. Construct manhole so that the top of the base is at the elevation of the invert of the lowest pipe entering the manhole. Install steps as required by the local utility district. Coat inside surfaces with 12 mil thickness of coal tar epoxy when required by the local utility district.
   1. Masonry and cast-in-place type: Grout inside and outside surfaces to make watertight.
   2. Precast type: Provide flexible neoprene boots in precast manholes as required by local utility district, and flexible joint sealing compound between manhole sections.
   3. Drop manholes: Construct manholes to be drop type when difference between invert elevations of two or more pipes is 24 inches or greater. Use drop pipe and fittings of the same diameter as pipe entering manholes. Support drop connection with cast-in-place concrete as required by the local utility district.

3.04 ACCEPTANCE TESTING

A. Demonstrate that pipe and manholes are laid true to line and grade. Provide labor and equipment necessary to assist demonstration.
   1. Verify insert elevations and pipe gradients of installed items.
   2. "Lamp" lines between manholes. If lamping indicates a possibility of pipe deflection, pull an approved mandrel with a diameter of 95% of the pipe diameter from manhole to manhole. Replace sections not permitting the mandrel to pass at no additional cost.
B. Demonstrate proper gradient of pipe segments by flooding and visual inspection.
   1. After flooding, verify water drains off so that the depth of water remaining is no greater than 1/2 inch in pipes less than 36 inches in diameter and 3/4 inch in pipe 36 inches in diameter and greater.
   2. Replace pipe segments with puddling in excess of that specified above at no additional cost.
C. When requested by the Architect or local utility district, demonstrate that pipe and manholes are watertight by low air pressure testing, infiltration testing or exfiltration testing. Repair pipe segments or manholes failing to pass leakage test at no extra cost.
D. The system will not be acceptable until leaks and other defects are repaired.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Installation of storm drainage systems.

1.02 RELATED WORK
A. Section 31 23 35: Excavating and Backfilling for Service Utilities
B. Section 32 05 23: Site Concrete Work

1.03 REGULATORY REQUIREMENTS
A. Comply with requirements of authorities having jurisdiction for materials and installation of work of this Section.

1.04 PROJECT RECORD DOCUMENTS
A. Submit documents under provisions of Division 1 of the specifications.
B. Accurately record locations of pipe runs, connections, catch basins, manholes, clean-outs and invert elevations.
C. Identify and describe discovery of uncharted utilities.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS
A. Reinforced concrete pipe: ASTM C76 Class III, with Wall Type B mesh reinforcement, with bell and spigot end joints, size as indicated. Provide mortar joints.
B. PVC pipe: ASTM D3034, SDR of 35 or equal, bell and spigot type, solvent sealed end joints, size as indicated.
C. HDPE pipe shall be corrugated, smooth-wall N-12 pipe with soil-tight joints.
D. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in configurations required.

2.02 CATCH BASINS
A. Lid and frame: Cast iron construction, hinged lid linear grill lid design with lock down fasteners (as noted on the plans), size as indicated on plans.
B. Shaft and cone section:
   1. Precast type: Reinforced precast concrete pipe sections of shape and size indicated, lipped male/female dry joints.
   2. Cast-in-place type: 3000 psi concrete as specified in Section 02516, detailed as indicated.
   3. Masonry type: ASTM C32 Grade MS manhole brick, and ASTM C270 Type S mortar made with ASTM C150. Type II Portland cement, ASTM C33 sand and potable water.
C. Base pad: 3000 psi concrete of type specified in Section 32 05 23, leveled top surface to receive concrete shaft sections, and sleeved to receive pipe sections.
D. Advanced Drainage Systems (ADS) or National Diversified Sales, Inc. (NDS) plastic catch basins and fittings.

2.03 MANHOLES AND CLEANOUTS
A. Lid and frame: Cast iron construction, with removable lockable closed lid, size as indicated on plans.
B. Shaft and cone section:
   1. Reinforced precast concrete pipe sections of shape and size indicated, with lipped male/female dry joints.
   2. Cast-in-place type: 3000 psi concrete as specified in Section 32 05 23, detailed as indicated.

3. Masonry type: ASTM C32 Grade MS manhole brick, and ASTM C270 Type S mortar made with ASTM C150. Type II Portland cement, ASTM C33 sand and potable water.
4. Ladder rungs: 1/2 inch diameter deformed reinforcing steel, grade 60 standards coated with High Impact Copolymer Polypropylene. Step to be placed at 12 inches oc.

C. Base pad: 3000 psi concrete of type specified in Section 32 05 23, leveled top surface to receive concrete shaft sections, and sleeved to receive pipe sections.

2.04 HEADWALLS

A. Materials: 3000 psi concrete as specified in Section 32 05 23, reinforced as indicated.

2.05 MATERIALS

A. Compacted natural ground or Structural Fill as specified Section 31 23 40.
B. Coarse aggregate shall conform to the physical and gradation requirements provided by the State Highway Specifications Section 901 for No. 57 Stone.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavation is ready to receive work of this Section, and that excavation's, dimensions and elevations are as indicated on the Drawings.
B. Do not install drainage structure until mass grading has resulted in rough subgrade elevations through the work area.

3.02 PREPARATION

A. Prior to laying pipe, prepare suitable bedding according to Section 31 23 35.
B. Before placing pipe in the trench, field inspect for cracks or other defects; remove defective pipe from the construction site.
C. Swab the interior of the pipe to remove all undesirable material.
D. Prepare the bell end and remove undesirable material from the gasket and gasket recess.

3.03 INSTALLING STORM SEWER PIPE

A. Lay pipe in a straight line on a uniform grade from structure to structure with the bell or groove end upgrade.
B. Firmly support each section throughout its length and form a close concentric joint with the adjoining pipe.
C. Make junctions and turns with standard or special fittings.
D. Do not open up more trench at any time than pumping facilities are able to dewater.
E. Whenever the work ceases, close the end of the pipe with a tight fitting plug or cover.
F. Close all openings provided for future use and abandoned pipe with a tight fitting plug sealed to avoid leakage.
G. When the pipe connects with structures, the exposed ends shall be placed or cut off flush with the interior face of the structure and satisfactory connections made.
H. Any pipe which is not in good alignment or which shows any undue settlement or damage shall be removed and replaced at the contractor's expense.
I. Laying pipe and sealing joints shall be a continuous operation.
   1. Seal all joints during the same day in which the pipe is laid.
   2. Construct the joints in such a manner that a watertight joint will result.
J. Joints for rigid pipe:
   1. Rubber gaskets; or
   2. Other types of joints recommended by the pipe manufacturer and approved.
K. Install rubber ring gaskets to form a flexible watertight seal.
L. When other type joints are permitted, install or construct in accordance with the recommendations of the manufacturer.
M. Firmly join flexible pipe by approved coupling bands.
N. Inspect the pipe before any backfill is placed.

O. When strutting or vertical elongation is required, it shall be performed in accordance with the details shown on the Plans.
P. Leave ties and struts in place until the embankment is completed, unless otherwise specified.
Q. As the work progresses, clean the interior of all pipe in place.
R. Make connections by constructing catchbasins, other structures, or by installing wyes or tees as shown on the Plans. Wyes and tees for future connections shall be installed as indicated.

3.04 INSTALLING CATCH BASINS, MANHOLES AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.
B. Form and place cast-in-place concrete base pad, with provision for pipe end sections.
C. Establish elevations and pipe inverts for inlets and outlets as indicated. The shape of the inverts shall conform uniformly to inlet and outlet pipe with a smooth finish.
D. Mount lid and frame level in grout, secured to top cone section to elevations indicated. Set true to line and grade and such that the entire surface of the casting is in contact with the bearing surface of the structure.
E. All castings shall be set firm and snug and shall not rattle.

3.05 INSTALLING HEADWALLS

A. Form and reinforce as indicated.
B. Place and cure as specified in 32 05 23.
C. Backfill with compacted Structural Fill to level of adjacent subgrade.

3.06 FIELD QUALITY CONTROL

A. Prior to backfilling, allow the Owner's Representative to observe installed pipe.
B. Comply with requirements of authorities having jurisdiction for their requirements for inspection.

3.07 PROTECTION

A. Protect finished installation under provisions of Division 1 of the Specifications.
B. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION

END OF PROJECT MANUAL
SPECIFICATIONS

HEREFORD·DOOLEY
ARCHITECTS

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PANAMA CITY EXPANSION FSER

21 0100A FLOW TEST

FLOW TEST REPORT

Location End of E 37th Plz Date 7/25/19

Test Made By Michael Anderson Time 12:45pm

Representative of Bay County Utility Services

Witness Ben Phillips

State Purpose of Test Requested by Bragg Foshee with Blox Built

Consumption Rate During Test 51 psi @ 1200 gpm / 5 min test /total gallons 6,000

If Pumps Affect Test, Indicate Pumps Operating WTP pressure at test 75 psi
No pumps affected

Flow Hydrants (gpm) *A1* 1200 *A2* _____ *A3* _____

Size Nozzle one 2.5
Pitot Reading 51 psi
gpm 1200
Total gpm 1200

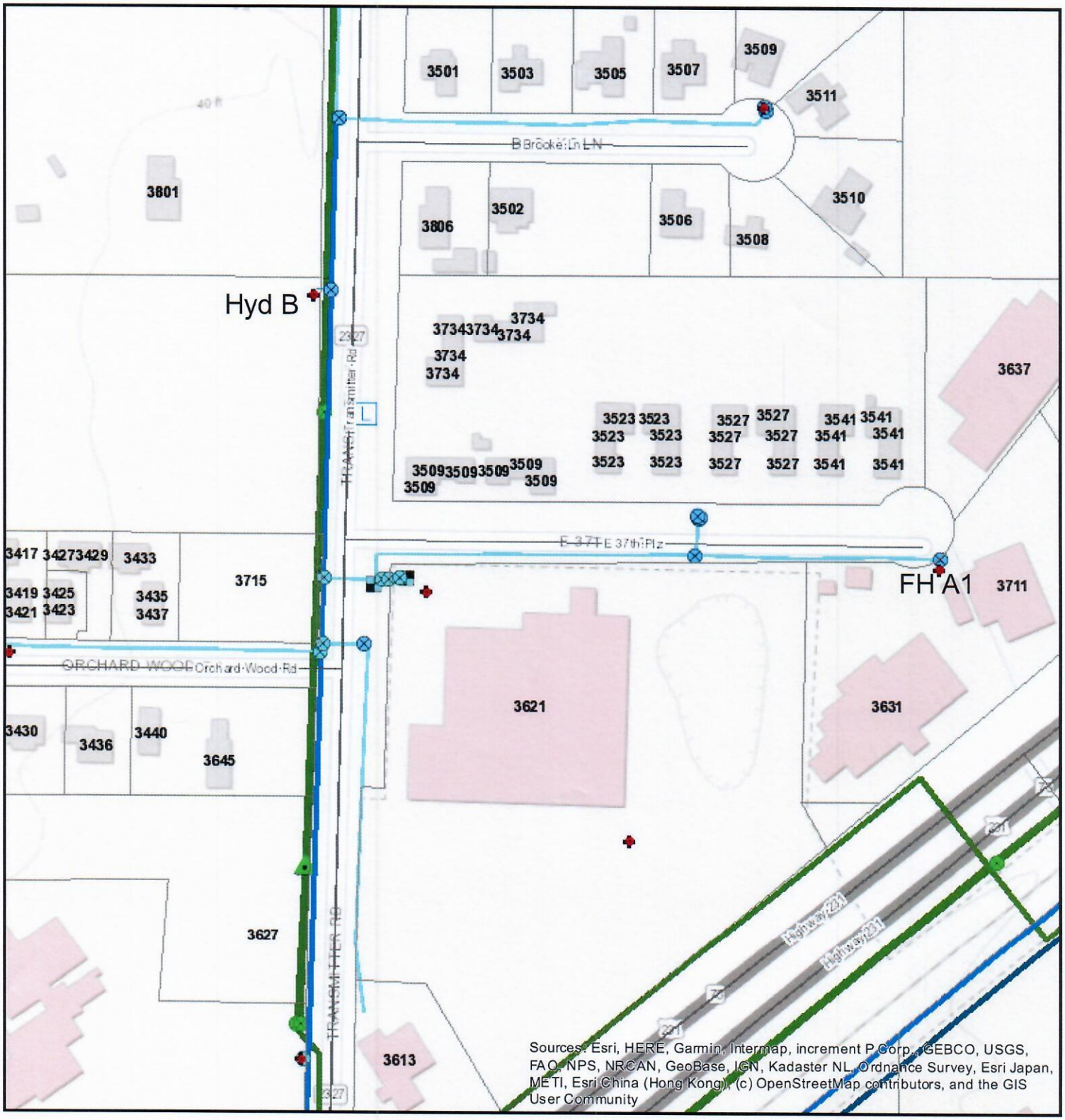
Static *B* 70 Residual *B* 68 psi

Projected Results:
at 20 psi Residual 6824.5 gpm; or at 30 psi res. 6049.8 gpm;

Remarks Flow test completed in accordance with AWWA M-17 Fifth Edition
Test from 12:36pm to 12:41pm Total Time :5min. / Total gallon's 6,000
Location of FHA1 & B Hydrant labled on the attched map

Location Map: Show line sizes and distance to next cross connected line. Show valves and hydrant branch size. Indicate North. Show flowing hydrants - label A_1, A_2, A_3. *Show location* of Static and Residual - label *B*

Indicate *B* Hydrant yes Sprinkler _____ Other (Identify) _____



Bay County Web Map

Addresses | Parcels

Roads
- Major Road
- Minor Road

Fire Hydrants
- Flushing
- Standard

Network Structures
- Pump Station
- Storage Tank
- Water System Valves
- Water System Valves_GPS

maps.baycountyfl.gov

This data is provided with understanding that the conclusions drawn from such information are solely the responsibilities of the user. The GIS data is not a legal representation of the features depicted, and any assumption of the legal status of this data is hereby disclaimed.

Printed: 7/25/2019

Bay County Utility Services Department
Fire Hydrant Flow Test Requests

In order for a fire hydrant flow test to be scheduled, the following information must be provided, signed and returned to the Utility Services office via fax, email, or postal mail.

Telephone: 850-248-5010
Fax: 850-248-5006 Attn: Utility Billing Clerk
Mail: Bay County Utility Services
3410 Transmitter Road
Panama City, FL 32404

All requests must include a map or sketch indicating the hydrant location.

All fire hydrant flow tests will typically be completed and results will be returned within 10 business days, subject to seasonal limitations. Extended period data cannot be obtained when forecast temperatures are expected to be below 32°F.

APPLICATION INFORMATION			
Request Date:	7/22/19	Business Phone:	205-461-5004
Contact Name:	Brass Foshee	Mobile Phone:	251-610-0769
Company Name:	BLOX, LLC	Fax:	
Mailing Address:	2625 5th Ave N, Bessemer, AL 35020	Email:	bfoshee@bloxbuilt.com
Method for return of results:	(email)	fax	mail

HYDRANT INFORMATION	
Hydrant Location Cross Streets: (Attach Map)	End of cul de sac on E 37th Plaza. Back side of property of old 371 Hwy 251 address. See attached

ANY ADDITIONAL NOTES / INFORMATION

Incomplete information may result in a delay conducting and providing the results for the requested fire hydrant flow test.

DATA DISCLAIMER	
Water Distribution information is taken at a single point in time and is subject to significant variation. This information is provided to the requestor for evaluation purposes only, without warranty of any kind, including but not limited to any expressed or implied warranty arising by contract, statute or law: in no event regardless of cause, shall the County be liable for any direct, indirect, special, punitive or consequential damages of any kind whether such damages arise under contract, tort, strict liability or in equity.	
Applicant Signature	Date 7/22/19

PANAMA CITY EXPANSION FSER

21 0100B HYDRAULIC CALCULATIONS

1. WET SYSTEM CALCULATION AREA-1

HYDRAULIC CALCULATIONS

PANAMA CITY FSER EXPANSION

PANAMA CITY, FL

WET SYSTEM REMOTE AREA 1

FILE NUMBER: 2545-01476-00

DATE: JUNE 11, 2025

DESIGN DATA

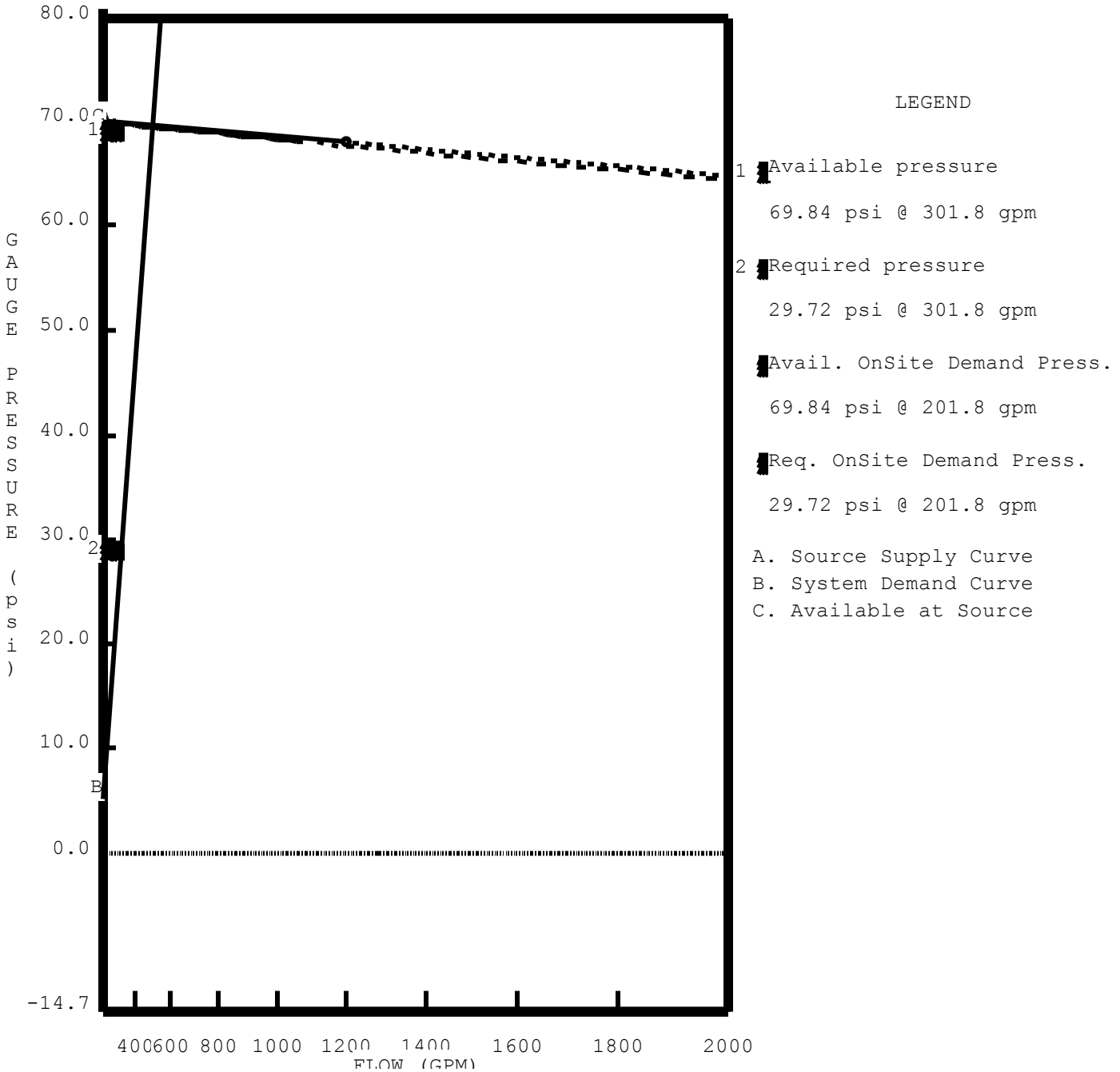
OCCUPANCYCLASSIFICATION:	LIGHT HAZARD
DENSITY:	0.10 GPM/SQFT
AREA OF APPLICATION:	1,500 SQFT
COVERAGE PER SPRINKLER:	225 SQFT
NUMBER OF SPRINKLERS CALCULATED:	12
TOTAL SPRINKLER WATER FLOW REQUIRED:	201.8 GPM
TOTAL WATER REQUIRED (INCLUDING HOSE):	301.8 GPM
FLOW AND PRESSURE (@ BOR):	301.8 GPM @ 29.7 PSI
SPRINKLER ORIFICE SIZE:	1/2 INCH
DESIGN /LAYOUT BY:	JOHN M CRUZ
AUTHORITY HAVING JURISDICTION:	AHCA

CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE)

HRS SYSTEMS, INC.

WATER SUPPLY ANALYSIS

Static: 70.00 psi Resid: 68.00 psi Flow: 1200.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

(2) On Site pressures are based on hose stream deduction at the source

DATE: 6/11/2025ATIONS\2545-01476 PANAMA CITY EXPANSION - LIGHT HAZARD.SDF
JOB TITLE: 2545-01476-00 PANAMA CITY EXPANSION - LIGHT HAZARD

NFPA WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. @ (PSI)	FLOW (GPM)	AVAIL. PRESS. @ (PSI)	TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
SOURCE	70.0	68.0	1200.0	69.8	301.8	29.7

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	301.8 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	100.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	201.8 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
1	9.0	K= 5.60	8.2	16.0
2	9.0	K= 5.60	9.4	17.1
3	12.0	- - - -	8.8	- - -
4	12.0	- - - -	8.8	- - -
5	12.0	- - - -	9.0	- - -
6	12.0	- - - -	9.3	- - -
7	12.0	- - - -	10.1	- - -
8	12.0	- - - -	12.6	- - -
9	-3.0	- - - -	19.5	- - -
10	-3.0	- - - -	29.5	- - -
11	9.0	K= 5.60	8.9	16.7
12	9.0	K= 5.60	8.2	16.0
13	9.0	K= 5.60	9.4	17.2
14	9.0	K= 5.60	9.1	16.9
15	9.0	K= 5.60	8.3	16.2
16	9.0	K= 5.60	9.6	17.3
17	9.0	K= 5.60	9.2	17.0
18	9.0	K= 5.60	8.6	16.4
19	9.0	K= 5.60	9.9	17.6
20	9.0	K= 5.60	9.5	17.3
SOURCE	-3.0	SOURCE	29.7	201.8

NFPA PIPE DATA

Pipe Tag / To Node / Frm Node	El (ft)	K-fac PT	Add Fl (q) Tot.(Q)	Add Fl To Node/ Disch	Nom ID Act ID	Fit: Eq.Ln. (ft.)	L F T	C Pf/ft.	(Pt) (Pe) (Pf)
Pipe: 1		5.60	16.0	Disch			14.00	120	8.2
1	9.0	8.2	0.0		1.000	----	0.00		0.0
2	9.0	9.4	16.0		1.049		14.00	0.086	1.2
Pipe: 2		5.60	17.1	Disch			8.00	120	9.4
2	9.0	9.4	16.0	1	1.250	----	0.00		-1.3
3	12.0	8.8	33.1		1.380		8.00	0.087	0.7
Pipe: 3		0.0	33.1	2			11.00	120	8.8
3	12.0	8.8	16.7	11	3.000	----	0.00		0.0
4	12.0	8.8	49.9		3.068		11.00	0.004	0.0
Pipe: 4		0.0	33.2	13			12.00	120	8.8
4	12.0	8.8	49.9	3	3.000	----	0.00		0.0
5	12.0	9.0	100.0		3.068		12.00	0.014	0.2
Pipe: 5		0.0	33.5	16			12.00	120	9.0
5	12.0	9.0	100.0	4	3.000	----	0.00		0.0
6	12.0	9.3	150.4		3.068		12.00	0.029	0.4
Pipe: 6		0.0	34.1	19			15.00	120	9.3
6	12.0	9.3	150.4	5	3.000	----	0.00		0.0
7	12.0	10.1	201.8		3.068		15.00	0.050	0.8
Pipe: 7		0.0	0.0				190.00	120	10.1
7	12.0	10.1	201.8	6	4.000	----	0.00		0.0
8	12.0	12.6	201.8		4.026		190.00	0.013	2.5
Pipe: 8		0.0	0.0				32.00	120	12.6
8	12.0	12.6	201.8	7	4.000	----	0.00		6.5
9	-3.0	19.5	201.8		4.026		32.00	0.013	0.4
Pipe: 9		0.0		Fixed Pressure Loss Device					
9	-3.0	19.5	201.8	8	10.0 psi, 201.8 gpm				
10	-3.0	29.5	201.8						
Pipe: 10		0.0	0.0				13.00	120	29.5
10	-3.0	29.5	201.8	9	4.000	----	0.00		0.0
SOURCE	-3.0	29.7	201.8		4.026		13.00	0.013	0.2
Pipe: 11		5.60	16.7	Disch			12.00	120	8.9
11	9.0	8.9	0.0		1.000	----	0.00		-1.3
3	12.0	8.8	16.7		1.049		12.00	0.094	1.1

Pipe Tag / To Node / Frm Node	El (ft)	K-fac / PT	Add Fl (q) / Tot.(Q)	Add Fl To Node/ Disch	Nom ID / Act ID	Fit: Eq.Ln. (ft.)	L / F / T	C / Pf/ft.	(Pt) / (Pe) / (Pf)
Pipe: 12		5.60	16.0	Disch			14.00	120	8.2
12	9.0	8.2	0.0		1.000	----	0.00		0.0
13	9.0	9.4	16.0		1.049		14.00	0.086	1.2
Pipe: 13		5.60	17.2	Disch			8.00	120	9.4
13	9.0	9.4	16.0	12	1.250	----	0.00		-1.3
4	12.0	8.8	33.2		1.380		8.00	0.087	0.7
Pipe: 14		5.60	16.9	Disch			11.00	120	9.1
14	9.0	9.1	0.0		1.000	----	0.00		-1.3
4	12.0	8.8	16.9		1.049		11.00	0.095	1.0
Pipe: 15		5.60	16.2	Disch			14.00	120	8.3
15	9.0	8.3	0.0		1.000	----	0.00		0.0
16	9.0	9.6	16.2		1.049		14.00	0.088	1.2
Pipe: 16		5.60	17.3	Disch			8.00	120	9.6
16	9.0	9.6	16.2	15	1.250	----	0.00		-1.3
5	12.0	9.0	33.5		1.380		8.00	0.089	0.7
Pipe: 17		5.60	17.0	Disch			11.00	120	9.2
17	9.0	9.2	0.0		1.000	----	0.00		-1.3
5	12.0	9.0	17.0		1.049		11.00	0.096	1.1
Pipe: 18		5.60	16.4	Disch			14.00	120	8.6
18	9.0	8.6	0.0		1.000	----	0.00		0.0
19	9.0	9.9	16.4		1.049		14.00	0.091	1.3
Pipe: 19		5.60	17.6	Disch			8.00	120	9.9
19	9.0	9.9	16.4	18	1.250	----	0.00		-1.3
6	12.0	9.3	34.1		1.380		8.00	0.092	0.7
Pipe: 20		5.60	17.3	Disch			11.00	120	9.5
20	9.0	9.5	0.0		1.000	----	0.00		-1.3
6	12.0	9.3	17.3		1.049		11.00	0.099	1.1

NOTES (HASS):

(1) Calculations were performed by the HASS 2023 D computer program
in accordance with (2020)
under license no. 64836407 granted by
HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

(2) The system has been calculated to provide an average imbalance at each node of 0.004 gpm and a maximum imbalance at any node of 0.087 gpm.

(3) Total pressure at each node is used in balancing the system. Maximum water velocity is 8.8 ft/sec at pipe 6.

(4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

(5) Available pressure at source node SOURCE under full flow conditions is 69.61 psi with a flow of 497.88 gpm.

(6) PIPE FITTINGS TABLE

HASS Pipe Table Name: standard

PAGE: A MATERIAL: S40 HWC: 120

Diameter	Equivalent Fitting Lengths in Feet								
(in)	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee
	F F45Ell								
1.049	2.00 1.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00 1.50	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
3.068	7.00 3.50	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
4.026	10.00 5.00	20.00	6.00	22.00	12.00	2.00	20.00	20.00	20.00

SECTION 01 91 13

GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

A. Work under this Section is subject to requirements of the Contract Documents including Divisions 00 and 01.

1.02 DESCRIPTION

A. Commissioning is a systematic process of ensuring the HVAC systems perform interactively according to the design intent and Owner's operational needs. Commissioning will encompass and coordinate traditionally separate functions of system documentation, installation checkout, equipment startup, control system calibration and point-to-point checkout, testing and balancing, and functional performance testing. Commissioning is intended to achieve the following specific objectives according to the Contract Documents:
   1. Verify systems are in accordance with the plans and specifications.
   2. Verify and document proper installation and performance of equipment and systems.
   3. Ensure O&M, maintenance training, and commissioning documentation requirements are complete.
   4. Provide Owner with functional buildings and/or systems with minimal operational problems at time of move-in.

B. Commissioning does not take away from or reduce responsibility of system designers or installing contractors to provide a finished and fully functioning product.

C. This section shall in no way diminish the responsibility of the Division 23 Sub-contractors and Suppliers in performing all aspects of work and testing as outlined in the contract documents. Any requirements outlined in this section are in addition to requirements outlined in Division 23 Specifications.

1.03 ABBREVIATIONS

A. The following are common abbreviations used in the Specifications. Definitions are found further in this Section.
   1. A/E - Architect and Design Engineers – The HVAC Engineer
   2. BAS - Building Automation System
   3. CA - Commissioning Agent – An employee or agent of the GC
   4. CM - Construction Manager – HCA Construction Manager
   5. CT - Commissioning Team
   6. Cx - Commissioning
   7. CC - Controls Contractor
   8. DFM - HCA Director of Facility Management
   9. EC - Electrical Contractor
   10. FPT - Functional Performance Test
   11. GC - General Contractor
   12. MC - Mechanical Contractor
   13. OR - Owner's Representative
   14. PC - Pre-functional Checklist
   15. TAB - Test, Adjust and Balance
   16. O&M - Operations & Maintenance
   17. RFI - Request for Information

1.04 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications.

1.05 COORDINATION

A. Commissioning Team: Members of the Commissioning Team (CT) will consist of:
   1. Commissioning Agent (CA)
   2. Owner's Representative(s) (OR)

3. Construction Manager (CM)
4. Architect and Design Engineers (A/E)
5. Mechanical Contractor (MC)
6. Electrical Contractor (EC)
7. Test and Balance Contractor (TAB Contractor)
8. Controls Contractor (CC)
9. Equipment Suppliers and Vendors

B. Management: The CA directs and coordinates commissioning activities. All members of the Commissioning Team shall cooperate to fulfill contracted responsibilities and objectives of the Contract Documents.

C. Kick-off Meeting: Within 90 days of commencement of construction, CA will plan, schedule and conduct a commissioning kick-off meeting. Membership and responsibilities of the commissioning team will be clarified at this meeting. CA will distribute meeting minutes to all parties.

D. Scheduling:
1. CA will work with commissioning team to establish required commissioning activities to incorporate in preliminary commissioning schedule. The CA and GC will integrate commissioning activities into the master construction schedule. Representatives of the commissioning team will address scheduling problems. Necessary notifications are to be made in a timely manner in order to expedite commissioning.
2. The CA will provide initial schedule of primary commissioning events at commissioning kick-off meeting. As construction progresses, more detailed schedules are developed by the CA.

1.06 DEFINITIONS

A. Acceptance Phase: Phase of construction after startup and initial checkout when Functional Performance Tests, O&M documentation review and training occur.

B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in tested modes according to the Contract Documents.

C. Architect/Engineer (A/E): Prime consultant (architect) and sub-consultants who comprise the design team, generally HVAC Mechanical Designer/Engineer and Electrical Designer/Engineer.

D. Commissioning Agent (CA): An assigned employee or agent of the GC. CA directs and coordinates day-to-day commissioning activities.

E. Contract Documents: Documents binding on parties involved in construction of this project (drawings, specifications, change orders, amendments, contracts, etc.).

F. Control System: System and components associated with building automation system.

G. Construction Manager (CM): Owner's employee assigned the responsibility of managing the overall project.

H. Deferred Functional Tests: Functional tests performed after substantial completion due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow test from being performed.

I. Deficiency: Condition of a component, piece of equipment or system that is not in compliance with Contract Documents (that is, does not perform properly or is not complying with design intent).

J. Director of Facility Management (DFM): Facility employee responsible for the maintenance of the Physical Plant.

K. Factory Testing: Testing of equipment on-site or at factory, by factory personnel.

L. Functional Performance Test Procedures: Commissioning protocols and detailed test procedures and instructions that fully describe the steps required to determine if the system is performing and functioning properly. These procedures are written by the A/E and shall be used to document Functional Performance Tests. They shall be included in the Project Manual.

M. Functional Performance Test (FPT): A demonstration of the dynamic function and operation of equipment and systems. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, life safety conditions, power failure, etc. Systems are run through all specified sequences of operation. Components are verified to be responding in accordance with contract documents. The test results are both manually recorded on the FPT Procedure and with trending data using the BAS. Functional Performance Tests are executed after pre-functional checklists and startups are complete.

N. General Contractor: Contracted directly to Owner. Sub-contractors report to the General Contractor.

O. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

P. Manual Test: Using hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrary to analyzing monitored data taken over time to make "observation").

Q. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or trending capabilities of control systems.

R. Non-Compliance: See Deficiency.

S. Non-Conformance: See Deficiency.

T. Overridden Value: Writing over a sensor value in the control system to see response of a system (e.g., changing outside air temperature value from 50°F to 75°F to verify economizer operation). See also "Simulated Signal".

U. Owner's Representative (OR) – An employee of the Owner or person contracted with the Owner to provide Cx Verification Services. The responsibility of the OR is to assist the Cx Team in understanding the Cx requirements of the project, monitor the Cx progress through site visits and Cx Team Meetings, review the completed Cx Pre-Functional Performance Checklists and Functional Performance Test for completeness, perform Cx verification testing as appropriate to determine that the Cx requirements of the project have been successfully completed.

V. Owner Verification: A repeat of the FPTs in the presence of the OR and A/E. The OR will determine if only selected or all FPTs will be repeated based on his inspection and review of the Cx documentation submitted by the CA prior to this visit. Typically the length of this visit is less than 3 days. On phased projects, phased commissioning may be required.

W. Phased Commissioning: Commissioning completed in phases (by floors, for example) due to size of structure or other scheduling issues.

X. Pre-functional Checklist (PC): 1) A list of static inspections and elementary component tests that verify proper installation of equipment (e.g., belt tension, oil levels, labels affixed, gages in place, sensors calibrated, etc.). 2) Pre-functional Checklists may also include startup tests that prepare equipment and system for functional operation. 3) A summary of specified documentation is presented in checklist format. The A/E shall include the PCs in the Project manual.

Y. Seasonal Performance Tests: Functional Performance Tests or parts thereof that are deferred until system(s) ambient conditions are closer to design conditions in order to verify proper system operation.

Z. Simulated Condition: Condition created for testing component or system (e.g., applying heat to space temperature sensor to monitor response of VAV box).

AA. Simulated Signal: Disconnecting a sensor and using a signal generator or a software value to simulate an input value to the BAS.

BB. Specifications: Construction specifications of Contract Documents.

CC. Startup: The activities where systems or equipment are initially tested and operated. Startup is completed prior to functional testing.

DD. Sub-contractor: Contractors of GC, and their sub-contractors, who provide and install building components and systems.

EE. Test Procedures: Step-by-step processes, which must be executed to fulfill test requirements.

FF. Test Requirements: Requirements specifying what modes and functions, etc. will be tested.

GG. Trending: Recording of parameters (flow, temperature, pressure, status, etc.) during system operation using the BAS.

HH. Vendor: Supplier of equipment.

II. Warranty Period: Warranty period for entire project, including equipment components.

1.07 SUBMITTALS

A. CA shall provide the OR and A/E an "as-built" controls submittal 5 working days prior to the scheduled Owner's Verification visit. The submittal shall include the full sequences of operation that describe the actual controls programming.

1.08 STARTUP

A. Sub-contractor responsible for purchase, installation and startup of equipment shall perform the manufacturer's detailed startup and checkout procedures in addition to the PCs.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Division sub-contractors shall provide all specialized tools, test equipment and instruments required to execute startup, checkout and functional performance testing of equipment under their contract.

B. Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance with tolerances specified. A testing laboratory shall have calibrated test equipment within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be calibrated according to manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 EXECUTION

3.01 COMMISSIONING OVERVIEW

A. The following provides a brief overview of typical commissioning tasks during construction and the general order in which they occur:
   1. Commissioning during construction begins with a kick-off meeting conducted by CA and OR where membership of commissioning team is established, responsibilities reviewed, and the Cx scope and procedures are reviewed.. A preliminary commissioning schedule is distributed for review.
   2. CA schedules subsequent meetings as necessary to plan, coordinate and schedule commissioning activities. Deficiencies and problem resolution will also be discussed at these meetings.
   3. CA develops, with cooperation of sub-contractor/vendor, detailed training plan. The CA schedules training activities with the facility's staff.
   4. CA assembles the Cx team and for a step by step review of the FPT procedures in advance of the execution of the first FPT. The A/E shall lead this review and immediately update any FPT that requires changes.
   5. A/E shall be present to assist in the execution of the first FPT. The CA shall coordinate the schedule for this test to coincide with the A/E's scheduled trip to attend an Owner-Architect-Contractor meeting.
   6. CA supervises the execution of the PCs. CA will witness startup of selected equipment.
   7. Functional testing is completed after TAB is completed.
   8. Functional Performance Tests are executed by sub-contractors, under supervision of and documented by CA.

9. CA is responsible for having the completed FPT procedures, the specified trending data, the final T&B report, and the "as-built" control submittal to the OR and A/E not less than 5 working days prior to the scheduled Owner's Verification visit.
10. All the FPTs must be completed and the Owner's Verification must occur prior to occupancy unless otherwise directed by the CM. (Owner Verification may be waived on some phases of a phased project; however, the FPTs and controls submittal must be submitted to the OR prior to occupancy.)
11. Items of non-compliance in material, installation or setup will be corrected at sub-contractor expense and system shall be retested.

3.02 SYSTEMS TO BE COMMISSIONED

A. Mechanical
   1. Air Handling Systems including air handlers, air terminal boxes, energy recovery systems, exhaust fans and ancillary equipment.
   2. Heating Hot Water System including boilers, pumps and ancillary equipment.
   3. Building Automation System

B. Plumbing: Domestic Hot Water Recirculation System

C. Electrical: Emergency Generator

3.03 RESPONSIBILITIES

A. Responsibilities of commissioning team members are:
   1. Architect/Engineer (A/E):
   2. Develop detailed PCs.
   3. Develop detailed project specific FPT procedures.
   4. Review FPTs in detail with the Cx Team.
   5. Witnesses first run of first FPT.
   6. Review all Cx documentation, including TAB reports, and provide written comments to the OR and CA within 5 days of receipt.

B. Commissioning Agent (CA):
   1. Coordinate and direct commissioning activities in a logical, sequential and efficient manner.
   2. Schedule and chair Cx kick-off meeting and issue minutes.
   3. Provide progress reports of commissioning status.
   4. Periodically update commissioning schedule.
   5. Supervise completion of Pre-functional Checklists and supporting documentation to verify systems readiness for Functional Performance Testing.
   6. Supervise Functional Performance Tests. Document test results and recommend system for acceptance.
   7. Review completed TAB reports.
   8. Develop, with cooperation of sub-contractor/vendor and DFM, a detailed training plan.
   9. Schedule and oversee training sessions.
   10. Prepare final Commissioning Turnover Documentation.
   11. Facilitate cooperation of sub-contractors in commissioning work.
   12. Incorporate commissioning activities into master construction schedule.
   13. Schedule and chair all commissioning team meetings.
   14. Forward completed TAB report, as-built controls submittal, FPT procedure, and trend data to OR and A/E and at least 5 working days prior to scheduled Owner Verification visit.
   15. Identify, track and coordinate resolution of non-compliance and deficiencies identified by commissioning team. Maintain records of all issues submitted by commissioning team.
   16. Coordinate sub-contractor/vendor participation in training sessions. Provide workspace or conference room as needed. Ensure attendance at training is documented.
   17. Schedule, coordinate and assist CT in seasonal or deferred testing.

C. Sub-contractors/Vendors:
   1. Review PCs and Functional Performance Test procedures.
   2. Ensure installation work is complete, is in compliance with Contract Documents and is ready for Functional Performance Testing.

3. Execute Pre-functional Checklists and submit with supporting documentation to CA.
4. Execute Functional Performance Tests developed by CA as described in contract documents.
5. Provide certified and calibrated instrumentation required to take measurements of system and equipment performance during Functional Performance Testing.
6. Assist CA with developing a comprehensive commissioning schedule.
7. Attend commissioning kick-off meeting and other commissioning team meetings.
8. Execute seasonal or deferred Functional Performance Testing.
9. Make necessary amendments to O&M manuals and as-built drawings/submittals for applicable issues identified in the Cx process.
10. Support the testing that occurs during the Owner's Verification visits.

D. Controls Contractor (CC):
1. Completely install and thoroughly inspect startup, test, adjust, calibrate and document systems and equipment under BAS Contract.
2. Provide laptop computer, software and training to accommodate TAB Contractor in system balancing.
3. Maintain database of control parameters submitted by TAB Contractor subsequent to field adjustments and measurements.
4. Provide on-site technician skilled in software programming and hardware operation to exercise sequences of operation and to correct control deficiencies identified during Functional Performance Testing and Owner's Verification.
5. Provide instrumentation, computer, software and communication resources necessary to demonstrate total operation of building systems during Functional Performance Testing and Owner's Verification of control system equipment.
6. Attend commissioning kick-off meeting and other commissioning team meetings.
7. Maintain comprehensive system calibration and checkout records. Submit records to CA upon request.
8. Setup trend logs as requested by CA to substantiate proper systems operation.
9. Prepare the required trending information and submit to the CA.

E. Test, Adjust and Balance (TAB) Contractor:
1. Attend commissioning kick-off meeting and other commissioning team meetings.
2. Complete test and balance procedures prior to Owner's Verification visit.
3. Cooperate with CC with execution of required work.
4. Rebalance deficient areas identified during commissioning.
5. Provide on-site technician, as necessary, skilled in TAB procedures to provide limited system TAB readings during Functional Performance Testing and Owner's Verification.

3.04 COMMISSIONING TEAM MEETINGS

A. Commissioning team meetings will be held periodically as determined by CA with frequency increasing as construction advances and systems become operational. Attendance is mandatory. CA will record minutes and attendance. CA will chair Commissioning Team Meetings.

B. Discussions held in Commissioning Team Meetings shall include, but not be limited to system/equipment startup, progress, scheduling, testing, documentation, deficiencies and problem resolution.

3.05 REPORTING

A. CA will at OAC meetings provide regular status reports to CM and A/E.

B. CA will regularly communicate with members of commissioning team, keeping them apprised of commissioning progress.

C. CA shall submit non-compliance and deficiency reports to the CM.

3.06 STARTUP AND INITIAL CHECKOUT

A. CA shall schedule equipment startup after the PCs are executed and documented by Sub-contractor. Startup shall not occur until after the CA and sub-contractors have reviewed the completed PCs.

B. OR reserves the right to witness any startup or equipment testing. DFM shall be contacted and invited to witness all equipment startup.

C. CA shall provide OR with signed and data copy of completed startup and pre-functional checklists. Only individuals having direct knowledge that a line item task was actually performed will initial or check that item off.

D. CA shall clearly list outstanding items or initial startup and pre-functional procedures not completed successfully.

E. CA shall review deficiency reports to determine if outstanding items prevent scheduling of Functional Performance Testing.

3.07 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope:
   1. The objective of Functional Performance Testing is to demonstrate each system is operating according to documented design intent and Contract Documents. Functional Performance Testing facilitates bringing systems from a state of substantial completion to full dynamic operation. Additionally, during Functional Performance Testing, areas of deficient performance are identified and corrected, improving operation and functioning of systems.
   2. Each system shall be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required.

B. Development of Test Procedures:
   1. The purpose of any given specific test is to verify and document compliance with stated criteria of acceptance given on test form. A/E shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the CA will review the FPT procedures with the A/E and Cx Team (i.e. answering questions about equipment, operation, sequences, etc.). CA shall provide a copy of test procedures to Sub-contractor. Sub-contractor will review tests for feasibility, safety and equipment warranty protection. CA shall also submit tests to Owner, CM and A/E and other commissioning team members for review.
   2. Examples of test procedure forms to be developed by the A/E are included herein.

C. Coordination and Scheduling:
   1. CA will conduct a step by step table top review of the FPT procedures with the CT weeks in advance of the first FPT.
   2. CA shall witness and document functional testing of equipment and systems. Sub-contractor shall execute tests under direction of CA.
   3. Functional Performance Testing is conducted after system operation and checkout is satisfactorily completed. Air balancing and water balancing is to be completed and debugged before functional testing of air-related or water-related equipment or systems.
   4. CA will schedule Owner's Verification visit with the OR and A/E.
   5. CA will transmit the completed FPT procedures, associated trend data, TAB report, and "as-built" control submittal to the OR and A/E on a schedule that will give the them five working days to review this information prior to the scheduled Owner's Verification visit.

3.08 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation: CA will witness and document the results of the FPTs using specific Functional Performance Test procedures developed for that purpose. CA will include filled out FPTs in Commissioning Turnover Package.

B. Non-Conformance:
   1. CA will record results of functional performance testing. Deficiency or non-conformance issues will be noted and reported to A/E and OR on notes section of the FPT procedure.

2. Corrections of minor deficiencies identified may be made during tests at discretion of CA. In such cases, deficiency and resolution will be documented on FPT form.
3. Every effort will be made to expedite testing and minimize unnecessary delays, while not compromising integrity of tests. CA shall not overlook deficient work or loosen acceptance criteria to satisfy scheduling or cost issues unless directed to do so by the OR.
4. Deficiencies are handled in the following manner:
    a. When there is no dispute on deficiency and Sub-contractor accepts responsibility for remedial action:
        1) CA documents deficiency.
        2) CA reschedules test with Sub-contractor.
    b. When there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
        1) CA documents deficiency and the sub-contractor's response and they go on to another test or sequence.
        2) CA facilitates resolution of deficiency. Other parties are brought into discussions as needed. Final interpretive authority is with A/E. Final acceptance authority is with the OR.
        3) CA documents the resolution.

C. Approval: CA notes each satisfactorily demonstrated function on test form. CA, A/E and OR provide formal approval of FPT. CA recommends acceptance of each test to A/E and OR. The OR maintains a Cx Issues Log that documents the issues/problems that arise during Cx Verification. The OR and A/E work together to update the log until all the issues are resolved to the satisfaction of the OR. The OR notifies the CM when the Cx Issues are resolved to the extent that occupancy by the Owner can occur.

3.09 COMMISSIONING DOCUMENTATION

A. Commissioning Turnover Package
1. CA is responsible to compile and organize commissioning records. CA shall deliver Cx records to the OR in Commissioning Binders. Turnover Package to include the following:
    a. "As-built" controls submittal
    b. Pre-functional Checklists
    c. Completed Functional Performance Test records
    d. Trend data
    e. A list of deficiencies referenced to a specific FPT section
    f. Final TAB Report

3.10 TRAINING OF OWNER PERSONNEL

A. Sub-contractors will provide complete training in startup, operation and maintenance of all equipment under contract.

B. CA will be responsible for overseeing and approving content and adequacy of Facility Staff training.

C. Sub-contractor responsible for training will submit a written training plan to CA for review and approval prior to training. Plan will cover the following elements:
1. Equipment (included in training)
2. Intended audience
3. Location of training
4. Objectives
5. Subjects covered
6. Duration of training on each subject
7. Instructor for each subject
8. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
9. Instructors and qualifications

D. CA coordinates and schedules training with CM, DFM and Sub-contractors. CA develops criteria to determine training satisfactorily completed. CA schedules training sessions with appropriate personnel.

E. CA will provide videotaping of training sessions as required.

3.11 DEFERRED TESTING

A. Deferred Seasonal Testing: During warranty period, seasonal testing (tests delayed until weather conditions are closer to system's design) will be completed as part of this contract. CA will coordinate this activity. Tests will be executed, documented and deficiencies corrected by appropriate contractor(s), with DFM, OR and CA witnessing. CA will incorporate final updates to Commissioning Turnover Package as necessary.

B. Unforeseen Deferred Tests: Any check or test not completed due to building structure, required occupancy condition, or other deficiency, may be delayed upon approval of OR. These tests will be rescheduled as soon as possible.

3.12 PRE-FUNCTIONAL CHECKLISTS

A. The A/E shall include in the specifications Pre-functional Checklists for the major equipment in the systems under going Functional Performance Tests. Included at the end of this section are example Pre-functional Checklists. The design consultant is responsible for including in this section of the Project Manual comprehensive, accurate, and clearly written Pre-functional Checklists for the major equipment called for in the Project.

B. The Mechanical Contractor's field foreman shall inspect each piece of installed HVAC equipment using the appropriate Pre-functional Checklist. He shall initial and date each item when it passes inspection and re-inspect until all items pass.

C. When all items have successfully passed inspection the Mechanical Contractor's superintendent and the General Contractor's project manager shall separately inspect, sign and date the checklists to verify that the installation is complete.

3.13 FUNCTIONAL PERFORMANCE TESTS AND TEST PROCEDURES

A. AHU Functional Performance Test – The AHU FPT is to be conducted after the hydronic water balance and air side T&B for the spaces served by the AHU are complete. Portions of this FPT also require that the chilled water and heating water systems operate to produce chilled water and heating water at design temperatures. The AHU FPT requires a 24 hour trend at 3 minute intervals of AHU and chilled water system parameters listed in the FPT procedure. The trending should be scheduled to ensure that fire alarm tests or other activities do not shut down the AHU or hydronic systems during the 24 hour period.

B. In the Function Performance Tests Section (Tab 3) there is an example of AHU FPT (including templates for calculating and displaying the trend data) for the AHU sequence of operation contained in this document (see BAS AHU with and without Preheat Coil Schematic and Sequence of Operation Sections, Tabs 8 and 9). The design consultant is responsible for including in this section of the Project Manual a comprehensive, accurate, and clearly written AHU FPT that is specific to the sequence of operation specified.

C. Air Terminal Unit Functional Performance Tests – Two tests are performed on the Air Terminal Units, a Heating Mode Test and a Cooling Mode Test. Completion of the AHU FPT is a prerequisite to performing these tests. The VAV/CAV Air Terminal Unit Heating and Cooling tests are to be conducted after the hydronic water balance and air side T&B for the terminal units and the AHUs serving these units are completed. These FPTs also require that the chilled water and heating water systems produce design chilled water and heating water temperatures of typically 42°F and 180°F, respectively, continuously throughout the tests. Coordinate with other trades to insure that the chilled water, heating water, and AHUs involved will operate without interference throughout the duration of the tests, approximately 5 hours for each test. An effort should be made to keep all doors separating the terminal boxes' zones closed during these tests. The Air Terminal Unit FPT can be conducted simultaneously for all the terminal units in the project or selected terminal units may be tested separately from others provided the chilled water system,

heating hot water system, and the AHU serving the units meet the prerequisites for conducting the test.

D. The Heating Mode test is to be performed prior to the Cooling Mode test. The space thermostats involved in the Heating Mode test are to be set at 72°F at least 5 hours immediately prior to beginning the Heating Mode test. This is done to establish steady state temperature conditions prior to raising the space thermostats to a set point of 76°F.

E. When the building has been given time to stabilize at 72°F begin trending the required parameters. Trend each data point every 3 minutes.

F. Thirty minutes after beginning the trending of parameters globally change the thermostat set point of the boxes being tested to 76°F. Continue trending for another 5 hours. This completes the Heating Mode Test. The information requested on the Heating Mode Test form (see Functional Performance Test Procedures Section, Tab 3) is only supplied for terminal boxes that do not meet the test criteria specified at the bottom of the form.

G. The Cooling Mode Test should immediately follow the Heating Mode Test. Globally set the thermostat set point of the boxes being tested to 69°F and continue trending the same parameters for 4½ hours.

H. If the Cooling Mode Test does not immediately follow the Heating Mode Test, 5 hours prior to starting the Cooling Mode Test adjust the thermostat set point for the terminal units being tested to 74°F. After the 5 hour stabilization period, begin trending the parameters specified in the test form. Thirty minutes after beginning the trending, globally change the thermostat set point of the terminal units being tested to 69°F. Continue trending for another 5 hours.

I. The trend data is to be presented as tabular data in an Excel workbook. The data for each terminal unit is to be contained in separate work sheets using the unique terminal unit designation as the name for each sheet. The columns of each work sheet are to be ordered from left to right as follows:

J. Date and time in ascending order, zone thermostat set point, cooling set point, heating set point, actual zone temperature, terminal unit reheat coil discharge air temperature, reheat valve commanded position, actual cfm, heating cfm set point, cooling cfm set point, commanded damper position, AHU discharge air temperature, and heating hot water supply temperature. Shade data of the Heating Mode Test red and the Cooling Mode Test data blue.

K. The system trend data, AHU discharge air temperature, chilled water valve control position, building chilled water supply temperature, building heating hot water supply temperature, and outside air temperature are to be combined in a separate worksheet for each AHU.

L. Heating Mode and Cooling Mode test forms and templates for calculating and displaying the trend data are included in the Functional Performance Tests Section (Tab 3). These sheets are to be completed for the terminal units that fail the initial FTP or any subsequent FPT.

M. Chilled Water System Functional Performance Test – The Chilled Water System FPT is conducted after chiller startup, hydronic TAB, and the AHU chilled water control valves are under automatic control. This FPT must test or demonstrate: user change of the order in which the chillers are staged; automatic start of the lead chiller; automatic start of the lag chillers in sequence; automatic de-staging of the lag chillers in sequence; automatic staging and control of pumps and pump speeds; the ability of the system to maintain minimum chiller flow; calibration of the chilled water system sensors.

N. In the Function Performance Tests Section (Tab 3) there is an example of a Primary/Secondary Chilled Water System FPT. The design consultant is responsible for including in this section of the Project Manual a comprehensive, accurate, and clearly written Chilled Water System FPT that is specific to the sequence of operation specified.

O. BAS/ESC connectivity Functional Performance Test – Coordinate with HCA corporate FacilitiGroup Energy Service center to verify full BAS communication between the facility and ESC.

P. Pre-Functional Checklists:

1. 01 91 13A Air Handling Unit Pre-Functional Checklist
2. 01 91 13B Air Terminal Unit Pre-Functional Checklist
3. 01 91 13C Fan Coil Unit Pre-Functional Checklist
4. 01 91 13D Ductless Split Unit Pre-Functional Checklist
5. 01 91 13E Emergency Generator Pre-Functional Checklist
6. 01 91 13F General Exhaust Fan Pre-Functional Checklist
7. 01 91 13G Hot Water Boiler Pre-Functional Checklist
8. 01 91 13H Hydronic Pump Pre-Functional Checklist
9. 01 91 13I Isolation Room Exhaust Fan Pre-Functional Checklist
10. 01 91 13J Piping and Ductwork Pre-Functional Checklist
11. 01 91 13K Rooftop Unit Pre-Functional Checklist

Q. Functional Performance Test Procedures:

1. 019113L Air Handling Unit Functional Performance Test
2. 019113M Air Terminal Unit Heating and Cooling Test Report Functional Performance Test
3. 019113N BAS Graphics Programmers' Guide Functional Performance Test
4. 019113O General Exhaust Fan Functional Performance Test
5. 019113P Heating Hot Water Functional Performance Test
6. 019113Q Isolation Room Functional Performance Test
7. 019113R VAV Trend Data Functional Performance Test

END OF SECTION 01 91 13

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Air Handling Unit Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
AHU #:			

1	**Manufacturer:**	
2	**Model #:**	

General		**Y/N/NA; Initials; Date**
3	Unit is installed on housekeeping pad	
4	Unit is installed on floating floor as shown on construction documents	
5	Access doors open freely and seal tightly	
6	Lights are provided and controlled off timer switch	
7	Viewable windows are provided in access doors at filters, fans, and humidifier sections	
8	Casing and duct sealed with proper sealant	
9	Dampers are low leakage and installed with rubber gasket	
10	Casing and duct are properly insulated	
11	Duct smoke detectors are installed in supply and return ductwork with required access doors	
12	Fire/Smoke dampers are installed with access doors where specified	
13	Unit and plenums are clean	

Chilled Water Coil		**Y/N/NA; Initials; Date**
14	Isolation valves are installed on supply and return piping for service	
15	Piping is properly supported and not supported by the coil	
16	Flanges/Unions are provided at coil connections for access	
17	Access is provided for coil pull without obstructions	
18	Clearances have been maintained and piping is installed for service	
19	Coil drain with valve is installed at low point of coil	
20	Manual air vent is installed at high point in coil	
21	Line size dirt leg with shutoff valve is installed in supply and return piping	
22	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
23	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
24	Control valve is installed in the return piping	
25	Common glycerin filled pressure gauge is installed across coil with shutoff valve installed on each line	
26	Weiss solar digital thermometers are installed in common supply and return piping to/from coils and viewable from floor	
27	Temperature sensor is installed in return piping	
28	Coils are clean and fins are in good condition	
29	Temporary flushing connection is installed with valves to bypass coil during flushing	
30	Coil is piped counterflow (coldest water to coldest air)	
31	Control wells are installed	

Condensate Piping		**Y/N/NA; Initials; Date**
32	Stainless steel drain pan is sloped to drain	
33	Condensate drain is full line size with union	
34	Condensate drain is installed with clean out plug at tee	
35	Open vent is installed after trap	
36	Total trap height between drain pan and condensate after trap is Total Static Pressure + 1"	
37	Total trap height between drain pan and bottom of trap is 2 * (Total Static Pressure + 1")	
38	Condensate drain is piped to nearest floor drain with air gap	

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Secondary Cooling Coil		Y/N/NA; Initials; Date
39	Isolation valves are installed on supply and return piping for service	
40	Piping is properly supported and not supported by the coil	
41	Flanges/Unions are provided at coil connections for access	
42	Access is provided for coil pull without obstructions	
43	Clearances have been maintained and piping is installed for service	
44	Coil drain with valve is installed at low point of coil	
45	Manual air vent is installed at high point in coil	
46	Line size dirt leg with shutoff valve is installed in supply and return piping	
47	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
48	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
49	Control valve is installed in the return piping	
50	Common glycerin filled pressure gauge is installed across coil with shutoff valve installed on each line	
51	Weiss solar digital thermometers are installed in common supply and return piping to/from coils and viewable from floor	
52	Temperature sensor is installed in return piping	
53	Coils are clean and fins are in good condition	
54	Temporary flushing connection is installed with valves to bypass coil during flushing	
55	Coil is piped counterflow (coldest water to coldest air)	
56	Control wells are installed	

Heating Hot Water Coil		Y/N/NA; Initials; Date
57	Isolation valves are installed on supply and return piping for service	
58	Flanges/Unions are provided at coil connections for access	
59	Access is provided for coil pull without obstructions	
60	Piping is properly supported and not supported by the coil	
61	Coil drain with valve is installed at low point of coil	
62	Manual air vent is installed at high point in coil	
63	Line size dirt leg with shutoff valve is installed in supply and return piping	
64	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
65	Weiss solar digital thermometers are installed in common supply and return piping to/from coils and viewable from floor	
66	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
67	Control valve is installed in the return piping	
68	Isolation valves are installed across recirculation pump	
69	Check valve is installed on discharge of recirculation pump	
70	Glycerin filled pressure gauges are installed across recirculation pump	
71	Recirculation pump is installed with differential pressure switch across pump to indicate status to BAS	

Steam Pre-Heat Coil		Y/N/NA; Initials; Date
72	Isolation valve is installed on supply piping for service	
73	Flanges/Unions are provided at coil connections for access	
74	Access is provided for coil pull without obstructions	
75	Piping is properly supported and not supported by the coil	
76	Dirt leg is installed with condensate trap on steam piping to coil	
77	Control valve is installed not to allow the buildup of condensate and is accessible	
78	Parallel traps are installed	
79	Condensate trap is installed with shutoff valves and unions for service	
80	Condensate piping slopes down from coil and does not lift	
81	Vacuum breaker is installed in coil	

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Humidifier		Y/N/NA; Initials; Date
82	Isolation valve is installed on supply piping for service	
83	Flanges/Unions are provided at coil connections for access	
84	Access is provided for tube removal without obstructions	
85	Piping is properly supported and not supported by the humidifier	
86	Control valve is installed not to allow the buildup of condensate and is accessible	
87	Humidifier is located a minimum 15 feet upstream of final filters or downstream of final filters and smoke detectors	
88	Viewable window and light is provided to observe operation	
89	Controlling high limit humidity sensor is installed downstream of humidifier	
90	High limit humidity switch is installed adjacent to the controlling high limit humidity sensor	
91	Condensate trap is installed with shutoff valves and unions for service	
92	Condensate piping slopes down from coil and does not lift	

Supply Fan		Y/N/NA; Initials; Date
93	Fan is installed on 2" static deflection spring isolators and not bottomed out	
94	Torque springs are properly installed on fan	
95	Shipping bolts have been removed from spring isolators	
96	Piezometer ring properly installed for air flow measuring station with proper transducer	
97	Fan guard is properly installed	
98	High static pressure safety switch is installed in proper location and manual reset is accessible	
99	Flexible connection is provided at fan and duct connections	
100	Starter/VFD is installed and permanently labeled	
101	Bearings lubricated on fans and shaft. Grease Zerks are readily accessible	

Return Fan		Y/N/NA; Initials; Date
102	Fan is installed on 2" static deflection spring isolators and not bottomed out	
103	Torque springs are properly installed on fan	
104	Shipping bolts have been removed from spring isolators	
105	Piezometer ring properly installed for air flow measuring station with proper transducer	
106	Fan guard is properly installed	
107	High static pressure safety switch is installed in proper location and manual reset is accessible	
108	Flexible connection is provided at fan and duct connections	
109	Starter/VFD is installed and permanently labeled	
110	Bearings lubricated on fans and shaft. Grease Zerks are readily accessible	

Filter Sections		Y/N/NA; Initials; Date
111	Filter racks are front loading	
112	Manometers are installed and have clean and dirty markings on gauge	
113	Pre and final filters are installed prior to equipment startup	

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Air Handling Unit Pre-Functional Checklist

Electrical / Controls		Y / N / NA; Initials; Date
114	Power is connected to unit	
115	Control and electrical panel clearances are provided and piping is not installed above panels	
116	Return temperature sensor is installed in return ductwork	
117	Return humidity sensor is installed in return ductwork	
118	Mixed Air temperature sensor is installed 1 linear foot for each square foot of coil area	
119	Freezestat sensors are installed 1 linear foot for each square foot of coil area	
120	Adequate space between coil and temperature sensor is allowed for coil cleaning without removing capillary tube	
121	Pre-Heat coil temperature sensor is installed downstream of pre-heat coil	
122	Duct static pressure sensor is installed in proper location	
123	Discharge air temperature sensor is installed downstream of coils	
124	Air Flow Measuring Station display is in accessible location	
125	All dampers and actuators are installed per construction documents	
126	Filter switch is installed across pre and final filter bank	
127	Controls wiring and sensors are installed and complete	

Insulation & Labeling		Y / N / NA; Initials; Date
128	Piping insulation is complete and undamaged	
129	Duct insulation is complete and undamaged	
130	Condensate drain line insulation is complete and undamaged	
131	Engraved label for unit is installed and clearly visible	
132	Piping is painted and labeled with contents and flow direction	
133	Valves are tagged with permanent engraved labels	

Start-Up		Y / N / NA; Initials; Date
134	Flushing of piping is complete and flushing connection lines are removed, capped, and valve handles removed prior to start-up	
135	Unit and all ductwork are protected prior to being used for temporary conditioning of space	
136	Factory representative start-up completed and documents provided	

Notes		Date
1		
2		
3		
4		
5		
6		
7		

Approvals

Mechanical Contractor / Signature **Company:**

General Contractor / Signature **Company:**

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AIR TERMINAL UNIT PRE-FUNCTIONAL CHECKLIST

Facility Name:		**Date:**	
Project Name:			
Served by AHU #:			
VAV #:			

General		**Y/N/NA; Initials; Date**
1	Box is hung from structure with 4 support wires supplied by manufacturer.	
2	Transition to box inlet allows for minimum 2 duct diameters of straight, hard duct entering box, no flex allowed.	
3	Duct run out matches duct size on drawings.	
4	Duct run out from main line greater than 15 feet is 1 size larger than inlet of VAV.	
5	Piping package is installed and accessible with isolation valves and union for service.	
6	Hot water return and air bleed are installed at top of coil.	
7	Hot water piping is not installed above air bleed valve.	
8	Piping is properly supported within 3 feet of box.	
9	Power is connected to unit.	
10	Required access is provided for control box for service.	
11	Discharge air temperature sensor is installed downstream of unit.	
12	Controls wiring and sensors are installed and complete.	
13	Piping insulation is complete and undamaged.	
14	Duct insulation is complete and undamaged.	
15	Units concealed above lay-in ceilings are marked by a marker clipped to the grid.	
16	Unit is labeled.	

Notes		**Date**
1		
2		
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7		

Approvals

Mechanical Contractor / Signature **Company:**

General Contractor / Signature **Company:**

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Fan Coil Unit Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
FCU #:			

1	**Manufacturer:**	
2	**Model #:**	

	General	**Y/N/NA; Initials; Date**
3	Unit is properly mounted with spring isolators	
4	Unit is installed with access for service of fan and electrical panel	
5	Filter access is provided for maintenance	
13	Unit is clean	

	Chilled Water Coil	**Y/N/NA; Initials; Date**
14	Isolation valves are installed on supply and return piping for service	
15	Piping is properly supported and not supported by the coil	
16	Unions are provided at coil connections for access	
18	Clearances have been maintained and piping is installed for service	
19	Coil drain with valve is installed at low point of coil	
20	Manual air vent is installed at high point in coil	
22	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
23	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
24	Control valve is installed in the return piping	
27	Temperature sensor is installed in return piping	
29	Temporary flushing connection is installed with valves to bypass coil during flushing	
30	Coil is piped counterflow (coldest water to coldest air)	
31	Control wells are installed	

	Condensate Piping	**Y/N/NA; Initials; Date**
33	Condensate drain is full line size with union	
34	Condensate drain is installed with clean out plug at tee	
35	Open vent is installed after trap	

	Heating Hot Water Coil	**Y/N/NA; Initials; Date**
57	Isolation valves are installed on supply and return piping for service	
58	Unions are provided at coil connections for access	
60	Piping is properly supported and not supported by the coil	
61	Coil drain with valve is installed at low point of coil	
62	Manual air vent is installed at high point in coil	
64	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
66	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
67	Control valve is installed in the return piping	

	Electrical/Controls	**Y/N/NA; Initials; Date**
114	Power is connected to unit	
127	Controls wiring and sensors are installed and complete	

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Fan Coil Unit Pre-Functional Checklist

Insulation & Labeling		Y/N/NA; Initials; Date
128	Piping insulation is complete and undamaged	
129	Duct insulation is complete and undamaged	
130	Condensate drain line insulation is complete and undamaged	
131	Engraved label for unit is installed and clearly visible	
132	Piping is painted and labeled with contents and flow direction	
133	Valves are tagged with permanent engraved labels	

Start-Up		Y/N/NA; Initials; Date
134	Flushing of piping is complete and flushing connection lines are removed, capped, and valve handles removed prior to start-up	
135	Unit and all ductwork are protected prior to being used for temporary conditioning of space	
136	Start-up is complete and documents provided	

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Ductless Split Unit Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
Unit #:			

1	**Manufacturer:**	
2	**Model #:**	

General - Indoor Unit		**Y/N/NA; Initials; Date**
3	Unit is installed with access for service	
4	Condensate line is installed and piped to drain	
5	Filter access is provided for maintenance	
6	Unit is clean	

General - Outdoor Unit		**Y/N/NA; Initials; Date**
7	Unit is properly installed and elevated	
8	Refrigerant piping penetration to building is sealed	
9	Condenser fins are undamaged	

Electrical/Controls		**Y/N/NA; Initials; Date**
10	Power is connected to unit	
11	Disconnect is installed	
12	Controls wiring and sensors are installed and complete	

Insulation & Labeling		**Y/N/NA; Initials; Date**
13	Refrigerant Piping insulation is complete and undamaged	
14	Condensate drain line insulation is complete and undamaged	
15	Engraved label for unit is installed and clearly visible	

Start-Up		**Y/N/NA; Initials; Date**
16	Start-up is complete and documents provided	

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Emergency Generator Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
Generator #:			

1	**Manufacturer:**	
2	**Model #:**	

General		**Y/N/NA; Initials; Date**
3	Generator is installed on housekeeping pad and is level	
4	Generator is installed on spring isolators	
5	Adequate space is provided for service of generator	
6	Air intake is provided for generator	
7	Generator is connected to muffler with flexible exhaust connections	
8	Muffler is supported with spring isolators	
9	Muffler is installed with drain valve	
10	Unit is clean	

Piping		**Y/N/NA; Initials; Date**
11	Fuel oil piping is properly installed to allow service	
12	Natural gas piping is installed with pressure regulator and isolation valve for service	

Electrical/Controls		**Y/N/NA; Initials; Date**
13	Power is connected to generator	
14	Control and electrical panel clearances are provided and piping is not installed above panels	
15	Controls wiring and sensors are installed and complete	

Insulation & Labeling		**Y/N/NA; Initials; Date**
16	Exhaust pipe and muffler insulation is complete and undamaged	
17	Generator is clearly labeled	
18	Piping is painted and labeled with contents and flow direction	

Start-Up		**Y/N/NA; Initials; Date**
19	Factory representative start-up completed and documents provided	
20	Required load bank test has been completed and documents provided	

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General Exhaust Fan Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
EF #:			

1	**Manufacturer:**	
2	**Model #:**	

General		**Y/N/NA; Initials; Date**
3	Unit is securely mounted on roof curb	
4	Access is provided to service the fan	
5	Birdscreen is installed	
6	Fan is installed to avoid re-entrainment of exhaust air back into facility	
7	Unit is permanently labeled	
8	Unit is clean	

Electrical/Controls		**Y/N/NA; Initials; Date**
9	Power is connected to unit	
10	Disconnect is installed and located within sight of fan	
11	Controls wiring and sensors are installed and complete	

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Hot Water Boiler Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
Boiler #:			

1	**Manufacturer:**	
2	**Model #:**	

	General	**Y/N/NA; Initials; Date**
3	Boiler is installed on housekeeping pad and is level	
4	Adequate space is provided for service of boiler	
5	Air intake is properly piped to boiler and properly supported	
6	Flue is properly piped from boiler and properly supported	
7	Unit is clean	

	Piping	**Y/N/NA; Initials; Date**
8	Isolation valves are installed on supply and return piping for service	
9	Automatic control isolation valve or boiler pump installed at boiler	
10	Piping is properly supported and not supported by the boiler	
11	Pressure relief valve is installed and is proper setting	
12	PT Ports are installed on supply and return piping directly at boiler connection and at all temperature and pressure sensors	
13	Glycerin filled pressure gauges are installed across boiler	
14	Weiss solar digital thermometers are installed on supply and return of boiler	
15	Drain valves are installed at low point	
16	Control wells are installed	
17	Clearances have been maintained and piping is installed for service	
18	Condensate is installed with union for service into neutralization tank (Condensing Boilers)	
19	Natural gas piping is installed with pressure regulator and isolation valve for service	

	Electrical/Controls	**Y/N/NA; Initials; Date**
20	Power is connected to boiler	
21	Control and electrical panel clearances are provided and piping is not installed above panels	
22	Controls wiring and sensors are installed and complete	

	Insulation & Labeling	**Y/N/NA; Initials; Date**
23	Piping insulation is complete and undamaged	
24	Unit has proper insulation type and thickness	
25	Boiler is clearly labeled	
26	Piping is painted and labeled with contents and flow direction	

	Start-Up	**Y/N/NA; Initials; Date**
27	Flushing of piping is complete and flushing connection lines are removed, capped, and valve handles removed prior to start-up	
28	Factory representative start-up completed and documents provided	

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Hot Water Boiler Pre-Functional Checklist

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Hydronic Pump Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
Pump Tag:			

1	**Manufacturer:**	
2	**Model #:**	

General		**Y/N/NA; Initials; Date**
3	Pump is installed and bolted to housekeeping pad	
4	Inertia base is installed correctly per contract documents	
5	Vibration springs are properly adjusted and free floating	
6	Coupling guard is installed	
7	Unit is clean	

Piping		**Y/N/NA; Initials; Date**
8	Isolation valves are installed on supply and return piping for service	
9	Piping is connected to pump with flanges to allow service	
10	Piping is properly supported and not supported by the pump	
11	First three pipe hangers on suction and discharge piping at pump are installed with vibration spring isolators	
12	Flex connections are installed on supply and return piping	
13	Suction diffuser is installed with access to pull strainer	
14	Adjustable foot support is installed on suction diffuser	
15	Blowdown valve is installed at suction diffuser and piped to floor drain	
16	Check valve is installed on discharge of pump	
17	Balancing valve is installed on discharge piping	
18	Glycerin filled pressure gauge is installed at flange of suction diffuser, pump inlet, and pump outlet with each line and pressure gauge having a shutoff valve	
19	Control wells are installed	
20	Clearances have been maintained and piping is installed for service	
21	One shot chemical feeder is installed across suction and discharge of pump with isolation valves	
22	One shot feeder is installed with drain valve	

Electrical/Controls		**Y/N/NA; Initials; Date**
23	Power is connected to pump	
24	Starter/VFD is installed and clean	
25	Control wiring is complete and terminated	

Insulation & Labeling		**Y/N/NA; Initials; Date**
26	Piping insulation is complete and undamaged	
27	Chilled water pumps are installed with insulated box around pipe connections	
28	Valves are tagged with permanent engraved labels	
29	Pump is clearly labeled	
30	Piping is painted and labeled with contents and flow direction	

Start-Up		**Y/N/NA; Initials; Date**
31	Factory representative start-up completed and documents provided	

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Hydronic Pump Pre-Functional Checklist

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Isolation Room Exhaust Fan Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			
EF #:			

1	**Manufacturer:**	
2	**Model #:**	

General		**Y/N/NA; Initials; Date**
3	Unit is installed on channel iron supports a minimum of 18" above roof	
4	Access is provided to service the fan	
5	Fan is installed on spring isolators	
6	Weatherproof motor and drive housing is provided for unit	
	Exterior mounted zerk fittings	
7	Duct is connected to fan with flexible connections	
8	Inlet duct to fan provided with minimum 4 fan wheel diameters	
9	3/4" drain is installed in bottom of fan scroll and piped to nearest roof drain with 9" trap	
10	Fan discharge is installed 10 feet above finished roof	
11	1/4" hardware screen is installed at flue outlet	
12	12"x12" weatherproof warning sign is white with red lettering and is installed 5 feet above roof mounted on each side of duct or fan housing	
13	Flue is supported with 3 guy wires equally spaced bolted to roof	
14	Duct penetration through roof is installed with 18" curb and counter flashing	
15	Fan is installed to avoid re-entrainment of exhaust air back into facility	
16	Unit is permanently labeled	
17	Unit is clean	

Electrical/Controls		**Y/N/NA; Initials; Date**
18	Power is connected to unit	
19	Disconnect is installed and located within sight of fan	
20	Controls wiring and sensors are installed and complete	

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Piping and Ductwork Pre-Functional Checklist

Facility Name:		**Date:**	
Project Name:			

1	**Manufacturer:**	
2	**Model #:**	

Chilled Water Piping		**Y/N/NA; Initials; Date**
	Piping in mechanical rooms are painted and labeled identifying contents and flow direction	
	Piping is labeled in 20 foot intervals and at least once in each separate space	
	Pipe is supported properly per the contract documents	
	Sleeves are installed on piping passing through masonry walls and floors	
	Air separator and expansion tank are installed and piped	
	Expansion tank has been properly charged	
	Air vents are provided at high points throughout the system	
	Drain valves are provided at low points throughout the system	
	Shutoff valves are installed at main branches on each floor or major wings or sections	
	CHW piping is insulated with closed-cell type and undamaged	
	System has been cleaned and flushed	

Heating Hot Water Piping		**Y/N/NA; Initials; Date**
	Piping in mechanical rooms are painted and labeled identifying contents and flow direction	
	Piping is labeled in 20 foot intervals and at least once in each separate space	
	Pipe is supported properly per the contract documents	
	Sleeves are installed on piping passing through masonry walls and floors	
	Air separator and expansion tank are installed and piped	
	Expansion tank has been properly charged	
	Air vents are provided at high points throughout the system	
	Drain valves are provided at low points throughout the system	
	Shutoff valves are installed at main branches on each floor or major wings or sections	
	HW piping is insulated with molded fiberglass and undamaged	
	Piping 2" and larger are supported with high density insulation inserts and not wood blocks	
	System has been cleaned and flushed	

Steam Piping		**Y/N/NA; Initials; Date**
	Piping in mechanical rooms are painted and labeled identifying contents, flow direction, and working pressure	
	Piping is labeled in 20 foot intervals and at least once in each separate space	
	Pipe is supported properly per the contract documents	
	Sleeves are installed on piping passing through masonry walls and floors	
	Shutoff valves are installed at main branches on each floor or major wings or sections	
	Steam piping is insulated with molded fiberglass and undamaged	
	Piping 2" and larger are supported with high density insulation inserts and not wood blocks	

Condensate Piping		**Y/N/NA; Initials; Date**
	Piping in mechanical rooms are painted and labeled identifying contents and flow direction	
	Piping is labeled in 20 foot intervals and at least once in each separate space	
	Pipe is supported properly per the contract documents	
	Sleeves are installed on piping passing through masonry walls and floors	
	Condensate piping is insulated with molded fiberglass and undamaged	
	Piping 2" and larger are supported with high density insulation inserts and not wood blocks	

Ductwork		**Y/N/NA; Initials; Date**
	Duct is properly supported per the contract documents	
	Mechanical room duct floor penetrations and plenum floor penetrations are installed with 2" curb	
	Duct insulation is complete and undamaged	

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Piping and Ductwork Pre-Functional Checklist

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Rooftop Unit Pre-Functional Checklist

	Facility Name:		**Date:**
	Project Name:		
	RTU #:		

1	**Manufacturer:**	
2	**Model #:**	

General		**Y/N/NA; Initials; Date**
3	Unit is installed on spring vibration isolation roof curb	
5	Access doors open freely and seal tightly	
6	Lights are provided and controlled off timer switch	
7	Viewable windows are provided in access doors at filters, fans, and humidifier sections	
8	Outside air intake is minimum 36" above roof	
	Outside air intake is minimum 25 feet from sanitary vent or exhaust	
	Lightning protection installed and terminated	
9	Dampers are low leakage and installed with rubber gasket	
10	Duct smoke detectors are installed in supply and return ductwork with required access doors	
	All pipe penetrations through roof are sealed	
11	Fire/Smoke dampers are installed with access doors where specified	
12	Unit is clean	

Chilled Water Coil		**Y/N/NA; Initials; Date**
	Piping valves and accessories are installed at unit	
13	Isolation valves are installed on supply and return piping for service	
14	Piping is properly supported and not supported by the coil	
15	Flanges/Unions are provided at coil connections for access	
16	Access is provided for coil pull without obstructions	
17	Clearances have been maintained and piping is installed for service	
18	Coil drain with valve is installed at low point of coil	
19	Manual air vent is installed at high point in coil	
21	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
22	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
23	Control valve is installed in the return piping	
24	Common glycerin filled pressure gauge is installed across coil with shutoff valve installed on each line	
25	Weiss solar digital thermometers are installed in common supply and return piping to/from coils and viewable from floor	
26	Temperature sensor is installed in return piping	
27	Coils are clean and fins are in good condition	
28	Temporary flushing connection is installed with valves to bypass coil during flushing	
29	Coil is piped counterflow (coldest water to coldest air)	
30	Control wells are installed	

Condensate Piping		**Y/N/NA; Initials; Date**
31	Stainless steel drain pan is sloped to drain	
32	Condensate drain is full line size with union	
33	Condensate drain is installed with clean out plug at tee	
34	Open vent is installed after trap	
35	Total trap height between drain pan and condensate after trap is Total Static Pressure + 1"	
36	Total trap height between drain pan and bottom of trap is 2 * (Total Static Pressure + 1")	
37	Condensate drain is piped to nearest roof drain with air gap	

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Rooftop Unit Pre-Functional Checklist

Secondary Cooling Coil		Y/N/NA; Initials; Date
	Piping valves and accessories are installed at unit	
38	Isolation valves are installed on supply and return piping for service	
39	Piping is properly supported and not supported by the coil	
40	Flanges/Unions are provided at coil connections for access	
41	Access is provided for coil pull without obstructions	
42	Clearances have been maintained and piping is installed for service	
43	Coil drain with valve is installed at low point of coil	
44	Manual air vent is installed at high point in coil	
46	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
47	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
48	Control valve is installed in the return piping	
49	Common glycerin filled pressure gauge is installed across coil with shutoff valve installed on each line	
50	Weiss solar digital thermometers are installed in common supply and return piping to/from coils and viewable from floor	
51	Temperature sensor is installed in return piping	
52	Coils are clean and fins are in good condition	
53	Temporary flushing connection is installed with valves to bypass coil during flushing	
54	Coil is piped counterflow (coldest water to coldest air)	
55	Control wells are installed	

Heating Hot Water Coil		Y/N/NA; Initials; Date
	Piping valves and accessories are installed at unit	
56	Isolation valves are installed on supply and return piping for service	
57	Flanges/Unions are provided at coil connections for access	
58	Access is provided for coil pull without obstructions	
59	Piping is properly supported and not supported by the coil	
60	Coil drain with valve is installed at low point of coil	
61	Manual air vent is installed at high point in coil	
63	PT Ports are installed on supply and return piping directly at coil connection and at all temperature sensors	
64	Weiss solar digital thermometers are installed in common supply and return piping to/from coils and viewable from floor	
65	Balancing valve is installed in return piping with recommended straight length upstream and downstream of valve	
66	Control valve is installed in the return piping	
67	Isolation valves are installed across recirculation pump	
68	Check valve is installed on discharge of recirculation pump	
69	Glycerin filled pressure gauges are installed across recirculation pump	
70	Recirculation pump is installed with differential pressure switch across pump to indicate status to BAS	

Steam Pre-Heat Coil		Y/N/NA; Initials; Date
71	Isolation valve is installed on supply piping for service	
72	Flanges/Unions are provided at coil connections for access	
73	Access is provided for coil pull without obstructions	
74	Piping is properly supported and not supported by the coil	
75	Dirt leg is installed with condensate trap on steam piping to coil	
76	Control valve is installed not to allow the buildup of condensate and is accessible	
77	Condensate trap is installed with shutoff valves and unions for service	
78	Condensate piping slopes down from coil and does not lift	
79	Vacuum breaker is installed in coil	

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Rooftop Unit Pre-Functional Checklist

Humidifier		Y/N/NA; Initials; Date
80	Isolation valve is installed on supply piping for service	
81	Flanges/Unions are provided at coil connections for access	
82	Access is provided for tube removal without obstructions	
83	Piping is properly supported and not supported by the humidifier	
84	Control valve is installed not to allow the buildup of condensate and is accessible	
85	Humidifier is located a minimum 15 feet upstream of final filters or downstream of final filters and smoke detectors	
86	Viewable window and light is provided to observe operation	
87	Controlling high limit humidity sensor is installed downstream of humidifier	
88	High limit humidity switch is installed adjacent to the controlling high limit humidity sensor	
89	Condensate trap is installed with shutoff valves and unions for service	
90	Condensate piping slopes down from coil and does not lift	

Supply Fan		Y/N/NA; Initials; Date
	Fan is installed on 2" static deflection spring isolators and not bottomed out	
	Torque springs are properly installed on fan	
	Shipping bolts have been removed from spring isolators	
	Piezometer ring properly installed for air flow measuring station with proper transducer	
	Fan guard is properly installed	
	High static pressure safety switch is installed in proper location and manual reset is accessible	
	Flexible connection is provided at fan and duct connections	
	Starter/VFD is installed and permanently labeled	
	Bearings lubricated on fans and shaft. Grease Zerks are readily accessible	

Return Fan		Y/N/NA; Initials; Date
	Fan is installed on 2" static deflection spring isolators and not bottomed out	
	Torque springs are properly installed on fan	
	Shipping bolts have been removed from spring isolators	
	Piezometer ring properly installed for air flow measuring station with proper transducer	
	Fan guard is properly installed	
	High static pressure safety switch is installed in proper location and manual reset is accessible	
	Flexible connection is provided at fan and duct connections	
	Starter/VFD is installed and permanently labeled	
	Bearings lubricated on fans and shaft. Grease Zerks are readily accessible	

Filter Sections		Y/N/NA; Initials; Date
	Filter racks are front loading	
	Manometers are installed and have clean and dirty markings on gauge	
	Pre and final filters are installed prior to equipment startup	

Electrical/Controls		Y/N/NA; Initials; Date
	Power is connected to unit	
	Control and electrical panel clearances are provided	
	Return temperature sensor is installed in return ductwork	
	Return humidity sensor is installed in return ductwork	
	Mixed Air temperature sensor is installed 1 linear foot for each square foot of coil area	
	Freezestat sensors are installed 1 linear foot for each square foot of coil area	
	Adequate space between coil and temperature sensor is allowed for coil cleaning without removing capillary tube	
	Pre-Heat coil temperature sensor is installed downstream of pre-heat coil	
	Duct static pressure sensor is installed in proper location	
	Discharge air temperature sensor is installed downstream of coils	
	Air Flow Measuring Station display is in accessible location	
	All dampers and actuators are installed per construction documents	
	Filter switch is installed across pre and final filter bank	
	Controls wiring and sensors are installed and complete	

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Rooftop Unit Pre-Functional Checklist

Insulation & Labeling		Y/N/NA; Initials; Date
	Piping insulation is complete and undamaged	
	Duct insulation is complete and undamaged	
	Outdoor piping is insulated and heat traced	
	Engraved label for unit is installed and clearly visible	
	Piping is labeled with contents and flow direction	
	Valves are tagged with permanent engraved labels	

Start-Up		Y/N/NA; Initials; Date
	Flushing of piping is complete and flushing connection lines are removed, capped, and valve handles removed prior to start-up	
	Unit and all ductwork are protected prior to being used for temporary conditioning of space	
	Factory representative start-up completed and documents provided	

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Air Handling Unit Functional Performance Test

Reference		Date		AHU #	

Unit Configuration and Basic Design Information

Instructions:
- Answer Yes or No for each component that is present for this unit.
- Use Plan CFMs and VAV Totals for the following information.

Component	Y	N	Plan CFMs/VAV Totals	
Economizer Package			Unit Design CFM when all VAV terminals are at full cooling.	
Air Blender				
Return Fan			Unit Design CFM when all VAV terminals are at minimum.	
Pre-Heat Coil				
Humidifier			Design Outside Air CFM.	
CHW Coil				
Glycol Coil				
Supply Fan				

Notes:

1 Start of Test Readings

Instructions: BAS contractor to record the following controls system point readings to document status of unit at the beginning of test.

Sensor/Input Readings			Actuator/Output Positions		
Outside Air Temperature		° F	Minimum OA Damper Position		%
Outside Air Humidity		%RH	Economizer OA Damper Position		%
Return Air Temperature		° F	Return Air Damper Position		%
Return Air Humidity Setpoint		%RH	Relief Air Damper Position		%
Return Air Humidity		%RH	Pre-heat Valve Position		%
Mixed Air Temperature		° F	Humidifier Valve Position		%
Preheat Discharge Air Temperature Setpoint		° F	Chilled Water Valve Position		%
Preheat Discharge Air Temperature		° F	Supply Fan Speed		%
Discharge Air Temperature Setpoint		° F	Return Fan Speed	10	%
Discharge Air Temperature		° F	**Sensor/Input Readings Continued**		
Duct Static Pressure Setpoint		In.W.G.	Plant CHW Supply Temp		° F
Duct Static Pressure		In.W.G.	Plant HW Supply Temp		° F
Supply CFM		CFM			
Return CFM		CFM			
Outside Air CFM Setpoint		CFM			
Outside Air CFM Actual		CFM			

Notes:

2 Control Valve Test

2a. Chilled Water Valve (s)

Verify Chilled water system is operating and under control. ____ Y/N

Test Procedure: Command CHW Valve closed (0%)

Using Micro manometer, Measure Coil Water differential pressure. ____ In. W.G.

CHW Valve is closed with no water flow. ____ Y/N

Test Procedure: Command CHW Valve open to 5%

Using Micro manometer, Measure Coil Water differential pressure. ____ In. W.G.

Does coil ΔP indicate coil flow is present? ____ Y/N

Test Procedure: If no, Command CHW Valve open in 2% increments until water flow

Using Micro manometer, Measure Coil Water differential pressure. ____ In. W.G.

Record BAS command when water flow starts. ____ %

Value less than 15%? ____ Y/N

Test Procedure: Command CHW Valve to 90%

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		Verify valve motion to 90%.	Y/N
	Test Procedure: Command CHW Valve to 100% open		
		Verify valve fully opens.	Y/N
	Notes:		

2b.	**Hot Water Valve**		
		Verify hot water system is operating and under control.	Y/N
	Test Procedure: Command HW Valve closed (0%)		
		Using Micro manometer, Measure Coil Water differential pressure	In. W.G.
		HW Valve is closed with no water flow.	Y/N
	Test Procedure: Command HW Valve open to 5%		
		Using Micro manometer, Measure Coil Water differential pressure	In. W.G.
		Does coil ΔP indicate coil flow is present?	Y/N
	Test Procedures: If no, Command HW Valve open in 2% increments until water flow		
		Using Micro manometer, Measure Coil Water differential pressure	In. W.G.
		Record BAS command when water flow starts.	%
		Is value less than 15%?	Y/N
	Test Procedure: Command HW Valve to 90% & verify valve motion		
		Verify valve motion to 90%.	Y/N
	Test Procedure: Command HW Valve to 100% open & verify valve fully open		
		Verify valve fully opens.	Y/N
	Notes:		

2c.	**Recirculation Pump**		
	Test Procedure: Simulate OAT to 40°F		
		Recirculation pump energizes.	Y/N
		BAS pump status shows on.	Y/N
		Measure Preheat Coil ΔP	In W.G.
	Test Procedure: Simulate OAT > 42°F		
		Recirculation pump stops.	Y/N
		BAS pump status shows off.	Y/N
	Notes:		

2d.	**Humidifier Valve**		
		Verify Steam system is operating and under control.	Y/N
		Record Steam Pressure	PSI
	Test Procedure: Command valve closed (0%)		
		Verify valve closed.	Y/N
	Test Procedure: Command valve 5% open		
		Verify stem starts to open.	Y/N
	Test Procedures: If No, open valve in 2% increments		
		Record when valve starts to move.	%
		Value was less than 15%?	Y/N
	Test Procedure: Command valve to 90% open		
		Verify valve opens.	Y/N
	Test Procedure: Command valve to 100% open		
		Verify valve opens 100%.	Y/N
		Release all valve overrides.	Y/N
	Notes:		

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3	**Damper Binding Test**		
	Test Procedure: Command VAV terminals served by this AHU to 100% design cooling CFM		
3a.	**Minimum Outside Air Damper**		
	Test Procedure: Command minimum OA damper closed		
	Verify damper closed tightly.		Y/N
	Test Procedure: Command minimum OA damper open		
	Verify actuator and blades of damper open fully.		Y/N
	Notes:		
3b.	**Economizer Dampers**		
	Test Procedure: Command economizer OA damper to 50% open		
	Verify actuator and blades of ***OA damper*** are approximately 50% open.		Y/N
	Verify actuator and blades of ***relief damper*** are approximately 50% open.		Y/N
	Verify actuator and blades of ***return damper*** are approximately 50% open.		Y/N
	Test Procedure: Command economizer OA damper to 90% open		
	Verify actuator and blades of ***OA damper*** are approximately 90% open.		Y/N
	Verify actuator and blades of ***relief damper*** are approximately 90% open.		Y/N
	Verify actuator and blades of ***return damper*** is approximately 90% closed.		Y/N
	Test Procedure: Command economizer OA damper to 100% open		
	Verify actuator and blades of ***OA damper*** are 100% open.		Y/N
	Verify actuator and blades of ***relief damper*** are 100% open.		Y/N
	Verify actuator and blades of ***return damper*** are 100% closed and closed tightly.		Y/N
	Release all damper overrides.		Y/N
	Notes:		

4	**Static Pressure Controller**		
4a.	**Record location of static pressure sensor:**		
	Is pressure being sensed in area being served by the AHU?		Y/N
4b.	**Record TAB recommended set point necessary to satisfy worse case air terminal.**		In. W.G.
	List in notes below box(es) that determine set point.		
4c.	**Test Procedure: Set static SP to recommended value. Command VAVs to Design Full Cooling CFM.**		
	Verify calibration of sensor by comparison to TAB contractors test instrument measuring pressure between same locations as sensor.		Y/N
	Record **BAS** static pressure reading.		In. W.G.
	Record **TAB** static pressure reading.		In. W.G.
	Readings are within specified tolerance.		Y/N
4d.	**Test Procedure: Adjust setpoint down 0.4" below current setpoint.**		
	Verify supply fan modulates down to meet new SP.		Y/N
	Record New Set Point.		In. W.G.
	Set static SP to TAB recommended value .		Y/N
	Notes:		

5	**AFMS - Fan Inlet Probes Type**		
5a.	**Fan Information**		
	Supply Fan Information		
	Supply Fan: Record fan inlet cone area.		ft^2
	Supply Fan: Record less fan shaft where applicable.		ft^2
	Supply Fan: Record flow area.		ft^2
	Return Fan Information		
	Return Fan: Record fan inlet cone area.		ft^2
	Return Fan: Record less fan shaft where applicable.		ft^2
	Return Fan: Record flow area.		ft^2
5b.	**Verify Pargon transmitter air temperature settings**		
	Verify Paragon transmitter air temperature setting for return air is 73°F.		Y/N

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	Verify Paragon transmitter air temperature setting for supply air is 55°F.		Y/N
5c.	**Test Procedure: Command VAV terminals served by this AHU to 100% design cooling CFM. Manually control speed of supply fan until its AFMS reads approximately design CFM. Traverse supply and return ducts.**		
	Record supply fan BAS reading.		CFM
	Record supply fan traverse reading.		CFM
	Record return fan BAS reading.		CFM
	Record return fan traverse reading.		CFM
	Record the total air terminals supply air CFM from BAS.		CFM
	Notes:		

6	**Sensor Calibration**		
6a.	**Test Procedure: Close minimum OA, economizer OA, and relief dampers and open return damper 100%. Shut off pre-heat, CHW, and humidifier valves. Set OA CFM SP to 0 CFM. Command VAV boxes to full design CFM.**		
6b.	**Test Procedure: Slowly ramp up supply fan speed until return fan is almost unable to maintain a steady 0 CFM SP.**		
	Verify no air is leaking through the closed OA & relief dampers.		Y/N
6c.	**Test Procedure: Compare sensor readings against TAB contractor test instrument measuring temperature or humidity at same location as sensor (Tolerance - +/- 0.5°F & +/- 5% RH)**	**BAS Readings**	**TAB Reading**
	Return Air Temperature	°F	°F
	Sensor within tolerance?		Y/N
	Mixed Air Temperature	°F	°F
	Sensor within tolerance?		Y/N
	Pre-Heat Air Temperature	°F	°F
	Sensor within tolerance?		Y/N
	Discharge Air Temperature	°F	°F
	Sensor within tolerance?		Y/N
	Return Air Humidity	°F	°F
	Sensor within tolerance?		Y/N
	Supply Air High Limit Humidity	°F	°F
	Sensor within tolerance?		Y/N
	Outside Air Temperature	°F	°F
	Sensor within tolerance?		Y/N
	Outside Air Humidity	% RH	% RH
	Sensor within tolerance?		Y/N
	Notes:		

7	**SF and RF Airflow Measuring Device Synchronization and Calibration**		
7a.	**Test Procedure: With unit still in zero outside air mode (as above) and VAV boxes in full cooling, Command RF speed until micrometer readings of the mixed air plenum pressure stay within +/- 0.009" w.c. range.**		
	Record BAS box total.		CFM
	Record BAS supply fan CFM.		CFM
	Record BAS return fan CFM.		CFM
	Record Supply Fan CFM - Return Fan CFM (difference).		CFM
	Is difference greater than 5% of total airflow?		Y/N
7b.	**If yes, recalibrate one AFMS to equal other AFMS. Use AFMS that more closely matches box total as standard or more accurate traverse.**		
	After calibration: Record supply fan CFM.		CFM
	After calibration: Record return fan CFM.		CFM
	Record Supply Fan CFM - Return Fan CFM (Difference).		CFM
	Record which AFMS was recalibrated.		SF/RF
	Record Supply AFMS calibration factor.		
	Record Return AFMS calibration factor.		
7c.	**Return AHU to normal operation and release all overrides.**		
Notes:			

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8	**Return Fan Minimum Outside Air CFM**		
8a.	**Test Procedure: Command unit to Minimum OA Mode and VAV boxes to Design Full Cooling CFM.**		
	Supply fan modulates to maintain duct static pressure SP.		Y/N
	Return fan modulates to maintain CFM offset SP.		
	Set OA CFM offset to correct SP and record SP.		CFM
	Return fan modulates to maintain CFM offset SP.		Y/N
	Record supply duct static pressure reading.		in. W.G.
	Record supply fan speed and hertz.		%/Hz
	Record supply CFM per AFMS.		CFM
	Record return fan speed and hertz.		%/Hz
	Record return CFM per AFMS.		CFM
	Record Outside Air CFM (SF-RF).		CFM
8b.	**Test Procedure: Command AHU to 100% economizer mode.**		
	Return fan modulates to maintain CFM offset SP.		Y/N
	Record supply duct static pressure reading.		In. W.G.
	Record supply fan speed and hertz.		%/Hz
	Record supply CFM per AFMS.		CFM
	Record Outside Air CFM (SF-RF).		CFM
8c.	**Test Procedure: Command all VAV boxes served by this AHU to minimum CFM setting.**		
	Return fan modulates to maintain CFM offset SP.		Y/N
	Record supply duct static pressure reading.		In. W.G.
	Record supply fan speed and hertz.		%/Hz
	Record supply CFM per AFMS.		CFM
	Record return fan speed and hertz.		%/Hz
	Record return CFM per AFMS.		CFM
	Record Outside Air CFM (SF-RF).		CFM
8d.	**Test Procedure: Command AHU to minimum OA Mode at minimum CFM.**		
	Return fan modulates to maintain CFM offset SP.		Y/N
	Record supply duct static pressure reading.		In. W.G.
	Record supply fan speed and hertz.		%/Hz
	Record supply CFM per AFMS.		CFM
	Record return fan speed and hertz.		%/Hz
	Record return CFM per AFMS.		CFM
	Record Outside Air CFM (SF-RF).		CFM
8e.	**Test Procedure: Turn off supply and return fan.**		
	Supply fan CFM < 50 CFM		Y/N
	Return fan CFM < 50 CFM		Y/N
8f.	**Return AHU to normal operation and release all overrides.**		
Notes:			

9	**Manual Reset Freeze Stat / Low Temp Detection**		
9a.	**Verify Freezestat is set at 36°F.**		Y/N
9b.	**Test Procedure: Use ice bag to activate low temperature/freezestat.**		
	Verify supply fan shuts down.		Y/N
	Verify return fan shuts down.		Y/N
	Verify associated exhaust fans shut down.		Y/N
	Verify low temperature alarm is initiated at BAS.		Y/N
	Verify economizer OA damper is closed.		Y/N
	Verify minimum OA damper is closed.		Y/N
	Verify relief OA damper is closed.		Y/N
	Verify return OA damper is open.		Y/N
	Verify CHW valve opens.		Y/N
	Verify pre-heat recirculation pump energizes.		Y/N
	Verify secondary CHW pump is energized at plant.		Y/N
9c.	**Test Procedure: If Pre-heat coil; Simulate pre-heat leaving air temperature to 41°F and outside air temperature to 40°F.**		

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	Verify pre-heat valve opens.		Y/N
	Verify pre-heat recirculation pump energizes.		Y/N
9d.	**Return AHU to normal operation and release all overrides.**		
Notes:			

10	**High Static Safety Switch and Dirty Final Filter Alarm**		
10a.	**Record high static safety switch setting approved by Design Consultant.**		in. W.G.
10b.	**Test Procedure: With fan running, trip high static safety switch with squeeze bulb and magnahelic gauge. Adjust setting as required to trip at recorded setting above.**		
	Record high static safety switch setting after adjustment.		In. W.G
	Verify AHU supply fan, return fan, and associated Efs shut down.		Y/N
	Verify AHU economizer, minimum OA, and relief dampers modulate closed.		Y/N
	Verify return damper modulates fully open.		Y/N
	Verify CHW valve and humidifier valve close.		Y/N
	Verify pre-heat valve is active to maintain pre-heat temperature setpoint.		Y/N
	Record actual switch setpoint adjacent to switch on AHU casing with black permanent marker.		Y/N
	Record dirty pressure drop setpoint for final filter (consult submittal and filter schedule).		In. W.G
10c.	**Test Procedure: With fan running, trip dirty filter switch with squeeze bulb and magnahelic gauge. Adjust setting as required to trip at recorded setting above.**		
	Record dirty pressure drop setpoint after adjustment.		In. W.G
	Verify dirty final filter alarm was generated at BAS.		Y/N
10d.	**Test Procedure: Reset dirty filter alarm.**		
	Verify alarm clears on BAS.		Y/N
	Verify dirty filter setpoint is marked on pressure gauge.		Y/N
Notes:			

11	**LOW Static Safety Switch and Dirty Pre-Filter Alarm**		
11a.	**Record low static safety switch setting approved by Design Consultant.**		in. W.G.
11b.	**Test Procedure: With fan running, trip low static safety switch with squeeze bulb and magnahelic gauge. Adjust setting as required to trip at recorded setting above.**		
	Record low static safety switch setting after adjustment.		In. W.G
	Verify AHU supply fan, return fan, and associated Efs shut down.		Y/N
	Verify AHU economizer, minimum OA, and relief dampers modulate closed.		Y/N
	Verify return damper modulates fully open.		Y/N
	Verify CHW valve and humidifier valve close.		Y/N
	Verify pre-heat valve is active to maintain pre-heat temperature setpoint.		Y/N
	Record actual switch setpoint adjacent to switch on AHU casing with black permanent marker.		Y/N
	Record dirty pressure drop setpoint for final filter (consult submittal and filter schedule).		In. W.G
11c.	**Test Procedure: With fan running, trip dirty filter switch with squeeze bulb and magnahelic gauge. Adjust setting as required to trip at recorded setting above.**		
	Record dirty pressure drop setpoint after adjustment.		In. W.G
	Verify dirty final filter alarm was generated at BAS.		Y/N
11d.	**Test Procedure: Reset dirty filter alarm.**		
	Verify alarm clears on BAS.		Y/N
	Verify dirty filter setpoint is marked on pressure gauge.		Y/N
Notes:			

12	**Economizer Mode Operation**	
	Caution: This portion of the functional Performance Test (FPT) need only be performed on a single AHU provided a copy of its program is copied and used for the other AHUs that use the identical sequence of operation This test should be performed when the OAT is above 58°F. If the test cannot be delayed until those conditions, utilize pre-heat coil to heat 100% OA to 58°F pre-heat coil leaving temperature.	

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12a.	**Preliminary Set Up**		
	Test Procedure: Release VAV/CAV boxes to auto.		
	Test Procedure: Set DAT SP to 55°F.		
	Record actual BAS OAT.		°F
	Record MAT.		°F
	Record PHT.		°F
	Record DAT.		°F
	Record economizer dampers command.		%
	Record humidifier control valve command.		%
	Record pre-heat control valve command.		%
	Record program's time delay prior to going from State #1 to State #2 (TD 1/2).		Minute
	Record program's time delay prior to going from State #2 to State #1 (TD 2/1).		Minute
	Record program's time delay prior to going from State #2 to State #3 (TD 2/3).		Minute
	Record program's time delay prior to going from State #3 to State #2 (TD 3/2).		Minute
	Record program's time delay prior to going from State #3 to State #4 (TD 3/4).		Minute
	Record program's time delay prior to going from State #3 to State #3 (TD 4/3).		Minute
	Test Procedure: Set all above time delays to 5 minutes.		
	Record program's OAT transition temperature setpoint from State #1 to State #2 (TSP 1/2).		°F
	Record program's OAT transition temperature setpoint from State #2 to State #1 (TSP 2/1).		°F
12b.	**State #1: Mechanical Cooling**		
	Record State the AHU is currently indexed to.		#
	Test Procedure: Simulate OAT equal to TSP 1/2 + 2°F.		
	Record the simulated OAT.		°F
	If unit was in State #2, verify the TDI 2/1 times out in 5 minutes.		Y/N or N/A
	If unit was in State #3, verify unit immediately goes to State #1.		Y/N or N/A
	Verify AHU is operating in State #1.		Y/N
	Verify economizer dampers are closed.		Y/N
	Test Procedure: Wait until MAT and DAT stabilize.		
	Record MAT.		°F
	Record pre-heat coil leaving air temperature.		°F
	Record DAT.		°F
	Record DAT SP.		°F
	Record PH coil control valve command.		%
	Record CHW control valve command.		%
	Record CHW CEP supply temperature.		°F
12c.	**State #2: Full economizer w/ cooling coil**		
	Test Procedure: Simulate OAT equal to TSP 1/2 - 0.1°F.		
	Record simulated OAT.		°F
	Record initial CHW control valve command.		%
	Verify after 5 minutes, unit goes to State #2.		Y/N
	Verify Economizer dampers go from fully closed to fully open and remain open.		Y/N
	Test Procedure: Wait until MAT and DAT stabilize.		
	Record MAT.		°F
	Record pre-heat coil leaving air temperature.		°F
	Record DAT.		°F
	Record DAT SP.		°F
	Record PH Coil control valve command.		%
	Record CHW control valve command.		%
	Test Procedure: Simulate an OAT equal to TSP 2/1 + 0.1°F.		
	Record simulated OAT.		°F
	Record initial CHW control valve command.		%
	Verify after 5 minutes, unit goes to State #1.		Y/N
	Verify Economizer dampers go from fully open to fully closed.		Y/N
	Record adjusted CHW control valve command.		%

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	Test Procedure: Simulate OAT equal to TSP 1/2 - 0.1°F.		
	Record simulated OAT.		°F
	Record initial CHW control valve command.		Y/N
	Verify after 5 minutes, unit goes to State #2.		Y/N
	Verify Economizer dampers go from fully closed to fully open and remain open.		Y/N
12d.	**State #3: Free Cooling**		
	Verify AHU is in State #2 and OAT of TSP 1/2 -0.1°F is simulated.		Y/N
	Record MAT.		%
	Record DAT.		°F
	Record DAT SP.		°F
	Record pre-heat leaving temperature.		°F
	Record pre-heat coil control valve command.		%
	Record CHW control valve command.		%
	Record BAS OAT.		°F
	Test Procedure: Simulate MAT of 90°F to avoid MAT Low Limit from activating.		
	Test Procedure: Reset DAT SP to 90°F.		
	Verify CHW control valve goes to 0% open and stays closed.		Y/N
	Verify unit goes to State #3 after CHW valve has been closed for 5 minutes.		Y/N
	Verify economizer OA damper command goes to 0% open.		Y/N
	Test Procedure: Adjust DAT SP to actual DAT - 5°F.		
	Verify Economizer damper command is > 0%.		Y/N
	Test Procedure: Set DAT SP to 45°F.		
	Verify economizer dampers are commanded to 100% open and remain open.		Y/N
	Verify unit goes to State #2 when economizer dampers have been at 100% for 5 minutes.		Y/N
	Test Procedure: Reset DAT SP to 90°F.		
	Verify CHW control valve goes to 0% open and stays closed.		Y/N
	Verify unit goes to State #3 after CHW valve has been closed for 5 minutes.		Y/N
	VI Economizer dampers are 0% open.		Y/N
	Record DAT.		°F
12e.	**MAT Low Limit Alarm (If no Pre-Heat Section)**		
	Test Procedure: Simulate MAT of 44°F.		
	Verify MAT low limit alarm is issued to operator.		Y/N
	Verify AHU goes immediately to MAT Low Limit with no time delay.		Y/N
	Verify CHW valve goes to 100% open and stays open.		Y/N
	Verify minimum OA damper is open.		Y/N
	Verify relief dampers are fully closed.		Y/N
	Verify return dampers are fully open.		Y/N
	Verify none of the change of State timers activated.		Y/N
	Verify facility CHW pumps receive command to start if not already in operation.		Y/N
	Test Procedure: Wait more than 5 minutes, then set DAT SP to 45°F.		
	Verify relief dampers remain fully closed.		Y/N
	Verify return dampers are fully open.		Y/N
	Verify OAT remains simulated at TSP 1/2 - 0.1°F.		E/D
	Test Procedure: Reset MAT low limit alarm at front end and wait 7 minutes.		
	Verify facility CHW pumps were not commanded off.		Y/N
	Verify MAT low limit alarm did not reset.		Y/N
	Verify AHU remained in MAT low limit alarm.		Y/N
	Test Procedure: Simulate MAT of 46°F.		
	Test Procedure: Reset MAT low limit alarm at front end.		
	Verify facility CHW pumps override on command immediately terminated.		Y/N
	Verify that 5 minutes after resetting MAT low limit alarm the AHU indexes to State #3.		Y/N
	Test Procedure: Remove all simulations and reset all set points to initial values. Proceed to Section 13.		
12f.	**State #4: Pre-Heat**		
	Verify AHU is in State #3 and OAT simulation remains at OAT of TSP 1/2 - 0.1°F.		Y/N
	Verify DAT SP remains at 90°F.		°F
	Verify economizer dampers are commanded 0% open and stay closed.		Y/N
	Verify pre-heat valve remains closed in State #3.		Y/N
	Verify unit goes to State #4 after economizer dampers are closed to 5 minutes.		Y/N
	Record pre-heat valve command.		%

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	Record DAT.		°F
	Test Procedure: Reset pre-heat low limit temperature SP to 42°F.		
	Test Procedure: Set DAT SP to 45°F.		
	Verify pre-heat valve is commanded 0% open and remains closed.		Y/N
	Verify unit goes to State #3 when pre-heat valve has been closed for 5 minutes.		Y/N
	Record economizer damper's command.		%
	Record DAT.		°F
	Test Procedure: Simulate pre-heat coil leaving temperature of 40°F.		
	Verify pre-heat valve opens.		E/D
	Verify pre-heat low limit alarm is sent to BAS.		Y/N
	Test Procedure: Simulate pre-heat coil leaving temperature of 37°F.		
	Verify AHU shuts down.		Y/N
	Verify pre-heat temperature shutdown alarm is sent to BAS.		Y/N
	Test Procedure: Reset pre-heat temperature shutdown alarm at BAS.		
	Verify AHU restarts.		Y/N
12g.	**Reset to Normal**		
	Test Procedure: Return all timers set points and temperature setpoints to their initial values. Remove all analog input simulated temperatures.		
	Record MAT.		°F
	Record OAT.		°F
	Record DAT.		°F
	Record DAT SP.		°F
	Record pre-heat leaving temperature.		°F
	Record CHW control valve command.		%
	Record economizer dampers command.		%
	Record pre-heat valve command.		%
	Record operating State #.		#
Notes:			

13	**Humidifier Operation**		
13a.	Record setpoints of the space or return duct humidistat controlling the humidifier.		% RH
	Record actual space or return duct humidity.		% RH
	Verify controlling limit SP of the RH sensor located downstream of humidifier is 80% RH.		Y/N
	Verify high limit alarm SP of the RH sensor located downstream of humidifier is 95% RH.		Y/N
13b.	**Test Procedure: Override humidity SP of humidistat controlling humidifier to 90%**		
	Verify BAS commands humidifier steam valve open.		Y/N
	Verify humidifier steam valve opens and steam enters airstream.		Y/N
13c.	**Test Procedure: Override controlling limit SP to current supply RH - 10%.**		
	Record current supply humidity.		%RH
	Record new controlling limit SP (Current RH-10%).		%RH
	Verify humidifier steam valve starts to close.		Y/N
	Verify humidifier valve is controlling to new controlling limit SP.		Y/N
	Record duct humidity when steam valve position stabilizes.		%RH
	Record BAS command to steam valve when steam valve position stabilizes.		%
13d.	**Test Procedure: Reset controlling limit SP to 80% and override high limit alarm setpoint down in 5% increments.**		
	Verify high limit alarm activates.		Y/N
	Verify humidifier steam valve closes.		Y/N
	Verify humidifier is disabled.		Y/N
13e.	**Test Procedure: Manually reset humidifier alarm.**		
13f.	**Test Procedure: Reset controlling limit SP of the RH sensor located downstream of humidifier to 80% RH.**		
13g.	**Test Procedure: Reset high limit alarm SP of the RH sensor located downstream of humidifier to 95% RH.**		
13h.	**Test Procedure: Reset humidistat SP to original value.**		
	Verify humidifier is reset and under normal control.		Y/N

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Notes:

14	Fire Alarm		
14a.	**Test Procedure: Initiate fire alarm signal to BAS (Can open/close fire alarm interface contact).**		
	Verify supply fan shuts down.		Y/N
	Verify return fan shuts down.		Y/N
	Verify associated exhaust fans shut down.		Y/N
	Verify FS/D's associated with AHU close after 10 second delay.		Y/N
	Verify economizer dampers close.		Y/N
14b.	**Test Procedure: Simulate OAT to 40°F.**		
	Verify pre-heat recirculation pump energizes.		Y/N
14c.	**Test Procedure: Initiate fire alarm reset signal to BAS (Can open/close fire alarm interface contact).**		
	Verify FS/D's associated with AHU open.		Y/N
	Verify after 10 second delay, supply fan starts.		Y/N
	Verify return fan starts.		Y/N
	Verify associated exhaust fans start.		Y/N

Notes:

15	Final Set Points:					
	Test Procedure: Record the following setpoints.					
	DAT SP		° F	**Duct static pressure SP**		In. W. G.
	Pre-heat recirculating pump enable SP		° F	**SF/RF CFM Differential SP**		CFM
	Pre-heat coil low limit SP		° F	**State #1 enable temperature**		° F
	Pre-heat discharge temperature SP		° F	**State #2 enable temperature**		° F
	Controlling limit/high limit humidistat SP		%			
	Notes:					

16	Final Readings					
	Test Procedure: Record the following parameters.					
	OAT		° F	**Minimum OA Damper Position**		%
	OA Humidity		%RH	**Economizer OA Damper**		%
	RAT		° F	**Return Air Damper Position**		%
	RA Humidity		%RH	**Relief Air Damper Position**		%
	MAT		° F	**Preheat Valve Position**		%
	Pre-heat discharge temperature		° F	**Humidifier Valve Position**		%
	Humidifier High Limit Reading		%RH	**Chilled Water Valve Position**		%
	DAT		° F	**SF VFD Speed**		%
	Duct Static Pressure		In.W.G.	**RF VFD Speed**		%
	Supply Fan CFM		CFM	**AHU Operating Finite State**		#
	Return CFM		CFM	**Plant CHW Supply Temperature**		° F
	Outside Air CFM		CFM	**Plant HW Supply Temperature**		° F

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17	24-Hour Unit Trends					
17a.	Test Procedure: Set up trend log to record the following required points once every 1 minute preferred or a minimum of once every 3 minutes for 24 hours. Data shall be in electronic tabulated form in excel and transmitted to engineer for review. Obtain HCA data formatting template from design engineer and present data in that format in excel spreadsheet.					
	OAT		° F	Return Air Damper Position		%
	MAT		° F	Relief Air Damper Position		%
	Pre-heat discharge temperature		° F	CHW Valve Position		%
	DAT		° F	Pre-Heat Valve Position		%
	DAT SP		° F	Humidifier Valve Position		%
	RAT		° F	Supply CFM		CFM
	HHW Supply Temperature		° F	Return CFM		CFM
	CHW Supply Temperature		° F	OA CFM		CFM
	OA Humidity		%RH	Supply Fan Speed		%
	Return Air Humidity		%RH	Return Fan Speed		%
	Return Air Humidity SP		%RH	Duct Static SP		in. W.G.
	Any monitored space humidity		%RH	Duct Static		in. W.G.
	Duct sensors used for controlling limit and high limit %RH		%RH	Operating State of AHU		#
	Minimum OA Damper Position		%	Record Trend Start Date and Time		
	Economizer OA Damper		%	Record Trend End Date and Time		
Notes:						

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[Insert Your Logo Here] [Vendor Logo Here]

Air Terminal Unit Heating and Cooling Test Report

Instructions:

Follow the test procedures below. Complete the forms for only boxes noted to have problems during cooling or heating tests. Retain the completed forms from every test.

HEATING MODE TEST

Initialization: Confirm with design consultant that the AHU is operating at the appropriate DAT set point and that the heating water system is operating at the correct supply water set point (usually 180°F). Run this test prior to the Cooling Mode Test. The supply and return fan shall run continuously. Doors to spaces should be closed for this test. Immediately preceding Step One below, operate for a 3 hour continuous period with the thermostat setpoint of all boxes being tested set to 72°F. This is the Initialization Period.

STEP ONE - HEATING PERFORMANCE TEST

PROCEDURE: At the end of the initialization Period above, begin trending all the BAS points listed. After 1 hour of trending, adjust thermostat set point on all the system boxes to 76°F & continue trending for an additional 4.5 hours. The dead band between heating and cooling mode shall be 1°F .

TRENDING REQUIREMENTS

Trend the points listed in this paragraph at 3 minute intervals. Present the trended data in an Excel worksheet for each terminal unit. Graph the data per the templates provided by the Design Consultant. The columns in each worksheet shall be ordered (L to R) as follows: **Date & Time** in ascending order, **Zone Temperature Set Point, Actual Zone Temperature, Terminal Unit Discharge Air Temperature, Reheat Valve Command, CFM Set Point, Actual CFM, Damper Commanded Position**. Also trend the **AHU DAT, AHU CHW valve % open, Plant CHW & HHW Supply Temperatures and OAT**. The 5.5 hour terminal trend data for the Heating Mode Test is to be shaded red. The blank entries below in this form need only to be completed for the terminal boxes that do not satisfy the three test conditions listed below. Transmit forms & trends for all boxes that pass to the Design Consultant.

PASS/FAIL CRITERIA

To pass the test, a box must meet all three of the conditions described at the bottom of this page. Transmit the trends for all boxes that pass the test to the Design Consultant. If a box fails to meet all three conditions, complete the information below, inspect, repair the box and conduct the heating test again on this box. When a failed box subsequently passes the test, transmit this form and only the successful trend data to the Design Consultant.

Value	Measured	Set Point	Difference
AHU Discharge Air Temp	°F	°F	°F
AHU CHW Valve Command	% open		
Supply Chilled Water Sys Temp	°F	°F	°F
Heating Hot Water Supply Temp.	°F	°F	°F
Outside Air Temp.	°F		

Information	Response		Information	Response
BAS Box Identification			Space - Name/No.	
Manufacturer			Inlet Size	
Model No.			Respective AHU	

Value	Measured	Design	Difference
Box Damper Position	% open		
BAS Airflow	cfm	cfm	% difference
Box Discharge Air Temp	°F		°F difference [T(Box) - T(AHU)]
Reheat Valve Position	% open		
Thermostat Setpoint	°F		
Space Temperature	°F		°F difference [T(setpoint) - T(space)]

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[Insert Your Logo Here] [Vendor Logo Here]

Air Terminal Unit Heating and Cooling Test Report

1. If space temperature cannot be maintained within +/- 1°F of set point; record investigative findings and corrective measures taken.
2. If box cannot control airflow to within +/- 10% of design heating air flow, record investigative findings and corrective measures taken.
3. If box reheat valve is commanded 100% open & discharge air temperature is not equal to or greater than coil DAT in approved submittal then record investigative findings and corrective action taken. If reheat valve is commanded to less than 100% open, raise T-stat set point 5°F above current space temp, verify reheat valve is commanded 100% open & box discharge temp is not equal to or greater than coil DAT in approved submittal.

WITNESSED:	
General Contractor	***BAS Controls Contractor***
Mechanical Contractor	***Test and Balance Contractor***

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[Insert Your Logo Here] [Vendor Logo Here]

Air Terminal Unit Heating and Cooling Test Report

COOLING MODE TEST

The Cooling Mode Test begins at the end of the Heating Mode Test. In other words, the beginning of this test requires that the spaces have already been conditioned to 76°F. This test also requires that the AHU is operating at the appropriate DAT set point and that the heating water system is operating at the design maximum water supply water temperature (usually 180°F) . Run this test without any supply fan or return fan shutdowns. Doors to the space should continue to be closed for this test.

COOLING PERFORMANCE TEST

PROCEDURE: Continue trending the points listed in the Heating Mode Test. These points are also listed below. Adjust the thermostat set point of all system boxes to 68°F & continue trending for an additional 4.5

TRENDING REQUIREMENTS

Trend the points listed in this paragraph at 3 minute intervals. Present the trended data in an Excel worksheet for each terminal unit. Graph the data per the templates provided by the Design Consultant. The columns in each worksheet shall be ordered (L to R) as follows: **Date & Time** in ascending order, **Zone Temperature Set Point, Actual Zone Temperature, Terminal Unit Discharge Air Temperature, Reheat Valve Command, CFM Set Point, Actual CFM, Damper Commanded Position**. Also trend the **AHU DAT, AHU CHW valve % open, Plant CHW & HHW Supply Temperatures and OAT**. The blank entries below in this form need only to be completed for the terminal boxes that do not satisfy the three test conditions listed below during the initial test. Transmit forms & trends for all boxes that pass to the Design Consultant.

PASS/FAIL CRITERIA

To pass the test, a box must meet all three of the conditions described at the bottom of this page. Transmit the trends for all boxes that pass the test to the Design Consultant. If a box fails to meet all three conditions, complete the information below, inspect, repair the box and conduct the cooling test again on this box. When a failed box subsequently passes the test, transmit this form and only the successful trend data to the Design Consultant.

Information	Response		Information	Response
BAS Box Identification			Space - Name/No.	
Manufacturer			Inlet Size	
Model No.			Respective AHU	

Value	Measured	Design	Difference
Box Damper Position	% open		
BAS Airflow	cfm	cfm	% difference
Box Discharge Air Temp	°F		°F difference [T(Box) - T(AHU)]
Reheat Valve Position	% open		
Thermostat Setpoint	°F		
Space Temperature	°F		°F difference [T(setpoint) - T(space)]

1. If box damper position is 100% and space temperature cannot be maintained within +/- 1°F of set point; record investigation and corrective measures taken.

2. If box measured air flow is not within +/- 10% of design cooling air flow, record the investigation and corrective actions taken.

3. If reheat valve is commanded to 0% open & box discharge air temperature is not within + 2°F of AHU DAT, record the investigative findings and corrective actions taken. If reheat valve is commanded to greater than 0% open, lower t-stat set point 10°F below space temperature and repeat test and record results.

WITNESSED:

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[Insert Your Logo Here] [Vendor Logo Here]

Air Terminal Unit Heating and Cooling Test Report

General Contractor	***BAS Controls Contractor***
Mechanical Contractor	***Test and Balance Contractor***

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Appendix B-8: BAS Graphics Programmers' Guide

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Preface

The Programmers Guide is intended to be a more detailed explanation of the features of the user interface. It demonstrates the functionality of navigation buttons and hidden data links.

Not all graphic panels will be shown in the Programmer's Guide. All features mentioned in this guide should be carried through the entire user interface, even though they may only be displayed once.

The graphic panels present here may not necessarily be of the latest revision, but the intended navigation and operation remains the same.

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???? ????
???? ????

FACILITIGROUP
Infrastructure Solutions

TriStar Skyline MEDICAL CENTER

Johnson Controls

Chilled Water System	CH-1	CH-2
Supply Temp	???? ????	???? ????
% RLA	???? ????	???? ????
kW / Ton	???? ????	???? ????

??
??
??
??

Condenser Water System	CT-1	CT-2
Speed	???? ????	???? ????
delta T	???? ????	???? ????
Tons	???? ????	???? ????

??
??
??
??

Chilled Water System	CH-3	CH-4
Supply Temp	???? ????	???? ????
% RLA	???? ????	???? ????
kW / Ton	???? ????	???? ????

??
??
??
??

extra box to be deleted if not used

Air Handlers	Sa Temp	Sa Static
AHU 01 - Area Served	???? ????	???? ????
AHU 02 - Area Served	???? ????	???? ????
AHU 03 - Area Served	???? ????	???? ????
AHU 04 - Area Served	???? ????	???? ????
AHU 05 - Area Served	???? ????	???? ????
AHU 06 - Area Served	???? ????	???? ????
AHU 07 - Area Served	???? ????	???? ????
AHU 08 - Area Served	???? ????	???? ????
AHU 09 - Area Served	???? ????	???? ????
AHU 10 - Area Served	???? ????	???? ????
AHU 11 - Area Served	???? ????	???? ????
AHU 12 - Area Served	???? ????	???? ????
AHU 13 - Area Served	???? ????	???? ????
AHU 14 - Area Served	???? ????	???? ????
AHU 15 - Area Served	???? ????	???? ????
AHU 16 - Area Served	???? ????	???? ????
AHU 17 - Area Served	???? ????	???? ????
AHU 18 - Area Served	???? ????	???? ????

Steam System	BLR-1	BLR-2
% Firing Range	???? ????	???? ????
Steam Flow	???? ????	???? ????
Efficiency	???? ????	???? ????

??
??
??
??

Hot Water System	HX-1	HX-2
HW Sup Temp	???? ????	???? ????
HW Ret Temp	???? ????	???? ????
Pump Status	???? ????	???? ????

??
??
??
??

Hot Water System	HWBLR-1	HWBLR-2
% Firing Range	???? ????	???? ????
Supply Temp	???? ????	???? ????
Efficiency	???? ????	???? ????

??
??
??
??

extra box to be deleted if not used

Outside Air Temperature ???? ????
Outside Air Relative Humidity ???? ????
Typical of ALL panels

Links to facility's Energy portal on HCAFI.com

FACILITIGROUP Infrastructure Solutions

TriStar Skyline MEDICAL CENTER

Links to Facility Public Website

Johnson Controls

Links to Contact Panel for JCI Rep, Energy Service Center, Utility providers

Links to individual equipment detail panel

Links to AHU Summary

Links to individual air handling units

Chilled Water System	CH-1	CH-2
Supply Temp	???? ????	???? ????
% RLA	???? ????	???? ????
kW / Ton	???? ????	???? ????

Condenser Water System	CT-1	CT-2
Speed	???? ????	???? ????
delta T	???? ????	???? ????
Tons	???? ????	???? ????

Chilled Water System	CH-3	CH-4
Supply Temp	???? ????	???? ????
% RLA	???? ????	???? ????
kW / Ton	???? ????	???? ????

Links to individual System Panel

extra box to be deleted if not used

The facility logo on the footer will now become the HOME button and will link to the Dashboard. Typical of ALL panels

Air Handlers	Sa Temp	Sa Static
AHU 01 - Area Served	???? ????	???? ????
AHU 02 - Area Served	???? ????	???? ????
AHU 03 - Area Served	???? ????	???? ????
AHU 04 - Area Served	???? ????	???? ????
AHU 05 - Area Served	???? ????	???? ????
AHU 06 - Area Served	???? ????	???? ????
AHU 07 - Area Served	???? ????	???? ????
AHU 08 - Area Served	???? ????	???? ????
AHU 09 - Area Served	???? ????	???? ????
AHU 10 - Area Served	???? ????	???? ????
AHU 11 - Area Served	???? ????	???? ????
AHU 12 - Area Served	???? ????	???? ????
AHU 13 - Area Served	???? ????	???? ????
AHU 14 - Area Served	???? ????	???? ????
AHU 15 - Area Served	???? ????	???? ????
AHU 16 - Area Served	???? ????	???? ????
AHU 17 - Area Served	???? ????	???? ????
AHU 18 - Area Served	???? ????	???? ????

Steam System	BLR-1	BLR-2
% Firing Range	???? ????	???? ????
Steam Flow	???? ????	???? ????
Efficiency	???? ????	???? ????

Hot Water System	HX-1	HX-2
HW Sup Temp	???? ????	???? ????
HW Ret Temp	???? ????	???? ????
Pump Status	???? ????	???? ????

Hot Water System	HWBLR-1	HWBLR-2
% Firing Range	???? ????	???? ????
Supply Temp	???? ????	???? ????
Efficiency	???? ????	???? ????

Summarizes all alarms for the system.

extra box to be deleted if not used

Links to the facility's EnergyScript portal on HCAFI.com. Typical of ALL panels

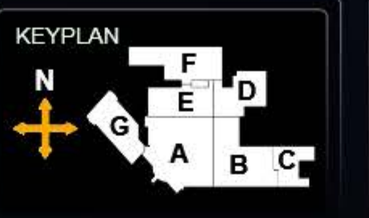
Facility Name - Floor Plan

???? ????
???? ????

First Floor

Section A - AHU-02,03,04

Second Floor



Section B - OR's
Section C - AHU-05

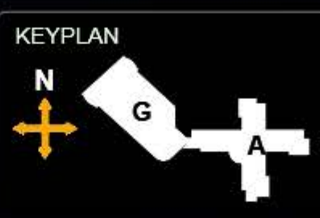
Second Floor-Zone B
?? ?? ??
??

Third Floor

Section A - AHU-06,07,08,09,10,11
Section A - C-Section

Third Floor-Zone A
?? ?? ??
??

Fourth Floor



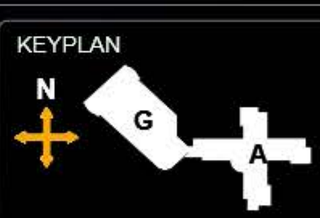
Fifth Floor

Sixth Floor

Seventh Floor

Eighth Floor

Ninth Floor



Section A - AHU-12,13

Roof

Floor Descriptions, Equipment labels, Critical Areas, and Plant Operations should be listed and linked where applicable

First Floor

Section A - AHU-02,03,04

Second Floor

Section B - OR's
Section C - AHU-05

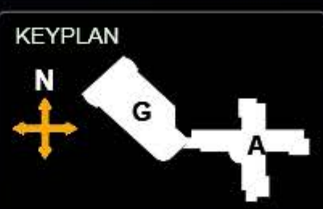
Second Floor-Zone B
?? ?? ??
??

Third Floor

Section A - AHU-06,07,08,09,10,11
Section A - C-Section

Third Floor-Zone A
?? ?? ??
??

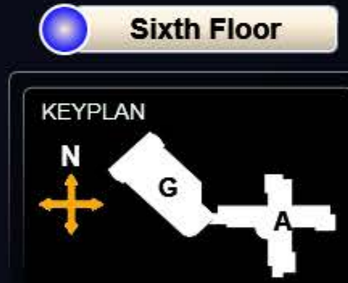
Fourth Floor



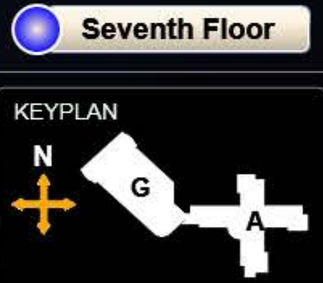
Fifth Floor

Alarm Modules are present for ORs and critical areas on this panel

Sixth Floor

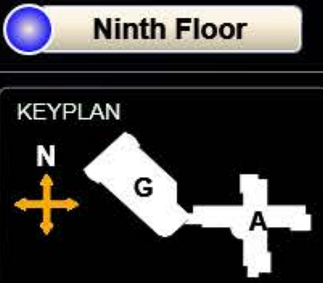


Seventh Floor



Eighth Floor

Ninth Floor



Section A - AHU-12,13

Roof

Once the user clicks on this icon and the panel is loaded, the icon will change color to indicate. This is typical of every button on the Footer.

Facility Name - First Floor

???? ????
???? ????

Room Control Module

????
????

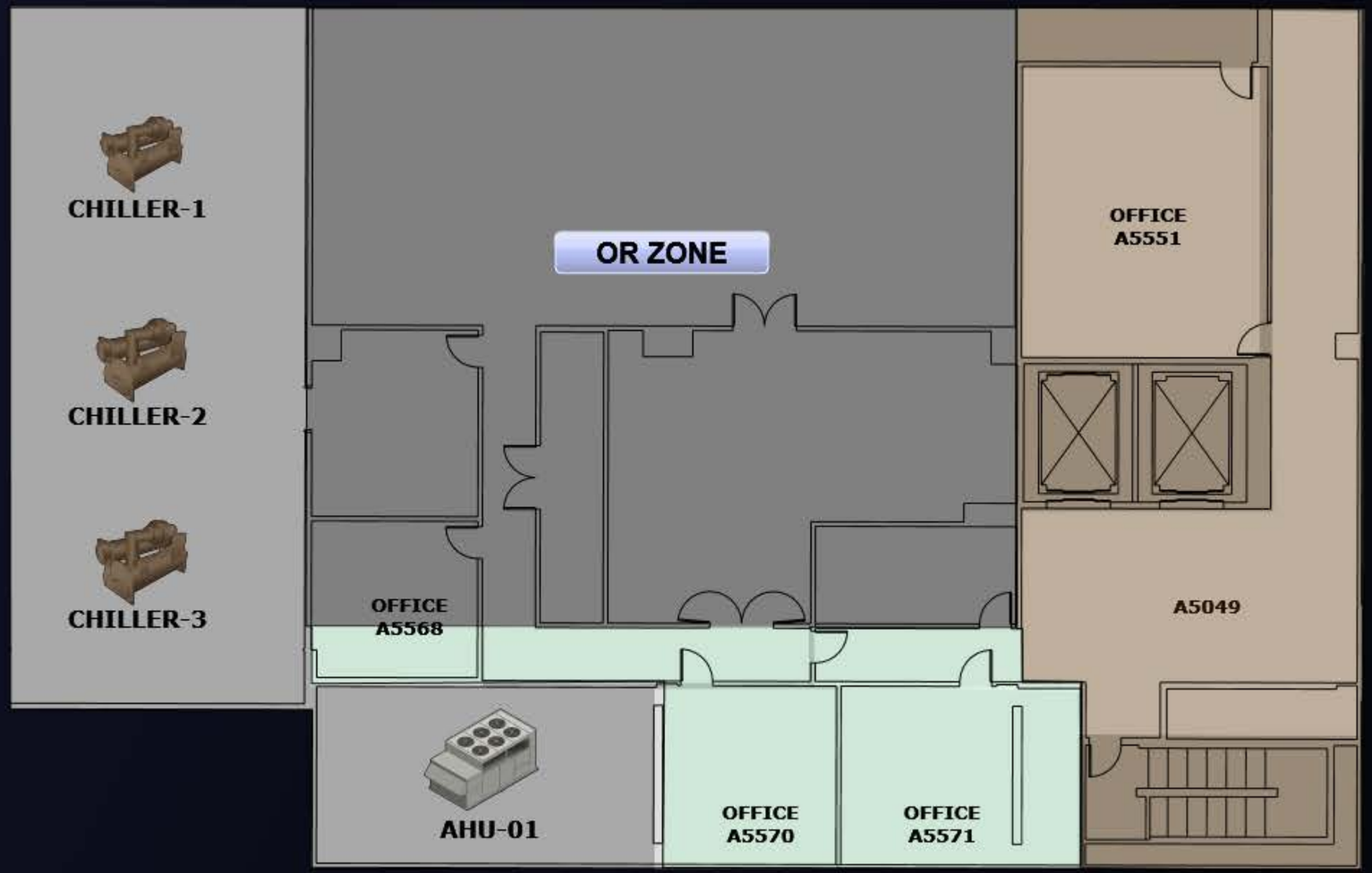
Zone Setpoint
???? ????

System Mode
???? ????

Unit Enable Mode
???? ????

Discharge Temp
???? ????

Heating Output
???? ????



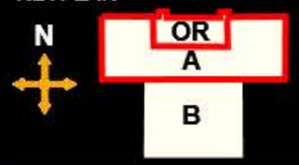
AHU 01

AHU 02

First Floor
?? ?? ??
??

Offline | Low Alarm | Low Warning | Below Setpoint | Normal | Above Setpoint | High Warning | High Alarm | Overridden

KEYPLAN



TriStar Skyline MEDICAL CENTER

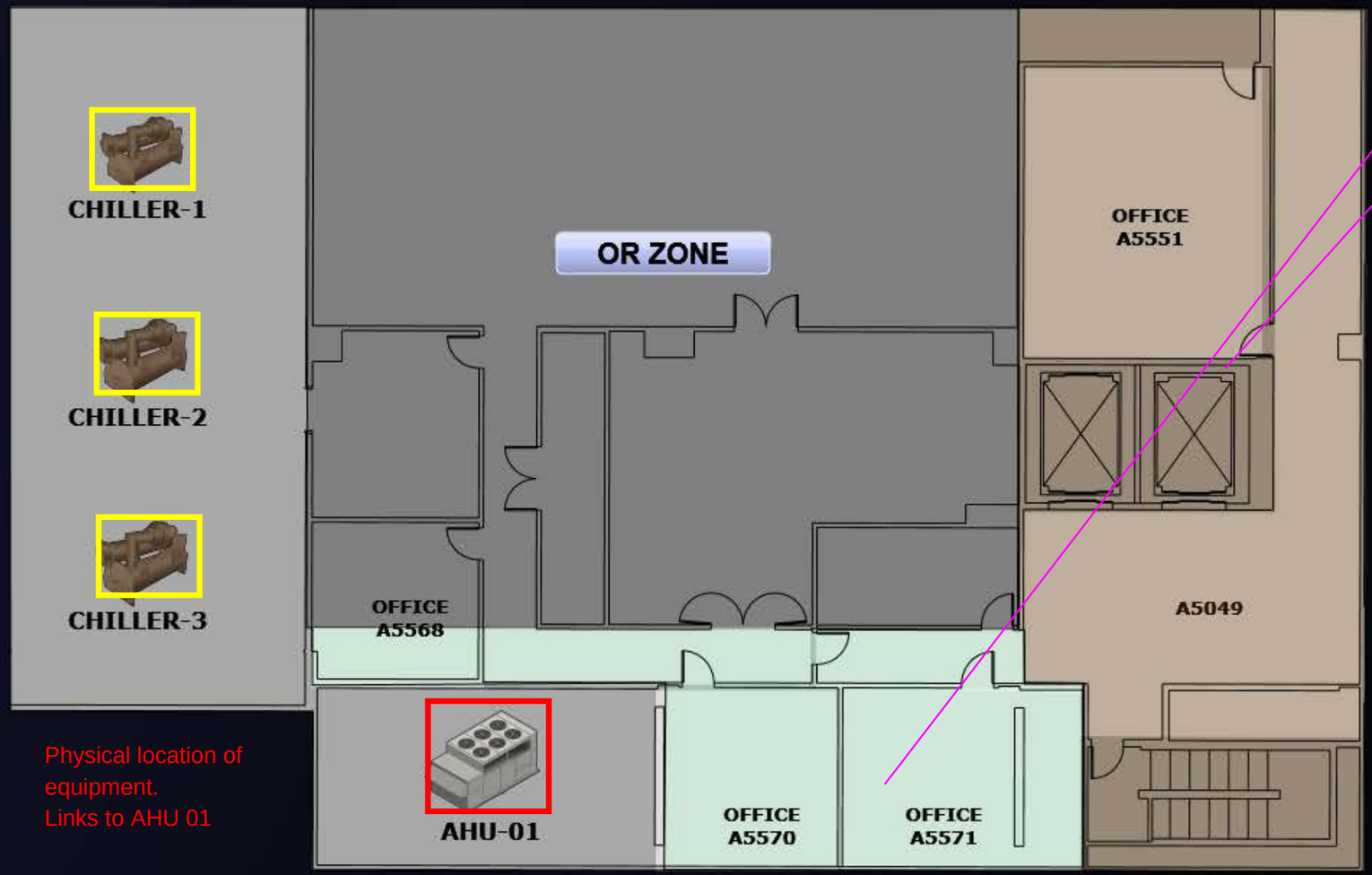
FLOOR CHW HW STEAM AHU ENERGY EPSS ALARMS AUX LEGEND

FACILITIGROUP
Infrastructure Solutions

Facility Name - First Floor

???? ????
???? ????

Physical locations of equipment.
Links to individual Chiller Detail Panels



Physical location of equipment.
Links to AHU 01

AHU 01

AHU 02

Floor Plan shaded to show different serving AHU. Button colors correspond to floor plan colors

This alarm module shows only the alarms relevant to this graphic panel

Offline | Low Alarm | Low Warning | Below Setpoint | Normal | Above Setpoint | High Warning | High Alarm | Overridden

TriStar Skyline MEDICAL CENTER

FLOOR CHW HW STEAM AHU ENERGY EPSS ALARMS AUX LEGEND

FACILITIGROUP Infrastructure Solutions

???? ????
???? ????

Room Control Module

????
????

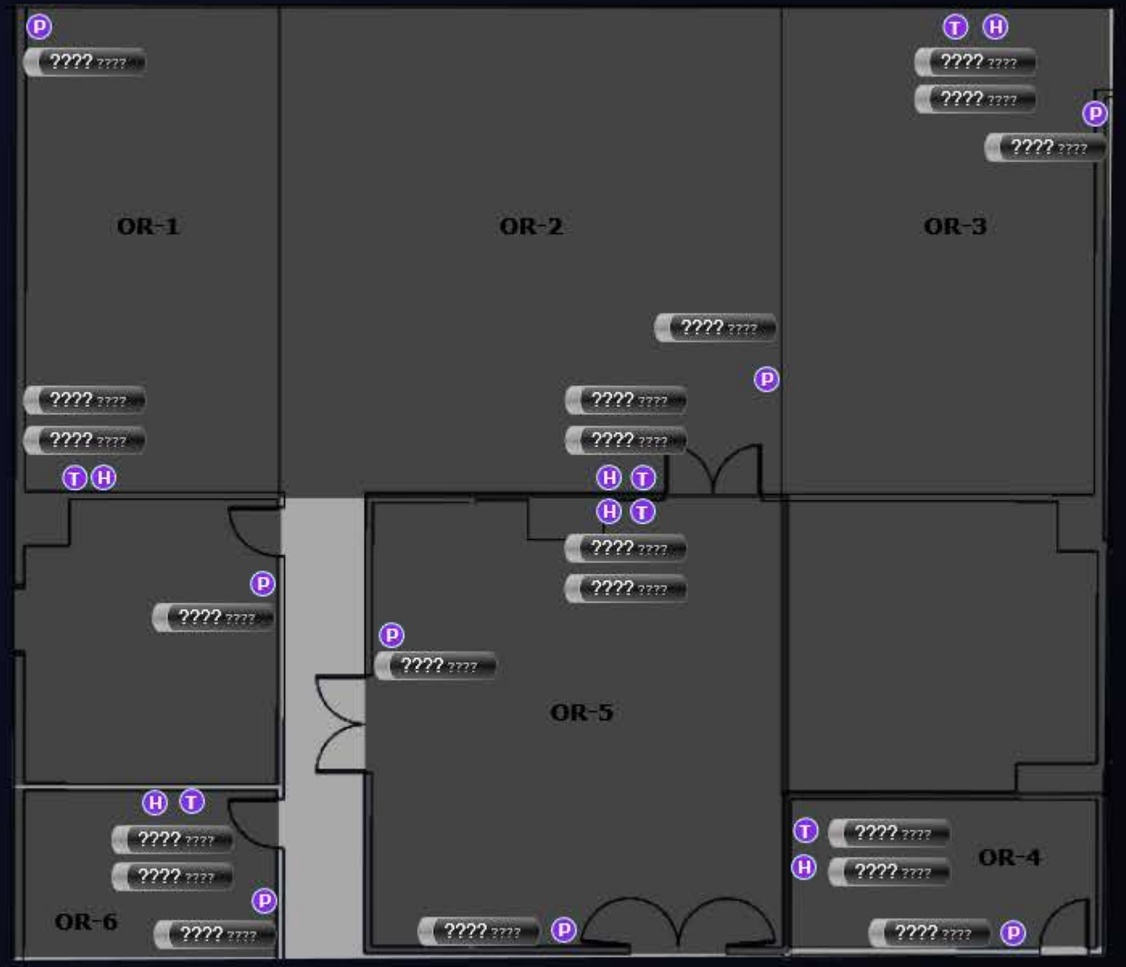
Zone Setpoint
???? ????

System Mode
???? ????

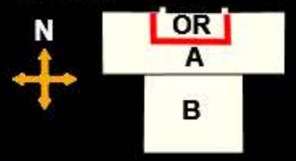
Unit Enable Mode
???? ????

Discharge Temp
???? ????

Heating Output
???? ????



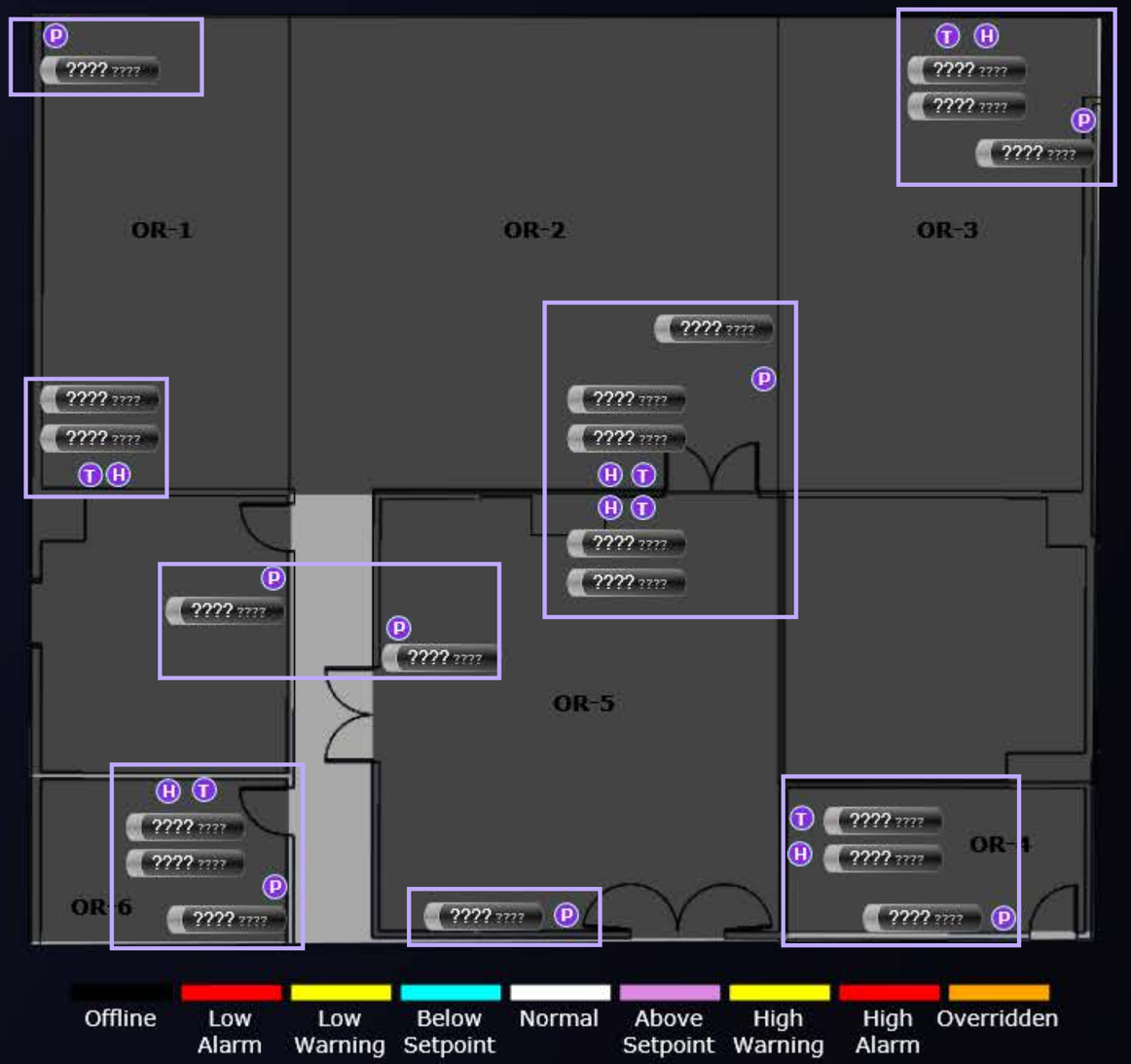
KEYPLAN



Offline | Low Alarm | Low Warning | Below Setpoint | Normal | Above Setpoint | High Warning | High Alarm | Overridden

???? ????
???? ????

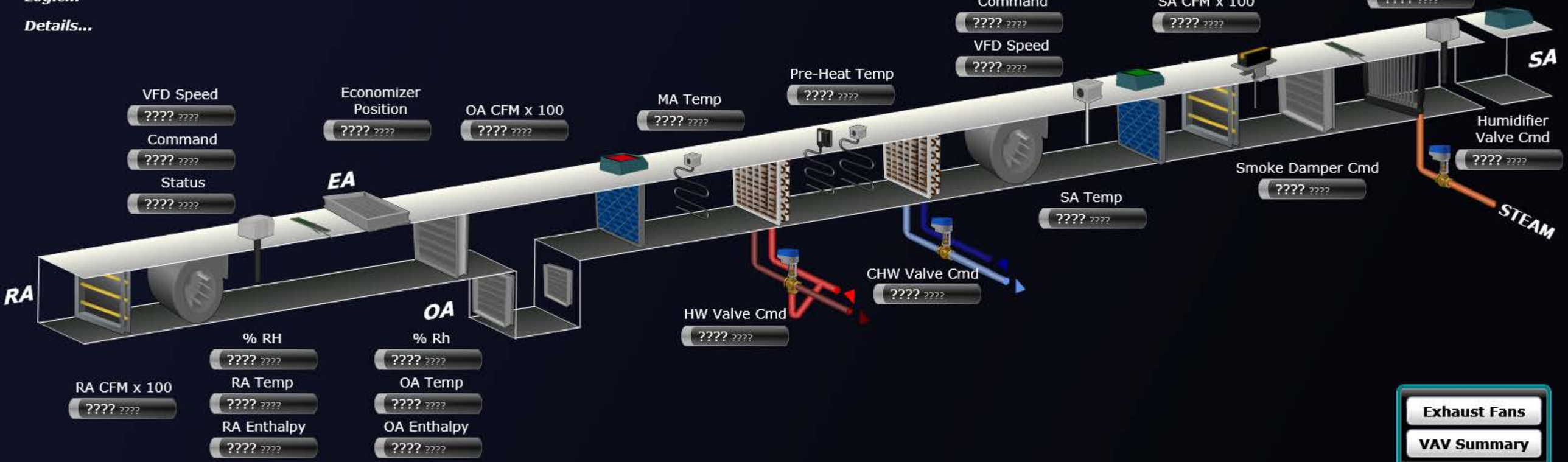
Temperature, Humidity, and Pressure sensors for the OR Zone should be located on this floor plan in the same location as the facility.



Facility Name - Air Handling Unit - 01

???? ????
???? ????

AhuEna
EconEna
Sequence...
Logic...
Details...



Exhaust Fans
VAV Summary

System Parameters

		SETPOINT
SA Temp	???? ????	???? ????
MA Temp	???? ????	???? ????
Pre-Heat Temp	???? ????	???? ????
Humidifier	???? ????	???? ????
SA Static Press	???? ????	???? ????

Alarms

Freeze Stat	????
Pre-Filter	????
Final Filter	????
High SA Static	????
Fire Alarm	????

Facility Name - Air Handling Unit - 01

???? ????
???? ????

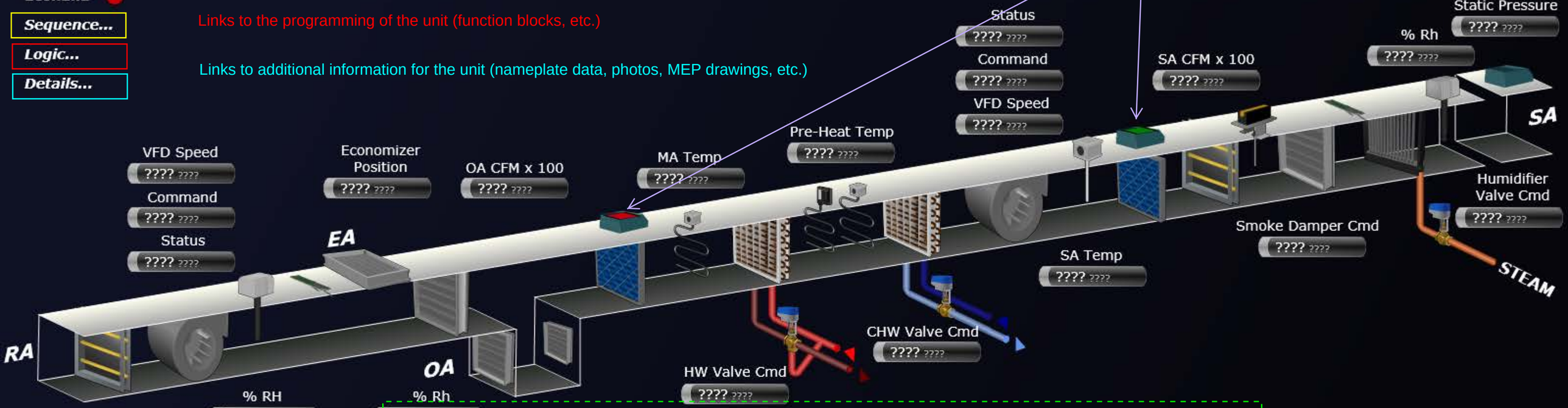
AhuEna
EconEna
Sequence...
Logic...
Details...

Links to the SOO Graphic panel, and PDF of the control drawings/sequence

Links to the programming of the unit (function blocks, etc.)

Links to additional information for the unit (nameplate data, photos, MEP drawings, etc.)

State squares to indicate the status of the filters. Green=Clean, Red=Dirty (alarm)



Upon a right-click > View Trend, the trend viewer window will pop up here for any point that is trended

Exhaust Fans
VAV Summary

System Parameters		SETPOINT
SA Temp	???? ????	???? ????
MA Temp	???? ????	???? ????
Pre-Heat Temp	???? ????	???? ????
Humidifier	???? ????	???? ????
SA Static Press	???? ????	???? ????

Alarms	
Freeze Stat	????
Pre-Filter	????
Final Filter	????
High SA Static	????
Fire Alarm	????

Facility Name - AHU Summary

???? ????
???? ????

Chiller Summary			
Chiller 01	????	ChwsTmp	????
Chiller 02	????	ChwrTmp	????
Chiller 03	????	SChwGPM	????
Chiller 04	????	Total Load	????

Boiler Summary			
Boiler 01	????	HwsTmp	????
Boiler 02	????	HwrTmp	????
		HwGPM	????
		Total Load	????

Equipment	Mode	EconState	SaTmp deg F	SaTmpSpt deg F	SaStp in wc	SaStPSpt in wc	ChwVlv % Open	MaTmp deg F	PrHtVlv % Open	PrHtTmp deg F	PrHtTmpSpt deg F	RaTmp deg F	RaRh % RH	BoxTotCFM
AHU 01 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 02 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 03 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 04 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 05 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 06 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 07 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 08 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 09 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 10 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 11 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 12 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 13 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 14 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 15 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????

OR Summary | AHU Details | Next >

Facility Name - AHU Summary

???? ????
???? ????

Chiller Summary

Chiller 01	????	ChwsTmp	????
Chiller 02	????	ChwrTmp	????
Chiller 03	????	SChwGPM	????
Chiller 04	????	Total Load	????

Links to individual equipment detail panels

Boiler Summary

Boiler 01	????	HwsTmp	????
Boiler 02	????	HwrTmp	????
		HwGPM	????
		Total Load	????

Links to individual air handling units

Equipment	Mode	EconState	SaTmp deg F	SaTmpSpt deg F	SaStp in wc	SaStPSpt in wc	ChwVlv % Open	MaTmp deg F	PrHtVlv % Open	PrHtTmp deg F	PrHtTmpSpt deg F	RaTmp deg F	RaRh % RH	BoxTotCFM
AHU 01 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 02 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 03 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 04 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 05 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 06 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 07 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 08 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 09 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 10 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 11 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 12 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 13 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 14 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????
AHU 15 - Area Served	????	????	????	????	????	????	????	????	????	????	????	????	????	????

OR Summary

Links to Operating Room Summary

AHU Details

Links to Tailored Summary with all other AHU points

Next >

Links to 2nd panel for additional AHUs. Delete if unused

Facility Name - OR Summary

???? ????
???? ????

AHU 01 Summary			
Econ State	????	ChwVlvPos	????
SaTmp	????	HwVlvPos	????
RaTmp	????	BoxTotCFM	????
RaRh	????	Total Load	????

Chiller Summary			
Chiller 01	????	ChwsTmp	????
Chiller 02	????	ChwrTmp	????
Chiller 03	????	SChwGPM	????
Chiller 04	????	Total Load	????

Boiler Summary			
Boiler 01	????	HwsTmp	????
Boiler 02	????	HwrTmp	????
		HwGPM	????
		Total Load	????

Equipment	Mode	ZnTmp deg F	ZnTmpSpt deg F	ZnRh % RH	ZnRhSpt % RH	ReHtVlv % Open	DaCFM CFM	DaCFMSpt CFM	DmprPos % Open	Door Sensor	ZnPress in wc			
OR 01 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 02 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 03 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 04 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 05 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 06 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 07 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 08 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 09 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 10 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 11 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 12 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 13 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 14 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 15 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????

< Previous

Next >

Facility Name - OR Summary

???? ????
???? ????

Links to AHU 01 graphic panel

AHU 01 Summary			
Econ State	????	ChwVlvPos	????
SaTmp	????	HwVlvPos	????
RaTmp	????	BoxTotCFM	????
RaRh	????	Total Load	????

Chiller Summary			
Chiller 01	????	ChwsTmp	????
Chiller 02	????	ChwrTmp	????
Chiller 03	????	SChwGPM	????
Chiller 04	????	Total Load	????

Boiler Summary			
Boiler 01	????	HwsTmp	????
Boiler 02	????	HwrTmp	????
		HwGPM	????
		Total Load	????

Links to individual VAV units

Links to individual equipment detail panels

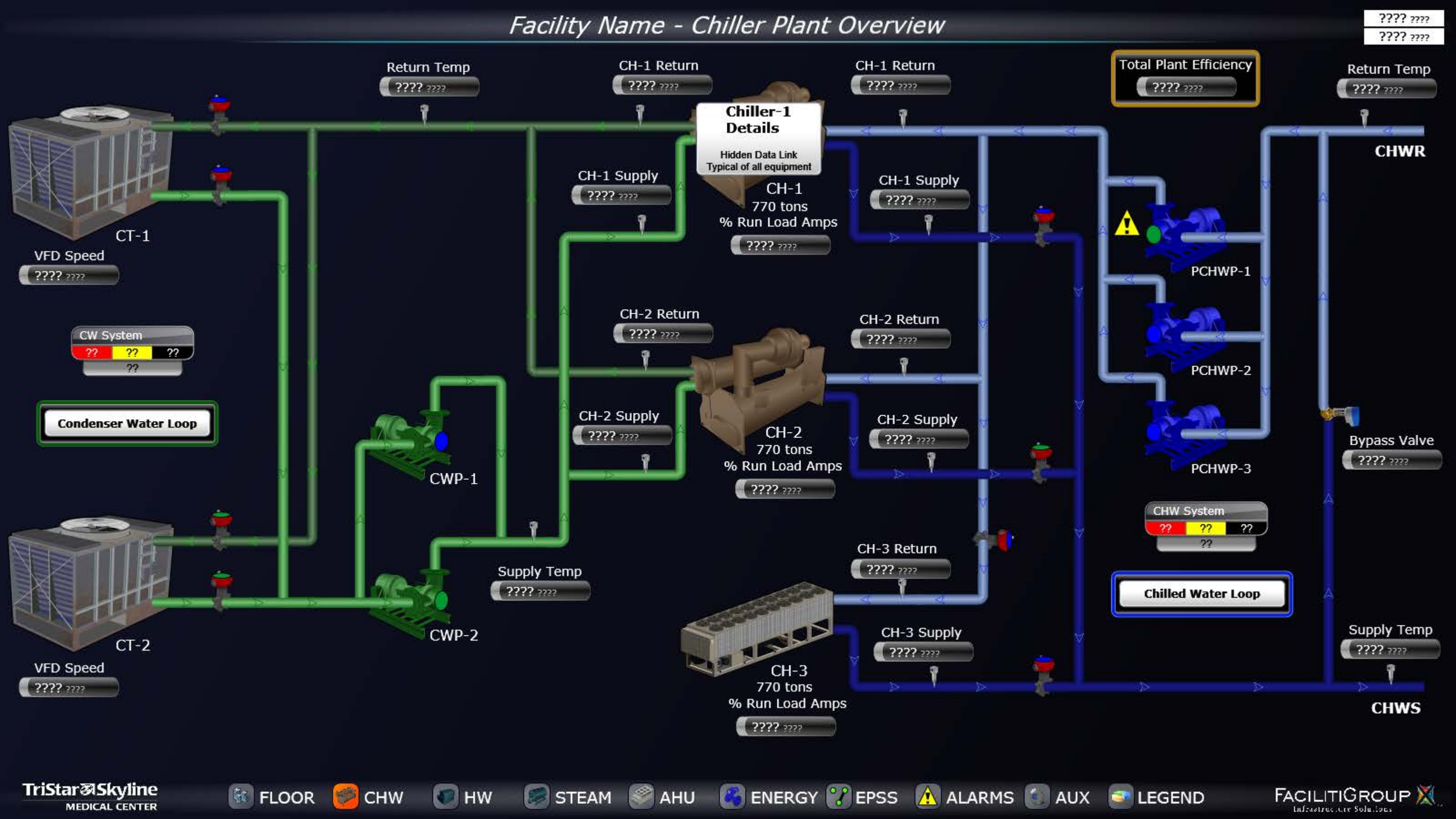
Remove unused columns

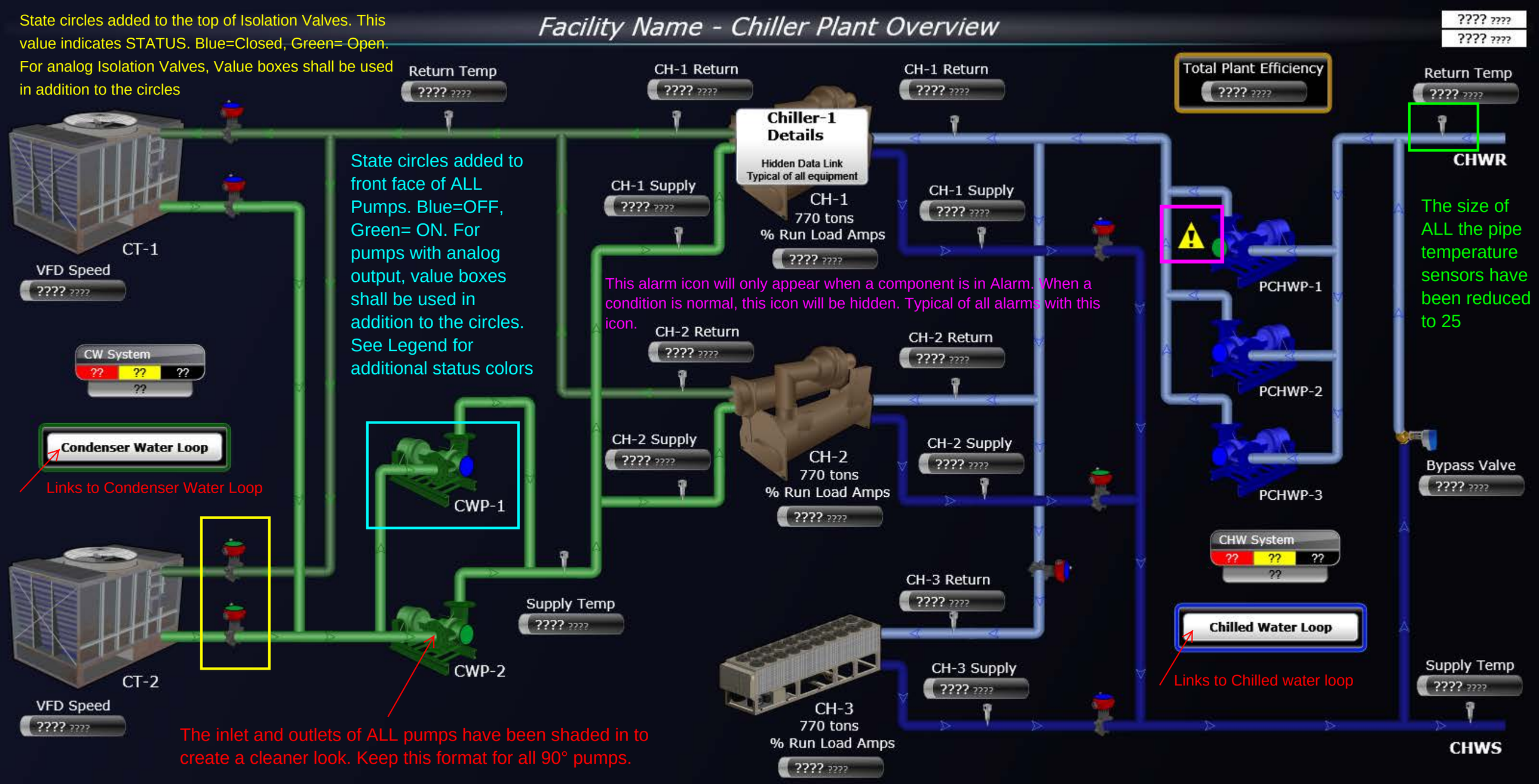
Equipment	Mode	ZnTmp deg F	ZnTmpSpt deg F	ZnRh % RH	ZnRhSpt % RH	ReHtVlv % Open	DaCFM CFM	DaCFMSpt CFM	DmprPos % Open	Door Sensor	ZnPress in wc			
OR 01 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 02 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 03 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 04 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 05 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 06 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 07 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 08 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 09 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 10 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 11 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 12 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 13 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 14 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 15 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????

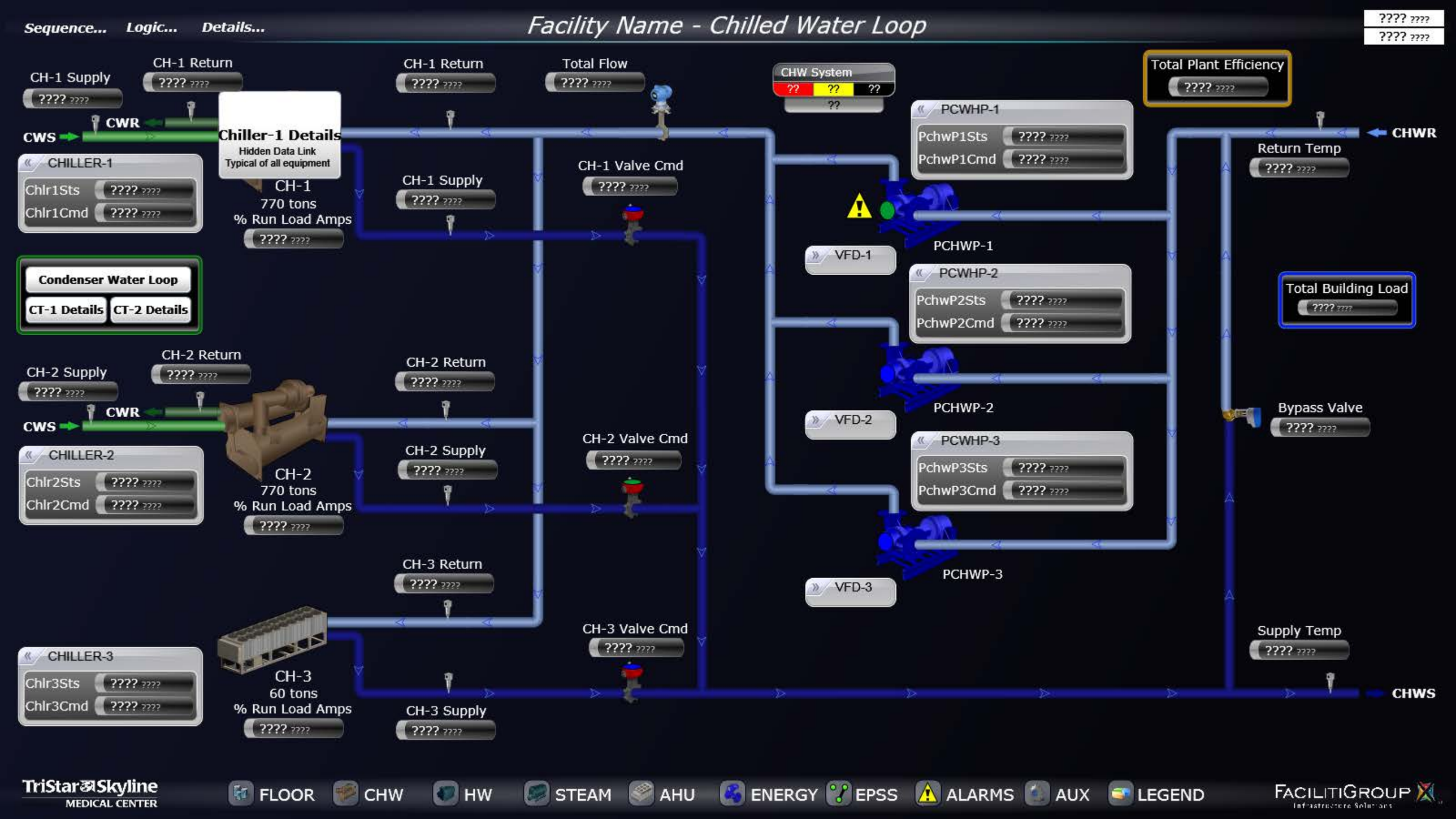
< Previous

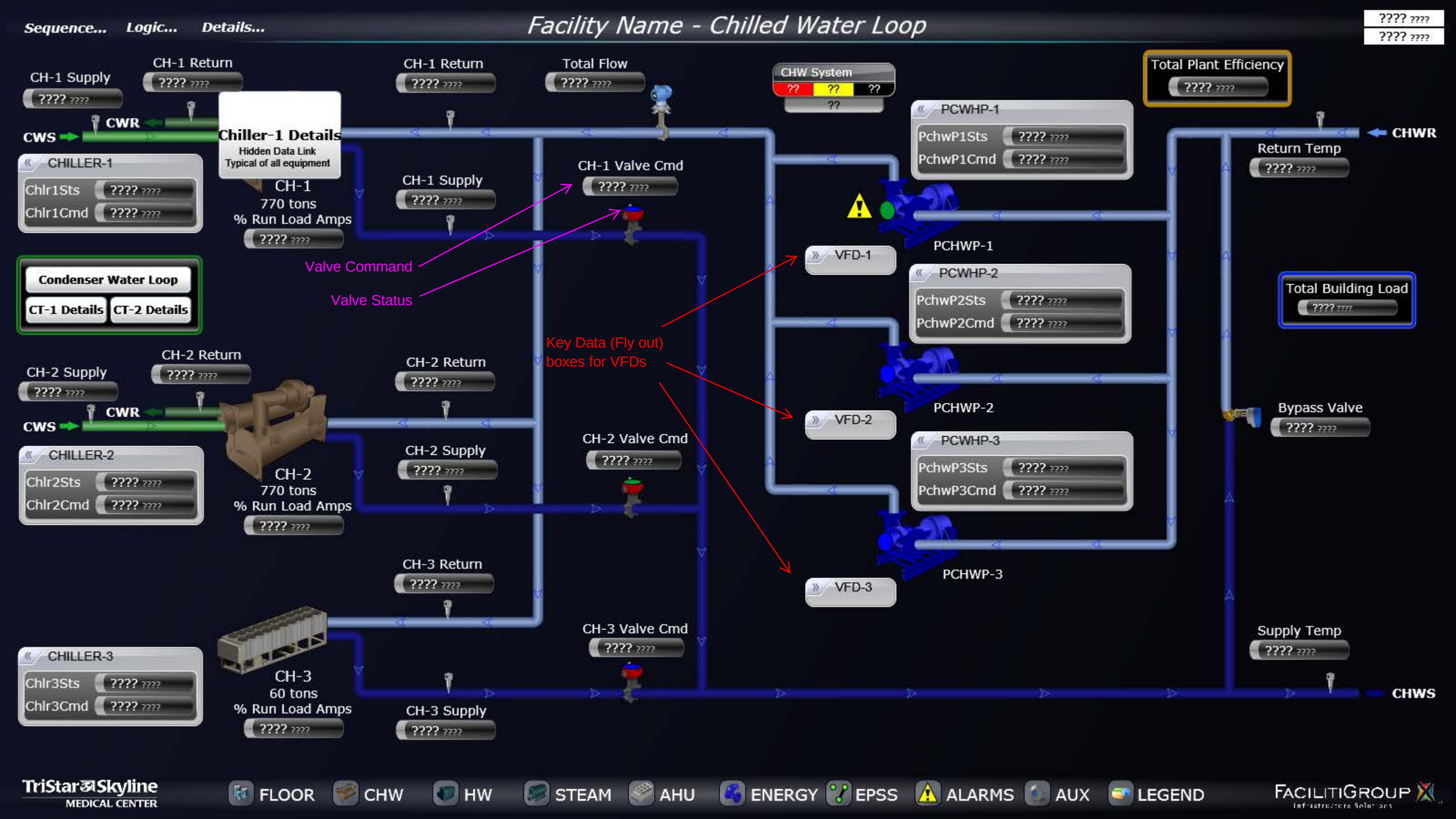
Links to 2nd panel for additional ORs

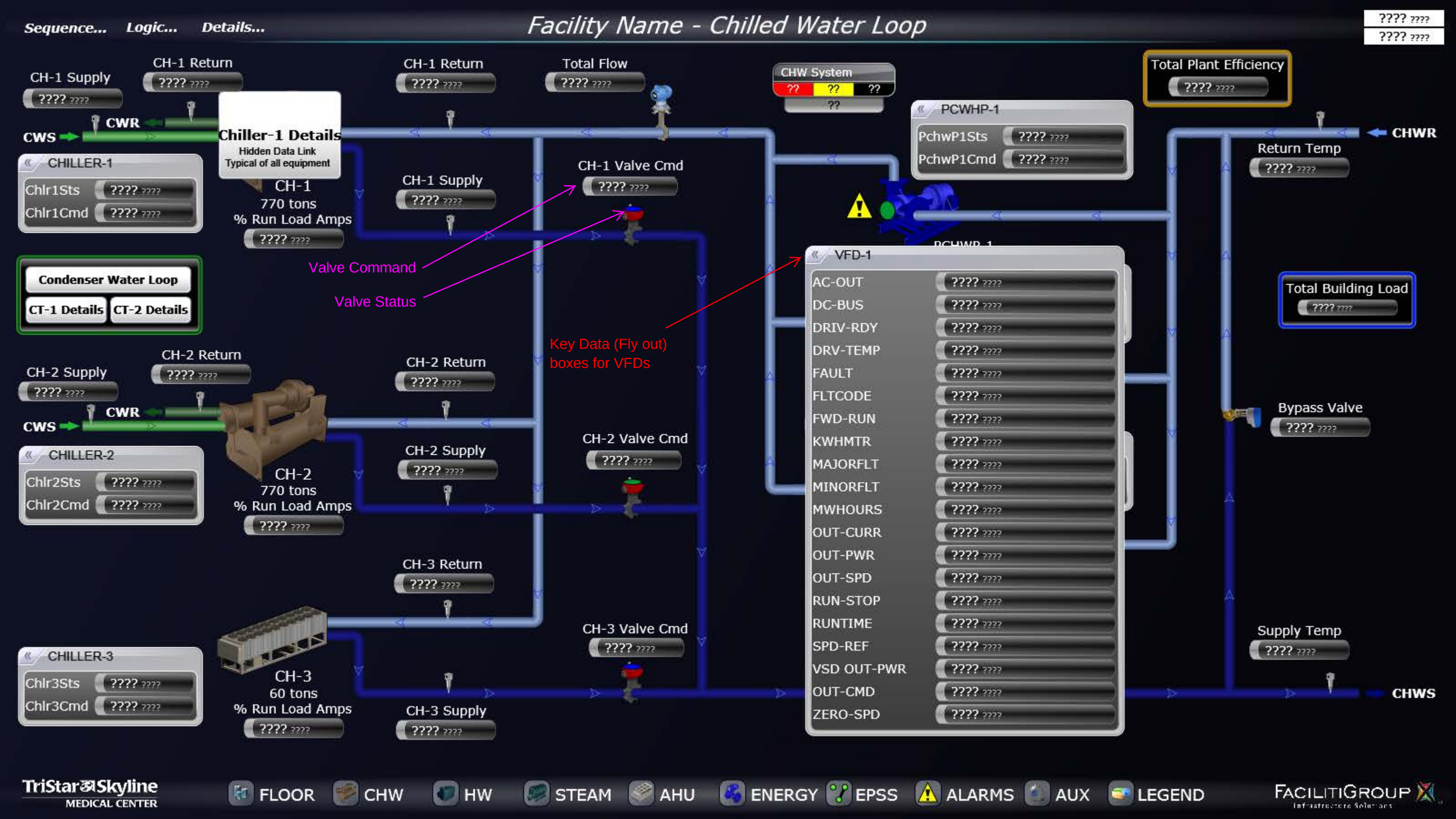
Next >


Facility Name - Chiller Plant Overview
???? ????
???? ????
Return Temp
???? ????
CH-1 Return
???? ????
CH-1 Return
???? ????
Total Plant Efficiency
???? ????
Return Temp
???? ????
CHWR
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CH-1
770 tons
% Run Load Amps
???? ????
CH-1 Supply
???? ????
CH-1 Supply
???? ????
CT-1
VFD Speed
???? ????
PCHWP-1
CW System
?? ?? ??
??
CH-2 Return
???? ????
CH-2 Return
???? ????
PCHWP-2
Condenser Water Loop
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Supply
???? ????
CH-2 Supply
???? ????
PCHWP-3
Bypass Valve
???? ????
CWP-1
CHW System
?? ?? ??
??
CH-3 Return
???? ????
Chilled Water Loop
Supply Temp
???? ????
CT-2
VFD Speed
???? ????
CWP-2
CH-3 Supply
???? ????
CH-3
770 tons
% Run Load Amps
???? ????
Supply Temp
???? ????
CHWS
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP
Infrastructure Solutions


State circles added to the top of Isolation Valves. This value indicates STATUS. Blue=Closed, Green= Open. For analog Isolation Valves, Value boxes shall be used in addition to the circles
Facility Name - Chiller Plant Overview
???? ????
???? ????
Return Temp
???? ????
CH-1 Return
???? ????
CH-1 Return
???? ????
Total Plant Efficiency
???? ????
Return Temp
???? ????
CHWR
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CH-1
770 tons
% Run Load Amps
???? ????
CH-1 Supply
???? ????
CH-1 Supply
???? ????
CT-1
VFD Speed
???? ????
State circles added to front face of ALL Pumps. Blue=OFF, Green= ON. For pumps with analog output, value boxes shall be used in addition to the circles. See Legend for additional status colors
This alarm icon will only appear when a component is in Alarm. When a condition is normal, this icon will be hidden. Typical of all alarms with this icon.
PCHWP-1
PCHWP-2
PCHWP-3
The size of ALL the pipe temperature sensors have been reduced to 25
CW System
?? ?? ??
??
CH-2 Return
???? ????
CH-2 Return
???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Supply
???? ????
CH-2 Supply
???? ????
Condenser Water Loop
Links to Condenser Water Loop
CWP-1
Bypass Valve
???? ????
CHW System
?? ?? ??
??
CH-3 Return
???? ????
Chilled Water Loop
Supply Temp
???? ????
CT-2
VFD Speed
???? ????
CWP-2
CH-3 Supply
???? ????
Links to Chilled water loop
CH-3
770 tons
% Run Load Amps
???? ????
Supply Temp
???? ????
CHWS
The inlet and outlets of ALL pumps have been shaded in to create a cleaner look. Keep this format for all 90° pumps.
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP
Infrastructure Solutions


Sequence...
Logic...
Details...
Facility Name - Chilled Water Loop
???? ????
???? ????
CH-1 Supply
???? ????
CH-1 Return
???? ????
CWR
CWS
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CHILLER-1
Chlr1Sts
???? ????
Chlr1Cmd
???? ????
CH-1
770 tons
% Run Load Amps
???? ????
CH-1 Return
???? ????
Total Flow
???? ????
CH-1 Supply
???? ????
CH-1 Valve Cmd
???? ????
CHW System
?? ?? ??
??
Total Plant Efficiency
???? ????
PCWHP-1
PchwP1Sts
???? ????
PchwP1Cmd
???? ????
PCHWP-1
VFD-1
CHWR
Return Temp
???? ????
Condenser Water Loop
CT-1 Details
CT-2 Details
PCWHP-2
PchwP2Sts
???? ????
PchwP2Cmd
???? ????
Total Building Load
???? ????
CH-2 Supply
???? ????
CH-2 Return
???? ????
CWR
CWS
CHILLER-2
Chlr2Sts
???? ????
Chlr2Cmd
???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Return
???? ????
CH-2 Supply
???? ????
CH-2 Valve Cmd
???? ????
PCHWP-2
VFD-2
Bypass Valve
???? ????
PCWHP-3
PchwP3Sts
???? ????
PchwP3Cmd
???? ????
PCHWP-3
VFD-3
CH-3 Return
???? ????
CHILLER-3
Chlr3Sts
???? ????
Chlr3Cmd
???? ????
CH-3
60 tons
% Run Load Amps
???? ????
CH-3 Valve Cmd
???? ????
CH-3 Supply
???? ????
Supply Temp
???? ????
CHWS
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Sequence...
Logic...
Details...
Facility Name - Chilled Water Loop
???? ????
???? ????
CH-1 Supply
???? ????
CH-1 Return
???? ????
CWR
CWS
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CHILLER-1
Chlr1Sts
???? ????
Chlr1Cmd
???? ????
CH-1
770 tons
% Run Load Amps
???? ????
CH-1 Return
???? ????
Total Flow
???? ????
CH-1 Supply
???? ????
CH-1 Valve Cmd
???? ????
Valve Command
Valve Status
Condenser Water Loop
CT-1 Details
CT-2 Details
CH-2 Supply
???? ????
CH-2 Return
???? ????
CWR
CWS
CHILLER-2
Chlr2Sts
???? ????
Chlr2Cmd
???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Return
???? ????
CH-2 Supply
???? ????
CH-2 Valve Cmd
???? ????
CH-3 Return
???? ????
CHILLER-3
Chlr3Sts
???? ????
Chlr3Cmd
???? ????
CH-3
60 tons
% Run Load Amps
???? ????
CH-3 Supply
???? ????
CH-3 Valve Cmd
???? ????
CHW System
??
??
??
??
Key Data (Fly out)
boxes for VFDs
VFD-1
VFD-2
VFD-3
PCWHP-1
PchwP1Sts
???? ????
PchwP1Cmd
???? ????
PCHWP-1
PCWHP-2
PchwP2Sts
???? ????
PchwP2Cmd
???? ????
PCHWP-2
PCWHP-3
PchwP3Sts
???? ????
PchwP3Cmd
???? ????
PCHWP-3
Total Plant Efficiency
???? ????
CHWR
Return Temp
???? ????
Total Building Load
???? ????
Bypass Valve
???? ????
Supply Temp
???? ????
CHWS
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Sequence...
Logic...
Details...
Facility Name - Chilled Water Loop
???? ????
???? ????
CH-1 Supply
???? ????
CH-1 Return
???? ????
CWR
CWS
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CH-1 Return
???? ????
Total Flow
???? ????
CHW System
?? ?? ??
??
Total Plant Efficiency
???? ????
PCWHP-1
PchwP1Sts
???? ????
PchwP1Cmd
???? ????
CHWR
Return Temp
???? ????
CHILLER-1
Chlr1Sts
???? ????
Chlr1Cmd
???? ????
CH-1
770 tons
% Run Load Amps
???? ????
CH-1 Supply
???? ????
CH-1 Valve Cmd
???? ????
Valve Command
Valve Status
Condenser Water Loop
CT-1 Details
CT-2 Details
VFD-1
AC-OUT ???? ????
DC-BUS ???? ????
DRIV-RDY ???? ????
DRV-TEMP ???? ????
FAULT ???? ????
FLTCODE ???? ????
FWD-RUN ???? ????
KWHMTR ???? ????
MAJORFLT ???? ????
MINORFLT ???? ????
MWHOURS ???? ????
OUT-CURR ???? ????
OUT-PWR ???? ????
OUT-SPD ???? ????
RUN-STOP ???? ????
RUNTIME ???? ????
SPD-REF ???? ????
VSD OUT-PWR ???? ????
OUT-CMD ???? ????
ZERO-SPD ???? ????
Key Data (Fly out)
boxes for VFDs
Total Building Load
???? ????
Bypass Valve
???? ????
CH-2 Return
???? ????
CH-2 Supply
???? ????
CWR
CWS
CHILLER-2
Chlr2Sts
???? ????
Chlr2Cmd
???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Return
???? ????
CH-2 Supply
???? ????
CH-2 Valve Cmd
???? ????
CH-3 Return
???? ????
CHILLER-3
Chlr3Sts
???? ????
Chlr3Cmd
???? ????
CH-3
60 tons
% Run Load Amps
???? ????
CH-3 Supply
???? ????
CH-3 Valve Cmd
???? ????
Supply Temp
???? ????
CHWS
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

Facility Name - Chiller 1 Details

???? ????
???? ????

Chiller 1 - Nameplate

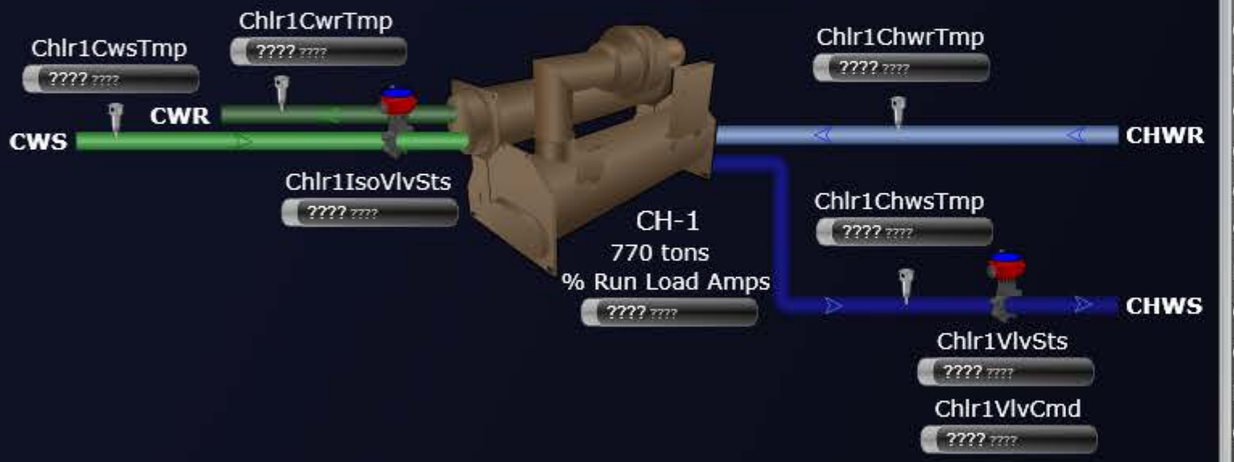
Serial Number -
Model Number -
Installation Date -

Chiller 1 Efficiency ???? ????

Total Plant Efficiency ???? ????

CHILLER-1

Chlr1Sts	???? ????
Chlr1Cmd	???? ????



CHILLER-1 Parameters

Manufacturer	???? ????
Command	???? ????
Status	???? ????
Efficiency	???? ????
Oil Temp	???? ????
Oil Press Diff	???? ????
CHW Lvg Temp	???? ????
CHW Ent Temp	???? ????
CW Lvg Temp	???? ????
CW Ent Temp	???? ????
% Full Load Amps	???? ????
Evap Refrig Press	???? ????
Cond Refrig Press	???? ????
Comp Dis Refrig Temp	???? ????
Evap Refrig Temp	???? ????
Cond Refrig Temp	???? ????
CHW Setpoint	???? ????
Cond Water Flow	???? ????
CHW Flow	???? ????
Capacity	???? ????

CHILLER-1 Parameters

System Reset	???? ????
System Eanble	???? ????
Runtime Rotate	???? ????
Rot SCHW Pumps	???? ????
Pump Down Time	???? ????
Pump Runtime Reset	???? ????
Lead Chiller Fail	???? ????
Rot Chillers	???? ????
CH Runtime Reset	???? ????
PCHWP-1A in Hand	???? ????
PCHWP-1A Runtime	???? ????
CH-1 Alm CH Panel	???? ????
CH-1 Runtime Exd	???? ????

Condenser Water Loop
CT-1 Details | CT-2 Details

Chilled Water Loop
CH-1 Details | CH-2 Details

Facility Name - Chiller 1 Details

???? ????
???? ????

Chiller 1 - Nameplate

Serial Number -
Model Number -
Installation Date -

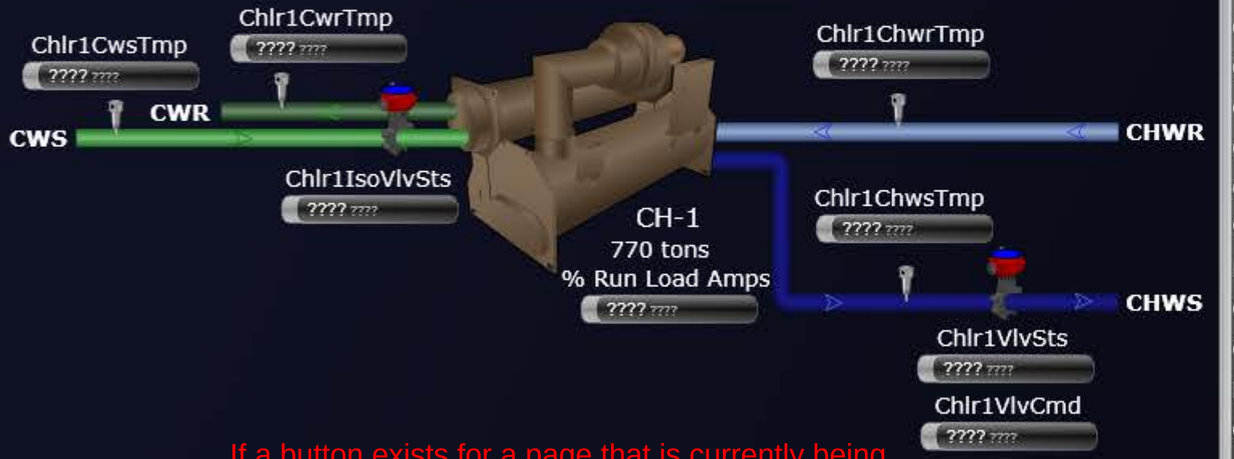
On a detail page, any and all information regarding that piece of equipment shall be accessed on this panel, either by listing it (as shown) or linking to it.

Chiller 1 Efficiency ???? ????

Total Plant Efficiency ???? ????

CHILLER-1

Chlr1Sts	???? ????
Chlr1Cmd	???? ????



If a button exists for a page that is currently being viewed, shade the Fill of the button Orange Red

Condenser Water Loop
CT-1 Details | CT-2 Details

Chilled Water Loop
CH-1 Details | CH-2 Details

CHILLER-1 Parameters

Manufacturer	???? ????
Command	???? ????
Status	???? ????
Efficiency	???? ????
Oil Temp	???? ????
Oil Press Diff	???? ????
CHW Lvg Temp	???? ????
CHW Ent Temp	???? ????
CW Lvg Temp	???? ????
CW Ent Temp	???? ????
% Full Load Amps	???? ????
Evap Refrig Press	???? ????
Cond Refrig Press	???? ????
Comp Dis Refrig Temp	???? ????
Evap Refrig Temp	???? ????
Cond Refrig Temp	???? ????
CHW Setpoint	???? ????
Cond Water Flow	???? ????
CHW Flow	???? ????
Capacity	???? ????

CHILLER-1 Parameters

System Reset	???? ????
System Eanble	???? ????
Runtime Rotate	???? ????
Rot SCHW Pumps	???? ????
Pump Down Time	???? ????
Pump Runtime Reset	???? ????
Lead Chiller Fail	???? ????
Rot Chillers	???? ????
CH Runtime Reset	???? ????
PCHWP-1A in Hand	???? ????
PCHWP-1A Runtime	???? ????
CH-1 Alm CH Panel	???? ????
CH-1 Runtime Exd	???? ????

Facility Name - Chiller 5-Low Temp Details

???? ????
???? ????

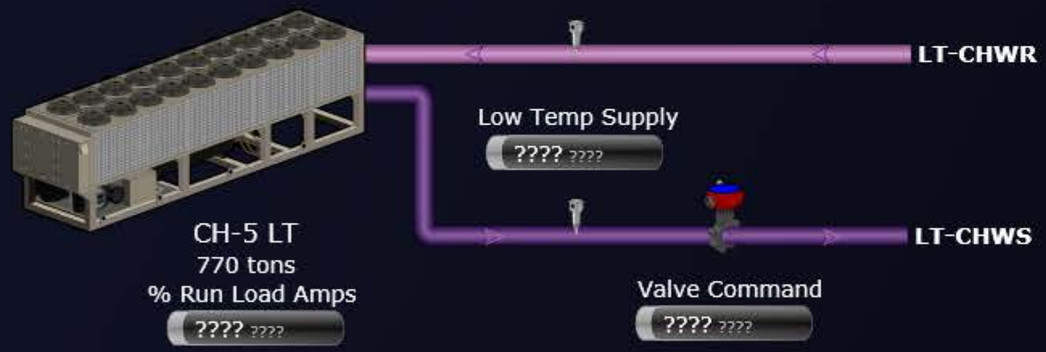
Chiller 5 - Name Plate

Serial Number -
Model Number -
Installation Date -

Chiller 5 Efficiency
???? ????

Chiller 5 - Low Temperature

Chlr05-LTSts	???? ????
Chlr05-LTCmd	???? ????



AHU Served

Chiller 5-LT Parameters

Manufacturer	???? ????
Capacity	???? ????
Command	???? ????
Status	???? ????
Efficiency	???? ????
Oil Temp	???? ????
Oil Press Diff	???? ????
CHW Lvg Temp	???? ????
CHW Ent Temp	???? ????
CW Lvg Temp	???? ????
CW Ent Temp	???? ????
% Full Load Amps	???? ????
Evap Refrig Press	???? ????
Cond Refrig Press	???? ????
Comp Dis Refrig Temp	???? ????
Evap Refrig Temp	???? ????
Cond Refrig Temp	???? ????
CHW Setpoint	???? ????
Cond Water Flow	???? ????
CHW Flow	???? ????

Chiller 5-LT Parameters

System Reset	???? ????
System Eanble	???? ????
Runtime Rotate	???? ????
Rot SCHW Pumps	???? ????
Pump Down Time	???? ????
Pump Runtime Reset	???? ????
Lead Chiller Fail	???? ????
Rot Chillers	???? ????
CH Runtime Reset	???? ????
PCHWP-5A in Hand	???? ????
PCHWP-5A Runtime	???? ????
CH-5 Alm CH Panel	???? ????
CH-5 Runtime Exd	???? ????

Facility Name - Chiller 5-Low Temp Details

???? ????
???? ????

Chiller 5 - Name Plate

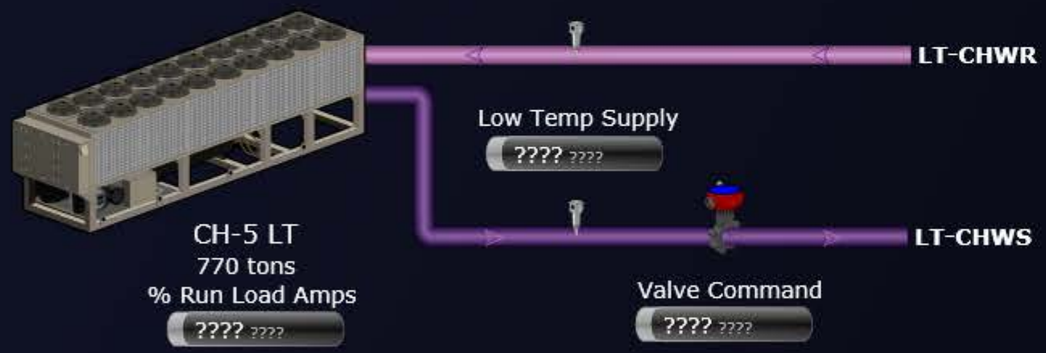
Serial Number -
Model Number -
Installation Date -

Refrigeration Machines that sub-cool will now be generally known as "Low Temperature, Low Temp, or LT" to cover the various types of equipment possibilities.

Chiller 5 Efficiency
???? ????

Chiller 5 - Low Temperature

Chlr05-LTSts	???? ????
Chlr05-LTCmd	???? ????



AHU Served

Chiller 5-LT Parameters

Manufacturer	???? ????
Capacity	???? ????
Command	???? ????
Status	???? ????
Efficiency	???? ????
Oil Temp	???? ????
Oil Press Diff	???? ????
CHW Lvg Temp	???? ????
CHW Ent Temp	???? ????
CW Lvg Temp	???? ????
CW Ent Temp	???? ????
% Full Load Amps	???? ????
Evap Refrig Press	???? ????
Cond Refrig Press	???? ????
Comp Dis Refrig Temp	???? ????
Evap Refrig Temp	???? ????
Cond Refrig Temp	???? ????
CHW Setpoint	???? ????
Cond Water Flow	???? ????
CHW Flow	???? ????

Chiller 5-LT Parameters

System Reset	???? ????
System Eanble	???? ????
Runtime Rotate	???? ????
Rot SCHW Pumps	???? ????
Pump Down Time	???? ????
Pump Runtime Reset	???? ????
Lead Chiller Fail	???? ????
Rot Chillers	???? ????
CH Runtime Reset	???? ????
PCHWP-5A in Hand	???? ????
PCHWP-5A Runtime	???? ????
CH-5 Alm CH Panel	???? ????
CH-5 Runtime Exd	???? ????

Facility Name - Hot Water Plant Overview

???? ????
???? ????

HW Plant Efficiency
???? ????

BLR-1 Supply
???? ????

BLR-1 Return
???? ????

Boiler 1 Detail
Hidden Data Link
Typical of all equipment

Boiler 01
12000 MBH
% Firing Range
???? ????

HWP-1

HWP-1
Sts ???? ????
Cmd ???? ????

Mixing Valve
???? ????

HW Supply
???? ????

SHWP-1
Sts ???? ????
Cmd ???? ????

HWS

VFD-1

SHWP-1

BLR-2 Supply
???? ????

HW-Diff Press
???? ????

BLR-2 Return
???? ????

VFD-2

SHWP-2

HWP-2

HWP-2
Sts ???? ????
Cmd ???? ????

SHWP-2
Sts ???? ????
Cmd ???? ????

Boiler 02
12000 MBH
% Firing Range
???? ????

HW Return
???? ????

HWR

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FLOOR | CHW | HW | STEAM | AHU | ENERGY | EPSS | ALARMS | AUX | LEGEND

FACILITIGROUP Infrastructure Solutions

Facility Name - Hot Water Plant Overview

???? ????
???? ????

HW Boiler capacity should always be written in MBH (1000 BTU/hr)

HW Plant Efficiency
???? ????

BLR-1 Supply
???? ????

BLR-1 Return
???? ????

Boiler 1 Detail
Hidden Data Link
Typical of all equipment

Boiler 01
12000 MBH
% Firing Range
???? ????

HWP-1
Sts ???? ????
Cmd ???? ????

Mixing Valve
???? ????

HW Supply
???? ????

SHWP-1
Sts ???? ????
Cmd ???? ????

HWS

VFD-1

SHWP-1

BLR-2 Supply
???? ????

HW-Diff Press
???? ????

BLR-2 Return
???? ????

VFD-2

SHWP-2

HWP-2
Sts ???? ????
Cmd ???? ????

SHWP-2
Sts ???? ????
Cmd ???? ????

Boiler 02
12000 MBH
% Firing Range
???? ????

HW Return
???? ????

HWR

TriStar Skyline MEDICAL CENTER

FLOOR | CHW | HW | STEAM | AHU | ENERGY | EPSS | ALARMS | AUX | LEGEND

FACILITIGROUP Infrastructure Solutions

Facility Name - Steam Boiler Plant Overview

???? ????
???? ????

Boiler 1 Detail
Hidden Data Link
Typical of all equipment

Steam Flow ???? ????

Pressure ???? ????

Steam Plant Efficiency ???? ????

Natural Gas ???? ????

BLR-1
400 BHP
% Firing Range ???? ????

Feed Water ???? ????

BLR-1
400 BHP
% Firing Range ???? ????

Feed Water ???? ????

Make Up Water ???? ????

FWP1
FWP2
FWP3

DA Tank

From Condensate Return Unit

FW Pump-1
Sts ???? ????
Cmd ???? ????

FW Pump-2
Sts ???? ????
Cmd ???? ????

FW Pump-3
Sts ???? ????
Cmd ???? ????

1/3 Vlv Output ???? ????

2/3 Vlv Output ???? ????

HX Detail

HX-1

To Consensate Return Unit

HWP - 1
HWP - 2

HWR

HWS

PFHX-1 Parameters
HwsTmp ???? ????
HwrTmp ???? ????
Hw GPM ???? ????
Load ???? ????

1/3 Vlv Output ???? ????

2/3 Vlv Output ???? ????

HX-2

To Consensate Return Unit

HWP - 3
HWP - 4

HWR

HWS

PFHX-2 Parameters
HwsTmp ???? ????
HwrTmp ???? ????
Hw GPM ???? ????
Load ???? ????

STM

HX Details

TriStar Skyline MEDICAL CENTER

FLOOR | CHW | HW | STEAM | AHU | ENERGY | EPSS | ALARMS | AUX | LEGEND

FACILITIGROUP Infrastructure Solutions

Facility Name - Steam Boiler Plant Overview

Steam boiler capacity should always be written in units of BHP (Boiler Horsepower)

State Square added on inline pumps. Green=ON, Blue = OFF. Pumps with analog output values shall have a value box in addition to the state square.

Boiler 1 Detail
Hidden Data Link
Typical of all equipment

Steam Flow
Pressure
Steam Plant Efficiency
Natural Gas
Feed Water
BLR-1
400 BHP
% Firing Range
Make Up Water
DA Tank
From Condensate Return Unit
FWP1
FWP2
FWP3
FW Pump-1
FW Pump-2
FW Pump-3
Sts
Cmd
1/3 Vlv Output
2/3 Vlv Output
HX Detail
HX-1
HX-2
To Consensate Return Unit
HWP - 1
HWP - 2
HWP - 3
HWP - 4
HWR
HWS
STM
PFHX-1 Parameters
PFHX-2 Parameters
HwsTmp
HwrTmp
Hw GPM
Load
HX Details

This is the preferred way to show the continuation of a pipe

TriStar Skyline MEDICAL CENTER

FLOOR | CHW | HW | STEAM | AHU | ENERGY | EPSS | ALARMS | AUX | LEGEND

FACILITIGROUP Infrastructure Solutions

Facility Name - Electrical System

???? ????
???? ????

Feed 1
???? ????
???? ????
???? ????
???? ????

Feed 2
???? ????
???? ????
???? ????
???? ????

???? A
???? A
???? A
???? A

Generator
???? ????
???? ????
???? ????
???? ????

Fuel Oil Tank

Fuel Oil Tank
Capacity ???? ????
Remaining ???? ????

Total kW
???? ????

Generator
Manufacturer ???? ????
Capacity ???? ????
Command ???? ????
Status ???? ????

ATS 01
???? A
Life Safety
???? ????
???? ????
???? ????
???? ????
???? ????

ATS 02
???? A
Equipment
???? ????
???? ????
???? ????
???? ????
???? ????

???? A
???? A
???? A
???? A
???? A
???? A
???? A
???? A

Chiller 1
???? ????
???? ????
???? ????
???? ????

Chiller 2
???? ????
???? ????
???? ????
???? ????

Floors 1-2

MRI
???? ????
???? ????
???? ????
???? ????

CAT
???? ????
???? ????
???? ????
???? ????

Floors 3-5

MRI
???? ????
???? ????
???? ????
???? ????

CAT
???? ????
???? ????
???? ????
???? ????

TriStar Skyline MEDICAL CENTER

FLOOR CHW HW STEAM AHU ENERGY EPSS ALARMS AUX LEGEND

FACILITIGROUP Infrastructure Solutions

Facility Name - Electrical System

???? ????
???? ????

Feed 1
???? ????
???? ????
???? ????
???? ????

Feed 2
???? ????
???? ????
???? ????
???? ????

V - Voltage
A - Amperage
kW - kilowatts
PF - Power Factor

???? A
???? A
???? A
???? A

Generator
???? ????
???? ????
???? ????
???? ????

Fuel Oil Tank

Fuel Oil Tank
Capacity ???? ????
Remaining ???? ????

Total kW
???? ????

Generator
Manufacturer ???? ????
Capacity ???? ????
Command ???? ????
Status ???? ????

State Squares. Green=Normal Power,
Red=Emergency Power

ATS Capacity, in Amps (A), static value

ATS 01
???? A
Life Safety
???? ????
???? ????
???? ????
???? ????
???? ????

ATS 02
???? A
Equipment
???? ????
???? ????
???? ????
???? ????
???? ????

Vs1
Vs2
Hzs1
Hzs2

Vs1
Vs2
Hzs1
Hzs2

Additional Info

???? A
Chiller 1
???? ????
???? ????
???? ????
???? ????

???? A
Chiller 2
???? ????
???? ????
???? ????
???? ????

???? A
Floors 1-2

???? A
MRI
???? ????
???? ????
???? ????
???? ????

???? A
CAT
???? ????
???? ????
???? ????
???? ????

???? A
Floors 3-5

???? A
MRI
???? ????
???? ????
???? ????
???? ????

???? A
CAT
???? ????
???? ????
???? ????
???? ????

Facility Name - VAV Summary

???? ????
???? ????

Equipment	Mode	ZnTmp deg F	ZnTmpSpt deg F	ReHtVlv % Open	DaCFM CFM	DaCFMSpt CFM	DmprPos % Open
VV 01-101 - Area Served	????	????	????	????	????	????	????
VV 01-102 - Area Served	????	????	????	????	????	????	????
VV 01-103 - Area Served	????	????	????	????	????	????	????
VV 01-104 - Area Served	????	????	????	????	????	????	????
VV 01-105 - Area Served	????	????	????	????	????	????	????
VV 01-106 - Area Served	????	????	????	????	????	????	????
VV 01-107 - Area Served	????	????	????	????	????	????	????
VV 01-108 - Area Served	????	????	????	????	????	????	????
VV 01-109 - Area Served	????	????	????	????	????	????	????
VV 01-110 - Area Served	????	????	????	????	????	????	????
VV 01-111 - Area Served	????	????	????	????	????	????	????
VV 01-112 - Area Served	????	????	????	????	????	????	????
VV 01-113 - Area Served	????	????	????	????	????	????	????
VV 01-114 - Area Served	????	????	????	????	????	????	????
VV 01-115 - Area Served	????	????	????	????	????	????	????
VV 01-116 - Area Served	????	????	????	????	????	????	????
VV 01-117 - Area Served	????	????	????	????	????	????	????
VV 01-118 - Area Served	????	????	????	????	????	????	????
VV 01-119 - Area Served	????	????	????	????	????	????	????
VV 01-120 - Area Served	????	????	????	????	????	????	????
VV 01-121 - Area Served	????	????	????	????	????	????	????
VV 01-122 - Area Served	????	????	????	????	????	????	????
VV 01-123 - Area Served	????	????	????	????	????	????	????
VV 01-124 - Area Served	????	????	????	????	????	????	????

< >

AHU 01 Summary			
Econ State	????	ChwVlvPos	????
SaTmp	????	HwVlvPos	????
RaTmp	????	BoxTotCFM	????
RaRh	????	Total Load	????

Chiller Summary			
Chiller 01	????	ChwsTmp	????
Chiller 02	????	ChwrTmp	????
Chiller 03	????	SChwGPM	????
Chiller 04	????	Total Load	????

Boiler Summary			
Boiler 01	????	HwsTmp	????
Boiler 02	????	HwrTmp	????
		HwGPM	????
		Total Load	????

Links to individual VAV graphic

Facility Name - VAV Summary

???? ????
???? ????

Equipment	Mode	ZnTmp deg F	ZnTmpSpt deg F	ReHtVlv % Open	DaCFM CFM	DaCFMSpt CFM	DmprPos % Open
VV 01-101 - Area Served	????	????	????	????	????	????	????
VV 01-102 - Area Served	????	????	????	????	????	????	????
VV 01-103 - Area Served	????	????	????	????	????	????	????
VV 01-104 - Area Served	????	????	????	????	????	????	????
VV 01-105 - Area Served	????	????	????	????	????	????	????
VV 01-106 - Area Served	????	????	????	????	????	????	????
VV 01-107 - Area Served	????	????	????	????	????	????	????
VV 01-108 - Area Served	????	????	????	????	????	????	????
VV 01-109 - Area Served	????	????	????	????	????	????	????
VV 01-110 - Area Served	????	????	????	????	????	????	????
VV 01-111 - Area Served	????	????	????	????	????	????	????
VV 01-112 - Area Served	????	????	????	????	????	????	????
VV 01-113 - Area Served	????	????	????	????	????	????	????
VV 01-114 - Area Served	????	????	????	????	????	????	????
VV 01-115 - Area Served	????	????	????	????	????	????	????
VV 01-116 - Area Served	????	????	????	????	????	????	????
VV 01-117 - Area Served	????	????	????	????	????	????	????
VV 01-118 - Area Served	????	????	????	????	????	????	????
VV 01-119 - Area Served	????	????	????	????	????	????	????
VV 01-120 - Area Served	????	????	????	????	????	????	????
VV 01-121 - Area Served	????	????	????	????	????	????	????
VV 01-122 - Area Served	????	????	????	????	????	????	????
VV 01-123 - Area Served	????	????	????	????	????	????	????
VV 01-124 - Area Served	????	????	????	????	????	????	????

< >

Links to individual equipment detail pages.

AHU 01 Summary			
Econ State	????	ChwVlvPos	????
SaTmp	????	HwVlvPos	????
RaTmp	????	BoxTotCFM	????
RaRh	????	Total Load	????

Chiller Summary			
Chiller 01	????	ChwsTmp	????
Chiller 02	????	ChwrTmp	????
Chiller 03	????	SChwGPM	????
Chiller 04	????	Total Load	????

Boiler Summary			
Boiler 01	????	HwsTmp	????
Boiler 02	????	HwrTmp	????
		HwGPM	????
		Total Load	????

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General Exhaust Fan Functional Performance Test

Reference		Date	

Description	Attribute	
Test Procedure: Command fan on.		
Expected Response: Fan is on.		Y/N
Test Procedure: Command fan off.		
Expected Response: Fan is off.		Y/N
Test Procedure: With fan commanded on, fail fan.		
Expected Response: Fan turns off.		Y/N
Expected Response: Alarm is sent to BAS.		Y/N
Test Procedure: Simulate belt failure while fan is commanded on.		
Expected Response: Alarm is sent to BAS.		Y/N

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Heating Hot Water Functional Performance Test

Date		Equipment	

Location	

1	System Configuration	Response	
	Number of Heat Recovery Chillers		#
	Number of HW Boilers		#
	Number of HW Pumps		#
	Flow Meter Installed		Y/N
	Parameters	**Value**	
	Outside Air Temperature		°F
	Outside Air Humidity		%RH
	Hot Water Supply Temperature Setpoint		°F
	Hot Water Supply Temperature		°F
	Hot Water Return Temperature		°F
	Heat Recovery Chiller Status		%
	Lead Boiler Status		%
	Differential Pressure Setpoint		psi
	Differential Pressure		psi
	Lead Pump Status		%
	HW System Flow		GPM
	HW System Load		BTU

2	System Disabled	Response	
	Test Procedure: Disable HW system at BAS.		
	Expected Response: All HOA switches are in auto.		Y/N
	Expected Response: HW Pumps are off.		Y/N
	Expected Response: Heat Recovery Chiller is off.		Y/N
	Expected Response: HW boilers are off.		Y/N
	Expected Response: BAS updates to each condition.		Y/N

3	System Enabled	Response	
	Test Procedure: Enable HW system from BAS.		
	Expected Response: Heat recovery chiller HW and CHW isolation valves open.		Y/N
	Expected Response: Lead HW pump energizes and modulates to maintain DP SP.		Y/N
	Expected Response: Heat recovery pumps energize.		Y/N
	Expected Response: Heat recovery chiller modulates to maintain HW supply temperature setpoint.		Y/N
	Expected Response: BAS updates to each condition.		Y/N

4	HW Pump Control	Response	
4a.	Record DP setpoint.		psi
	Record DP.		psi
	Record pump VFD%.		%
4b.	**Test Procedure: Vary DP setpoint.**		
	Expected Response: Pump modulates to maintain new DP SP.		Y/N
4c.	**Test Procedure: Fail lead pump.**		
	Expected Response: Lag pump energizes.		Y/N
	Expected Response: Alarm is sent to BAS.		Y/N
4d.	**Test Procedure: Fail lag pump.**		
	Expected Response: Standby pump energizes.		Y/N
	Expected Response: Alarm is sent to BAS.		Y/N
4e.	**Test Procedure: Simulate DP too high.**		
	Expected Response: High DP alarm is initiated at BAS.		Y/N
4f.	**Test Procedure: Simulate DP too low.**		
	Expected Response: Low DP alarm is initiated at BAS.		Y/N

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Heating Hot Water Functional Performance Test

5	HW Temperature Control	Response	
5a.	Record HW supply temperature setpoint.		°F
	Record HW supply temperature.		°F
	Record heat pump status.		%
	Record lead boiler status.		%
5b.	**Test Procedure: Raise HW supply temperature setpoint.**		
	Expected Response: Heat recovery chiller modulates to maintain new SP.		Y/N
	Expected Response: Once heat recovery chiller is 100%, lead boiler pump and boiler energize and boiler modulates to maintain HW supply temperature SP.		Y/N
5c.	**Test Procedure: Further raise HWS temperature.**		
	Expected Response: As capacity requires, lag boilers energize with boiler pump and modulate with lead boiler and heat recovery chiller to maintain HW supply temperature SP.		Y/N
5d.	**Test Procedure: Lower HWS temperature SP.**		
	Expected Response: Boilers stage down as load requires while heat recovery chiller stays in operation.		Y/N
5e.	**Test Procedure: Fail lead boiler while in operation.**		
	Expected Response: Lag boiler pump and boiler energize and modulate to maintain HW supply temperature.		Y/N
	Expected Response: BAS updates to each condition.		Y/N

6	Hot Water Temperature Reset Schedule	Response	
6a.	Record outside air temperature reset schedule.		
6b.	**Test Procedure: Simulate OAT greater than high limit of reset scheduled.**		
	Expected Response: HW supply temperature setpoint resets to low end of reset schedule.		Y/N
6c.	**Test Procedure: Simulate OAT is in middle of reset schedule.**		
	Expected Response: HW supply temperature setpoint resets to middle of reset schedule.		Y/N
6d.	**Test Procedure: Simulate OAT less than low limit of reset scheduled.**		
	Expected Response: HW supply temperature setpoint resets to high end of reset schedule.		Y/N
	Expected Response: BAS updates to each condition.		Y/N

7	Differential Pressure Reset Control	Response	
7a.	Record differential pressure reset range.		PSI
	Record most open critical zone valve position target.		%
	Record most open critical zone valve position.		%
7b.	**Test Procedure: Simulate most open critical valve above target position.**		
	Expected Response: DP setpoint is raised in increments to high limit until valve position is at the target.		Y/N
	Expected Response: HW pump modulates to maintain DP SP.		Y/N
	Expected Response: Non-critical valve positions are ignored for HW DP reset.		Y/N
7c.	**Test Procedure: Simulate most open critical valve below target position.**		
	Expected Response: DP setpoint is lowered in increments to low limit until valve position is at the target.		Y/N
	Expected Response: HW pump modulates to maintain DP SP.		Y/N
	Expected Response: BAS updates to each condition.		Y/N

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ISOLATION ROOM FUNCTIONAL PERFORMANCE TEST

Isolation Room #		Date	

1	Parameters	Response	
	Space Temperature Setpoint		°F
	Space Temperature		°F
	Supply Airflow Setpoint		CFM
	Supply Airflow		CFM
	Exhaust Airflow		CFM
	CFM Offset Setpoint		CFM
	CFM Offset		CFM
	Space Differential Pressure		inches
	Supply Damper Position		%
	Exhaust Damper Position		%
	AHU Discharge Air Temperature		°F
	Terminal Discharge Air Temperature		°F

2	Normal Operation	Response	
2a.	**Test Procedure: Isolation room is under normal operation.**		
	Expected Response: Exhaust damper modulates to maintain CFM setpoint.		Y/N
	Expected Response: Supply damper modulates to maintain CFM offset.		Y/N
	Expected Response: HW valve modulates to maintain space temperature setpoint.		Y/N
	Expected Response: Isolation fan modulates to maintain static pressure setpoint.		Y/N
2b.	**Test Procedure: Raise space temperature setpoint.**		
	Expected Response: HW valve modulates to maintain space temperature setpoint.		Y/N
	Expected Response: Supply and exhaust dampers modulate to maintain CFM setpoint and CFM offset.		Y/N
2c.	**Test Procedure: Lower space temperature setpoint.**		
	Expected Response: HW valve closes.		Y/N
	Expected Response: Supply and exhaust dampers modulate to maintain CFM setpoint and CFM offset.		Y/N
	Expected Response: Space differential pressure is below -0.01".		Y/N
	Record: Space differential pressure.		inches
	Expected Response: Space pressure monitor can be seen from BAS.		Y/N
2d.	**Test Procedure: Simulate space pressure is above -0.01" by opening door.**		
	Expected Response: Alarm is sent to nurse station.		Y/N
	Expected Response: Alarm is sent to BAS.		Y/N
2e.	**Test Procedure: Fail isolation exhaust fan.**		
	Expected Response: Alarm is sent to BAS.		Y/N
2f	**Test Procedure: Simulate broken belt while fan is running.**		
	Expected Response: Alarm is sent to BAS stating belt is broken.		Y/N

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VAV Trend Data

Date:	
Facility Name:	
Project:	
AHU:	

VAV Box I.D.	
Design Heating CFM:	
Design Cooling CFM:	

Line No.	Date / Time	Zone T-Stat Set Pt	Cooling Set Pt	Heating Set Pt	Actual Zone Temp	Air Terminal Box DAT	Reheat Valve Cmd Pos	Actual CFM	Heating CFM Set Pt	Cooling CFM Set Pt	Box Damper Cmd Pos	AHU DAT	Heating HW Temp
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
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28													
29													

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VAV Trend Data

Date:	
Facility Name:	
Project:	
AHU:	

VAV Box I.D.	
Design Heating CFM:	
Design Cooling CFM:	

Line No.	Date / Time	Zone T-Stat Set Pt	Cooling Set Pt	Heating Set Pt	Actual Zone Temp	Air Terminal Box DAT	Reheat Valve Cmd Pos	Actual CFM	Heating CFM Set Pt	Cooling CFM Set Pt	Box Damper Cmd Pos	AHU DAT	Heating HW Temp
30													
31													
32													
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VAV Trend Data

Date:	
Facility Name:	
Project:	
AHU:	

VAV Box I.D.	
Design Heating CFM:	
Design Cooling CFM:	

Line No.	Date / Time	Zone T-Stat Set Pt	Cooling Set Pt	Heating Set Pt	Actual Zone Temp	Air Terminal Box DAT	Reheat Valve Cmd Pos	Actual CFM	Heating CFM Set Pt	Cooling CFM Set Pt	Box Damper Cmd Pos	AHU DAT	Heating HW Temp
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Line No.	Date / Time	Zone T-Stat Set Pt	Cooling Set Pt	Heating Set Pt	Actual Zone Temp	Air Terminal Box DAT	Reheat Valve Cmd Pos	Actual CFM	Heating CFM Set Pt	Cooling CFM Set Pt	Box Damper Cmd Pos	AHU DAT	Heating HW Temp
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Line No.	Date / Time	Zone T-Stat Set Pt	Cooling Set Pt	Heating Set Pt	Actual Zone Temp	Air Terminal Box DAT	Reheat Valve Cmd Pos	Actual CFM	Heating CFM Set Pt	Cooling CFM Set Pt	Box Damper Cmd Pos	AHU DAT	Heating HW Temp
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Line No.	Date / Time	Zone T-Stat Set Pt	Cooling Set Pt	Heating Set Pt	Actual Zone Temp	Air Terminal Box DAT	Reheat Valve Cmd Pos	Actual CFM	Heating CFM Set Pt	Cooling CFM Set Pt	Box Damper Cmd Pos	AHU DAT	Heating HW Temp
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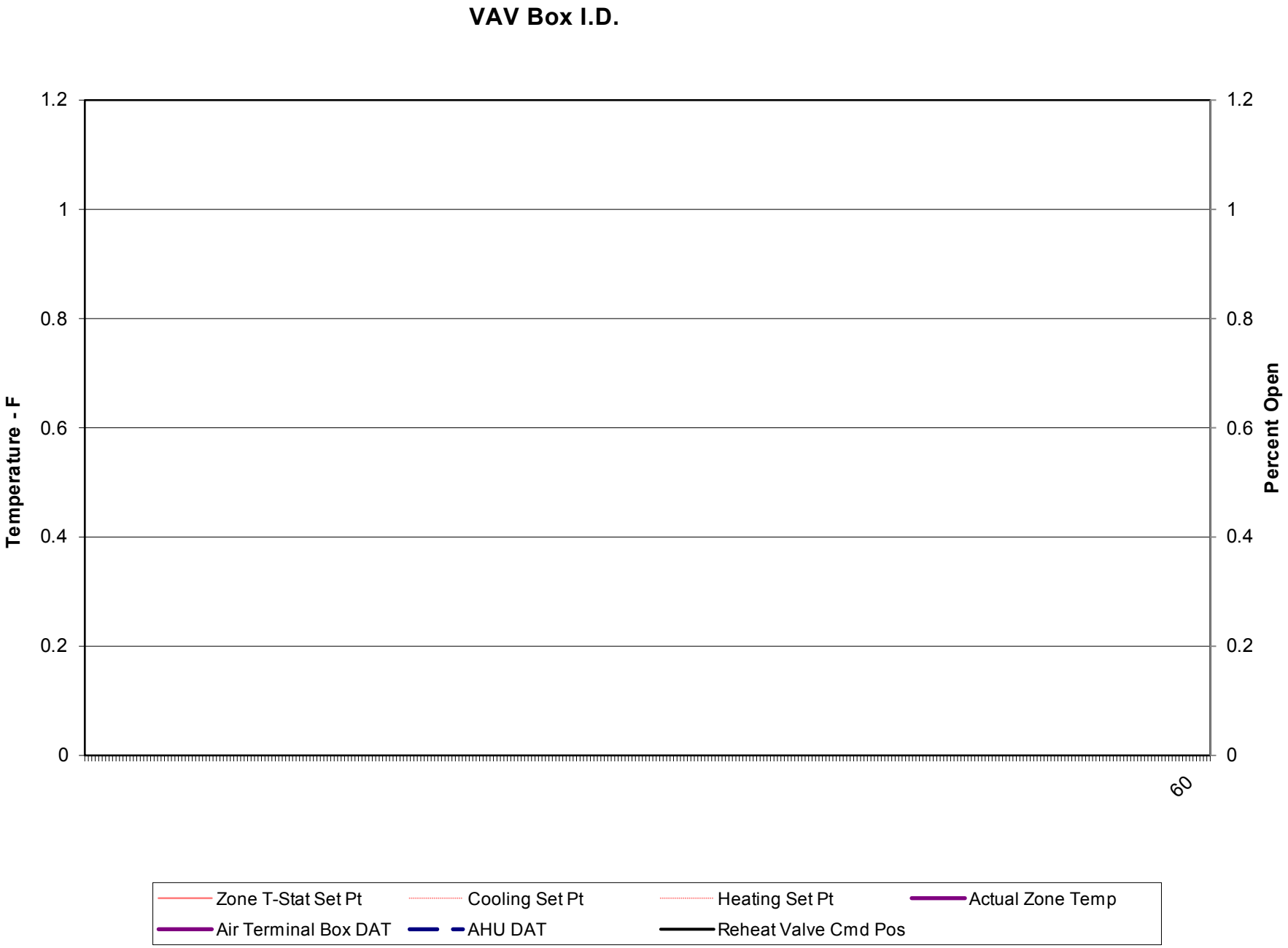
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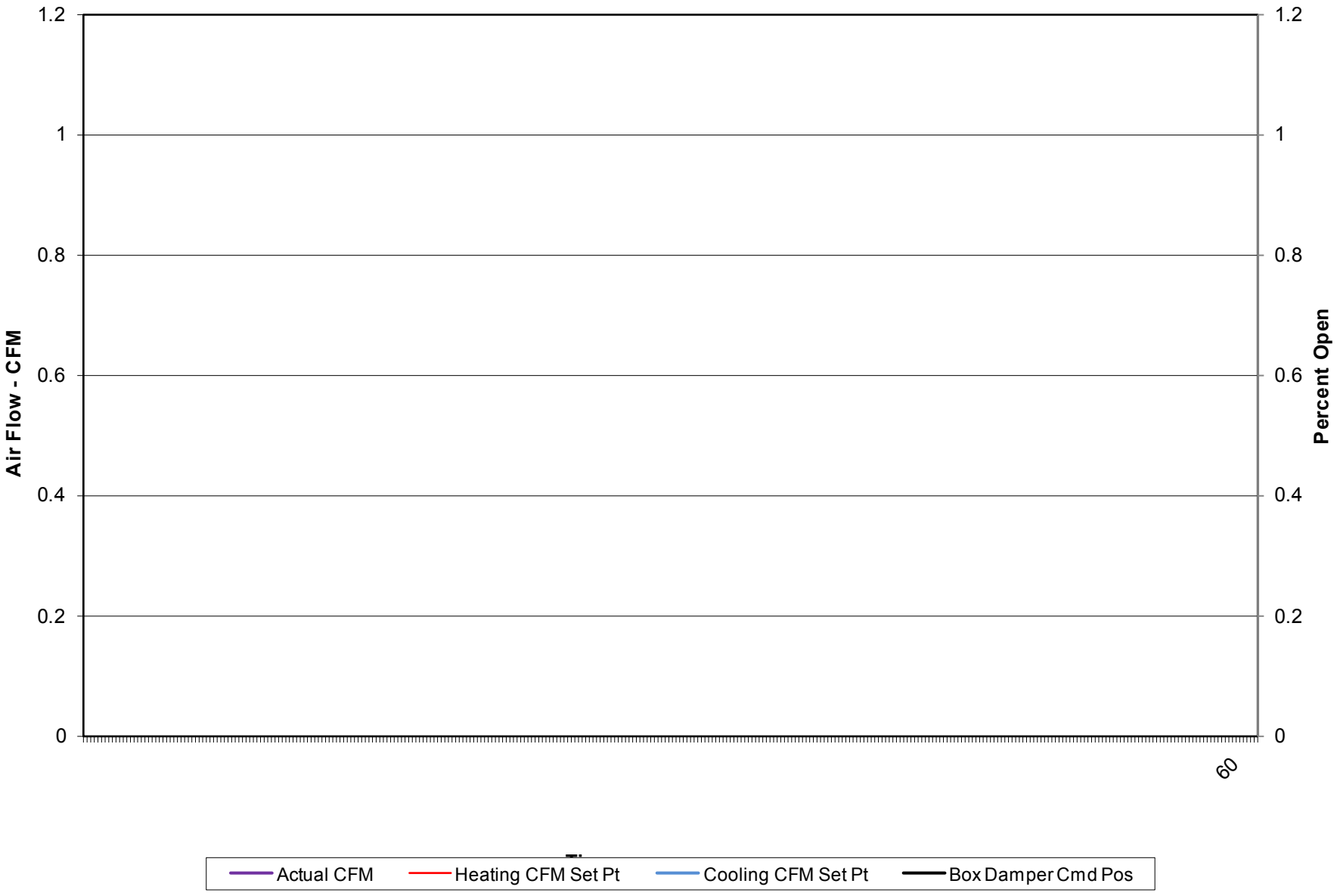
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Air Flow - CFM
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Cooling CFM Set Pt
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SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:
   1. Fire Protection system.
   2. Demolition of existing equipment, and piping.
   3. Seismic bracing and anchorage for equipment and piping.

1.02 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Field painting of exposed pipe.

1.03 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, and piping prior to construction.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in fire protection work.

E. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

1.04 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water connections.

1.05 CODES

A. Comply with all pertinent local, state, and national codes.

1.06 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to the contractor and is not to be considered all inclusive.
   1. NFPA 13: Standard on automatic sprinkler systems.
   2. NFPA 14: Standard on standpipe, hose systems.
   3. NFPA 24: Standard on fire service line.

1.07 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed.
   1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.
   2. Shop Drawings: Complete equipment, and piping systems.

1.08 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.09 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:
   1. Field Instruction: Provide explanation of how systems and equipment are to operate.
   2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.

1.10 CONSTRUCTION RECORD DOCUMENTS

A. Provide construction record documents. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.11 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacturer bearing the U.L. and F.M. label when such label is available.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate location of fire protection piping with equipment, ductwork, and other piping to eliminate conflict with other divisions.

B. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of fire protection work.

C. Perform repairs with materials that match existing in accordance with the appropriate sections of these specifications.

3.03 TRENCHING, EXCAVATION AND BACKFILLING

A. Provide trenching, excavation and backfilling necessary for performance of fire protection work in accordance with the appropriate section of these specifications.

3.04 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Paint piping exposed in equipment rooms and stairwells. Paint to be Sherwin Williams Metalatex fire protection red.

C. Identify all equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

D. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

3.05 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

3.06 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

END OF SECTION 21 05 00

SECTION 21 10 00

WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish materials, accessories, equipment, tools, and transportation and performance of all services and labor required to completely execute the sprinkler and fire protection work for this project, as indicated on the drawings and as herein specified.

1.02 SCOPE OF WORK

A. Shop drawings.

B. Valves including check valves, system valves, backflow preventer, indicator valves.

C. Pipe, fittings, exterior.

D. Pipe, fittings, interior.

E. Hangers, supports and sleeves.

F. Sprinkler heads, extra sprinkler cabinet.

G. Alarm check valves and accessories.

H. Testing and flushing.

I. Excavation and backfill.

J. Fire Department connection.

K. Fire valve and hose cabinets.

L. Preaction deluge valve and control cabinet.

M. Hydraulically calculate sprinkler system, wet and/or dry as required by drawings. Maximum water velocity shall be 25 feet per second for interior piping and 10 feet per second for exterior piping.

N. Cutting of holes necessary for the installation of work specified under this Section. Coordinate cutting of material with other Divisions. Employ services of other trades for patching of concrete, masonry, and other material. Use same material for patching and finish neatly.

O. Unless otherwise noted on the drawings or these specifications, the entire project shall be fully protected, excluding no spaces.

P. In an area of renovation and existing systems that are converted and/or extended to include the use of quick-response sprinklers, all existing sprinklers in the associated compartmented space shall be changed to quick response type. A compartmented space is defined as the entire smoke compartment.

1.03 DESIGN REQUIREMENTS

A. Install system(s) in accordance with the drawings, specifications, and requirements of NFPA 13, NFPA 14, NFPA 20, and NFPA 24.

B. Furnish material and labor necessary to fully comply with the drawings and specifications and with the rules, regulations, and ordinances.

C. Reduction of the system area of operation as allowed per NFPA 13 is not acceptable on this project.

D. Small room rule as allowed per NFPA 13 is not acceptable on this project.

E. Extended coverage heads are not acceptable on this project.

F. Include in sprinkler system design the following requirements:

1. Light Hazard Occupancies (offices, patient rooms, corridors, lobbies, classrooms, hotel guest rooms, institutional, residential, libraries with 8 ft. high shelves max, unused attics) shall be 0.10 GPM/sq. ft. over 1500 sq. ft.

2. Ordinary Hazard Group 1 Occupancies (electrical rooms, mechanical rooms, storage rooms, kitchens, parking garages, laundries, restaurant service areas, and similar areas) shall be 0.14 GPM/sq. ft. over 2000 sq. ft.
3. Ordinary Hazard Group 2 Occupancies (medical record, boiler rooms, loading docks, machine shop, mercantile, libraries with large stack areas, trash rooms and similar areas) shall be 0.17 GPM/sq. ft. over 3000 sq. ft.
4. Canopies and overhangs utilizing Dry Pipe sprinkler systems shall be designed on an Ordinary Hazard Group 1 basis, utilizing 30 percent additional square footage for coverage (i.e., 0.15 GPM/sq. ft. over 1950 sq. ft.).
5. Provide 286 degree F. sprinkler heads in mechanical rooms, boiler rooms, elevator shafts and machine rooms, and other related high ambient temperature spaces.
6. Provide hose streams as required by NFPA 13.
7. Provide a minimum of 18 inches clearance between bottom of sprinkler deflector and top of storage.
8. Provide a 3/4" ball drip for all types of fire department connections. Route discharge to outside of building.
9. Provide the results of a recent flow test in accordance to NFPA 291 within 6 months to determine the adequacy of the water supply before construction begins. The Contractor shall use this data obtained to hydraulically design the system. Submit this with sprinkler system drawings and calculations.
10. Provide dry pendent type sprinkler heads located within cooler and/or freezer boxes with recess seat located within a conditioned space. Provide flexible boot connector at freezer dry sprinkler.
11. The hydraulic calculations shall be carried to the city water supply taking into account all fittings, valves, etc. The contractor shall be responsible for hydraulically sizing all new piping not sized on the drawings and shall take into consideration the existing piping to remain.
    a. Design calculations shall have a minimum of 5% difference of system demand including hose stream and the available water supply.

1.04 QUALITY ASSURANCE

A. Materials bearing UL and FM approval, where such approval is applicable or required by the agencies having jurisdiction over fire protection work.

B. The installing sprinkler contractor shall be licensed or permitted by the state and local authority having jurisdiction to perform fire protection installations. This shall be in compliance with all applicable state and local laws.

1.05 SUBMITTALS AND SHOP DRAWINGS

A. The Contract Documents contain fire protection design drawings which indicate minor coordination. It is the responsibility of the Contractor to prepare detailed and coordinated working drawings and calculations, accurately representing the design of record.

B. Prepare complete detailed working drawings for Fire Protection System. Submit drawings to Designer and to HCA's insuring agency, AIG, for review. Email plans to planreview.americas@aig.com and copy james.dipaoli@aig.com. Alternate contact information: Jamie DiPaoli, PE 99 High Street, 24th Floor, Boston, MA 02110 Tel. (617) 457-5847 Cell. (862) 245-3572. After receiving this approval, submit shop drawings to State Fire Marshal and local AHJ for his review and approval prior to starting installation. Prior approval by above listed authorities is required before sprinkler installation is begun.

C. The Sprinkler Contractor shop drawings and calculations shall be stamped and signed by a firm employee who has a minimum NICET III level certification and signed by a Responsible Managing Employee. Shop drawings and calculations shall be submitted by a licensed and registered fire protection contractor.

D. Equipment submittal drawings and data are required on all items named by manufacturer, including the following:
    1. Sprinkler Heads - Type and Manufacturer.

2. Valves - Type and Manufacturer, interior and exterior.
3. Water Flow and Tamper Switches - Type and Manufacturer.
4. Piping and fittings.

E. The sprinkler system shall be hydraulically designed by industry standard computer software. The Contractor shall submit computer calculations and copy of original water flow test report with working plans. Include in calculations allowance for outside hose streams and domestic water as required.

F. Where seismic bracing is required by code, the Contractor will submit with the working plans copies of seismic bracing work sheets (ref. NFPA 13 - Fig. A.9.3.5(a)) or copies of computer generated seismic bracing calculations.

G. Contractor will supply as-built drawings to the Owner, the Owner's Insurer, the Architect, the Engineer and other entities as required by the Owner or the Authority Having Jurisdiction.

1.06 SPRINKLER SYSTEM COORDINATION

A. The contractor will be responsible for ensuring that the reflected ceiling plan shown on the working drawings is the latest revision from the Architect before commencing work.

B. The contractor shall be responsible for providing to the Architect notification for any drawing changes resulting from movement of sprinkler piping or heads during installation.

C. Failure to coordinate sprinkler system and building systems (including, but not limited to: ductwork, mechanical piping, and lighting fixtures) prior to fabrication or installation of sprinkler systems shall be corrected, modified, or changed as necessary at the expense of the contractor.

D. The contractor is to completely investigate, PRIOR TO BID, all requirements of local water utility and fire department. Devices such as ADT and/or local alarm systems, double check valve assemblies, detector checks, tamper switches shall be provided complete, wired, connected, and installed in accordance with local authorities by this Contractor. In the event the authorities have no installation details, the Contractor shall submit for approval proposed installation.

1.07 APPLICABLE CODES

A. NFPA 13

B. NFPA 14

C. NFPA 20

D. NFPA 24

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products listed indicate standard.

2.02 VALVES

A. Acceptable Valve Manufacturers: Ames, Nibco, Anvil, Mueller, Kennedy, Wilkins.

B. Outside System Valves:
1. Full flow fire meters with OS&Y valves in a utility company approved vault. Size as indicated on drawings.
2. Sectional valves in valve pit: Kennedy Valve 8068A flanged pattern outside screw and yoke wedge gate valves, epoxy coated.
3. Underground sectional control valves: Kennedy Valve 8561 flanged, or Kennedy Valve 8571 mechanical joint, or G-Kennedy Valve 8901 Tyton joint, NRS gate valve, epoxy coated. Provide cast iron roadway box, extended to grade.
4. Post indicator valves: Kennedy Valve 8701ASS flanged or Kennedy Valve 8071SS mechanical joint, or Kennedy Valve 8901 PSS Tyton joint, NRS gate valve, epoxy coated. Kennedy Valve 2945A indicator post with required extension sleeve. Install indicator post with window 30" above finished grade.

C. Backflow Preventer

1. Double check detector valves: Ames C300 or Wilkins 350 ADA with 2" bronze by-pass meter or local water department standard. Size as indicated on drawings.
2. Reduced pressure zone assembly: Ames C400 or Wilkins Model No. 375 or No. 475 with OS&Y valves.
3. When installed outside enclosure to be A.S.S.E. 1060 listed with electric heat to maintain 40 degrees F.

D. Interior Valves:
1. Check valves:
   a. Iron body, Kennedy Valve 1126 swing check valve, flanged body.
   b. Bronze body, Nibco KT-403-W threaded check valve with dielectric unions.
2. Gate valves:
   a. Iron body, O.S.&Y. gate valves, Kennedy Valve FW-8068A, flanged.
   b. Bronze body, O.S.&Y. gate valve, Nibco T-104-0, threaded with dielectric unions.
3. Butterfly valves shall not be accepted.

E. Hi-Rise System Valves:
1. Check valves:
   a. Iron body, swing check valves, Nibco F-968-B.
   b. Bronze body, swing check valves, Nibco KT-403-W threaded with dielectric unions.
2. Gate valves: Iron body, O.S.&Y. gate valve, 300 WWP, Kennedy Valve 7168SS.

F. Wall-Mounted Indicator Valves:
1. Gate valve, Kennedy Valve 8701ASS, flanged NRS.
2. Wall indicator post, Kennedy Valve 641.

2.03 PIPE AND FITTINGS

A. Exterior Pipe and Fittings:
1. Provide cement lined ductile iron pipe, Class 52 conforming to ANSI/AWWA C151/A21.51 for Tyton joint pipe or ANSI/AWWA C111/A21.11 for mechanical joint pipe. Acceptable Manufacturers: U.S. Pipe, American Pipe, McWane, or equivalent.
2. Fittings shall be push-on joint ductile iron fittings, 350 PSI, with field loc gaskets, or mechanical joint ductile iron fittings conforming to ANSI/AWWA C110/A21.10 and C111/A21.11.
3. Provide concrete thrust blocks at all fittings, valves, and changes in direction.
4. Provide braces, bridle rods, or restraining systems typical of "MEGALUG" by EBBA, Inc., on all mechanical joint fittings and valves.
5. Provide PVC water main pipe and fittings conforming to AWWA C900, Class 200 PSI, as manufactured by Johns Mansville, Certainteed, or equivalent.
6. All exterior site piping shall be buried with a standard, permanent, bright colored, continuous printed plastic tape. Tape shall be intended for direct burial service and buried directly above the service line. The tape shall be 6 inches by 4 mils thick minimum. Tape shall be printed with proper identification of the service located below it.

B. Interior Pipe and Fittings:
1. Piping shall be Schedule 40 black steel pipe 2” and smaller conforming to ASTM A135 or ASTM A53 and Schedule 10 black steel pipe 2-1/2” and larger conforming to ASTM A135.
2. Fittings:
   a. Ductile iron threaded fittings, ANSI B16.3 Class 300.
   b. Cast iron threaded fittings, ANSI B16.4 Class 125 and 300 (extra heavy).
   c. Cast iron flanged fittings, ANSI B16.1 Class 125 and 300.
   d. Mechanical joint, grooved couplings, as manufactured by Tyco, Anvil, or equivalent. Couplings shall be rigid type, equivalent to 772 Domestic Rigid Coupling or Style 577 Rigid Import Coupling. All groove couplings and fittings shall be furnished by a single manufacturer.
3. Piping for Dry Pipe systems and for drainage systems shall be Schedule 40 galvanized steel pipe, ASTM A795 or A135 with galvanized threaded fittings, ANSI B16.4, galvanized coated, both interior and exterior of pipe and fittings.

4. Flexible stainless steel hose connections between sprinkler heads and branch piping are not permitted.

C. Hangers, Supports, and Sleeves:
   1. Support piping with UL and FM approved hangers. Acceptable manufacturers: Anvil, B-Line, Fee & Mason.
   2. Adjustable Clevis: Anvil Fig. 260.
   3. Adjustable Swivel: Anvil Fig. 69.
   4. Beam Clamp: Anvil Fig. 92 and Anvil Fig. 218 with retaining strap.
   5. Concrete Fasteners: Anvil steel shell and expander plug.
   6. Concrete Insert: Anvil Fig. 152.
   7. Riser Clamp: Anvil Fig. 261.
   8. Powder-driven inserts shall not be accepted.
   9. All pipes passing through rated floors or walls shall be sleeved and/or firestopped to an equivalent rating of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements.
   10. All piping hangers and seismic braces shall be listed for use with sprinkler systems or shall be designed by a registered Structural Engineer, licensed to practice in the State.
   11. All hangers, bracing, etc., shall be designed to constrain the sprinkler discharge resulting from a system pressure of 175 psig at the base of the riser.

2.04 SPRINKLER HEADS, EXTRA SPRINKLER CABINET

A. Provide the following sprinkler heads of proper types, ratings, and spacings for areas involved. Provide appropriate finishes compatible with space finishes being served. Acceptable manufacturers: Tyco, Viking, and Reliable.
   1. Quick Response Type:
      a. Pendent and brass upright chrome: Tyco TY-FRB (F.M. approved). K-Factor = 5.6
      b. Recessed, chrome: Tyco TY-FRB (F.M. approved). K-Factor = 5.6
      c. Fully concealed: Tyco-RF II, white coverplate. custom color as selected by Architect coverplate coordinate with Architect for quantity of custom colors required and location of custom color coverplates Provide optional air and dust seal in all patient care areas, sterile work, sterile storage, procedure rooms, decontamination, compounding Pharmacy and dietary spaces. K-Factor = 5.6
      d. Horizontal sidewall: Tyco-FRB chrome brass recessed.
      e. Dry: Tyco Model DS-1 standard coverage upright sidewall pendent, K-Factor = 5.6.
      f. Institutional: Quick Response: Tyco “Raven” chrome brass recessed and Tyco “Raven” sidewall K-Factor = 5.6.

B. Pendent heads in ceilings and horizontal sidewall heads shall have one-piece, non-adjustable escutcheons. Two-piece or slip type escutcheons shall not be accepted. This does not apply to recessed heads.

C. Provide sprinkler cabinet with spare sprinkler heads per NFPA 13.

D. Contractor shall coordinate dry barrel length as required for field conditions.

2.05 SWITCHES

A. Water Flow Switch: Notifier Model No. WFD-60 24 VDC vane type flow switch with pneumatic retard adjustable from 0 to 70 seconds, complete with two sets of single pole, double throw micro feature. Coordinate final voltage with Division 26.

B. Tamper Switches: Notifier Model No. PIBV2(A) for 4" and larger, Potter Model No. OSYSU-2 24 VDC for pipe size less than 4", tamper switch double pole, double throw micro feature for ½-inch to 12-inch valves. Coordinate final voltage with Division 26.

2.06 WATER FLOW ALARMS

A. Water Motor Alarm: Hydraulically operated impeller type alarm with 8” round aluminum alloy chrome plated red enameled gong and motor housing, nylon bearings, and inlet strainer. Tyco Model: WMA-1 or approved equal.

B. Electric Alarm: Electrically operated 24 VDC red enameled 10” round gong with pressure alarm switch. Coordinate final voltage with Division 26. Notifier MB-G10 or approved equal.

C. Contractor Option: Contractor has option of providing water motor alarm in lieu of electric bell. Contractor shall provide all piping, retarding chamber, valves, etc. As required for a functioning system at no additional cost to Owner.

D. Contractors Option: Contractor has option of providing electric bell in lieu of water gong. If contractor chooses this option, all required coordination with Division 26 and changes shall be provided at no additional cost to Owner.

2.07 FIRE DEPARTMENT CONNECTION

A. Acceptable Manufacturers: Croker-Standard, Potter Roemer, Elkhart.)
   1. Fire Department Connection (Siamese): Croker-Standard, Figure Number 6010-PB 4 inch by 2-1/2 inch two-way, flushed polished brass, with double clapper inlets siamese fire department connection. Hose threads shall be in accordance with local fire department requirements. Provide plugs with chains. If required by AHJ, provide 2-1/2” KNOX LOCKS on inlet connections.
   2. Remote Free Standing Fire Department Connection (Siamese): Croker Standard Figure 6510-PC 4” by 2-1/2” two-way, polished chrome with double clapper inlets siamese fire department connection. Overall height shall be 24”. Hose threads shall be in accordance with local fire department requirements. Provide plugs with chains. If required by AHJ, provide 2-1/2” KNOX LOCKS on inlet connections.
   3. Exposed Fire Department Connection (Siamese): Croker Standard Figure 6410-PB 4” by 2-1/2” two-way, exposed polished brass, with double clapper inlets siamese fire department connection. Hose threads shall be in accordance with local fire department requirements. Provide plugs with chains. If required by AHJ, provide 2-1/2” KNOX LOCKS on inlet connections.

B. Provide signage per NFPA 13, NFPA 14 and requirements of local authority having jurisdiction for proper identification for fire department service.

C. Furnish material and labor necessary to fully comply with the drawings and specifications and with the rules, regulations, and ordinances.
   1. Provide a 3/4" ball drip for all types of fire department connections. Route discharge, to outside of building.

2.08 FIRE VALVE AND HOSE CABINETS

A. Acceptable Manufacturers: Croker-Standard, Potter Roemer, Elkhart.

B. Fire Department Valve (In Stairwells): Croker-Standard, Figure Number 5035-PB 2-1/2 inch 5066-PB 2-1/2 inch PRV angle hose valve with Figure Number 7245-PB 2-1/2 inch by 1-1/2 inch screw-on reducer, and Figure Number 5709-PB 1-1/2 inch cap and chain.

C. Fire Department Valve (In Recessed Wall Box)
   1. Croker Standard, Figure Number 1710 white baked enamel steel box with Style A full acrylic panel door, containing the following by Croker-Standard or equivalent:
      a. Figure Number 5035-PB 2-1/2 inch 5066-PB 2-1/2 inch PRV Fire Department valve with Figure Number 7245-PB 2-1/2 inch by 1-1/2 inch screw-on reducer, and Figure Number 5709-PB 1-1/2 inch cap and chain.
      b. Provide Figure Number 1813 decal lettering for cabinet. Provide cabinet with a minimum of ten inches in depth. Exterior frame of cabinet shall be painted to match wall surface.

D. Roof Manifold (Freezeproof)
   1. Through-roof type: Croker-Standard, Figure Number 6630, 4 inch by 2-1/2 inch, two way, freestanding Siamese hydrant, Figure number 6642 vertical type hydrant control valve. Provide 3/4 inch ball drip and pipe to floor drain or automatic sprinkler drain.
   2. Through-wall type: Croker-Standard, Figure Number 6625, 4 inch by 2-1/2 inch, two way, exposed Siamese hydrant. Figure number 6640 through-wall type hydrant control valve. Provide 3/4 inch ball drip and pipe to floor drain or automatic sprinkler drain. Provide

required four inch UL and FM approved non-rising stem gate valve, with 3/4 inch ball drip and required piping.

E. Fire Hose Cabinet (2-1/2" F.D. Valve, 100' Hose, F.E.) (Recessed)
   1. Croker-Standard, Figure Number 1400 white baked enamel steel box, with Style A full acrylic panel door, and containing the following by Croker-Standard:
      a. Figure Number 3010 with 5068-PB 1/2 inch PRV valve fire hose rack assembly, 100 foot lined hose with fog nozzle Figure Number 3471-PB.
      b. Figure Number 5035-PB 2-1/2 inch 5066-PB 2-1/2 inch PRV fire department valve with Figure Number 5713-PB 2-1/2 inch cap and chain.
      c. Figure number 4202 2-1/2 gallon pressurized water fire extinguisher with a UL rating of 2A.
      d. Figure Number 4010 ten pound ABC multi-purpose dry chemical fire extinguisher with a UL rating of 4A:60B:C.
      e. Provide Figure Numbers 1811 and 1813 decal lettering for cabinet. Exterior frame of cabinet shall be painted to match wall surface.
   2. Fire Hose Cabinet (100' Fire Hose And Fire Extinguisher) (Recessed)

F. Croker-Standard, Figure Number 1300 white baked enamel box, with Style A full acrylic panel door, and containing the following:
   1. Figure Number 3010 with 5068-PB 1-1/2 inch PRV valve fire hose rack assembly, 100 foot of lined hose with fog nozzle.
   2. Figure Number 4202 2-1/2 gallon pressurized water fire extinguisher with a UL rating of 2A.
   3. Figure Number 4010 ten pound ABC multi-purpose dry chemical fire extinguisher with a UL rating of 4A:60B:C.
   4. Provide Figure Numbers 1811 and 1813 decal lettering for cabinet. Exterior frame of cabinet shall be painted to match wall surface.
   5. Fire Hose Cabinet (2-1/2" F.D. Valve & 100' Hose) (Recessed)

G. Croker-Standard, Figure Number 1210 white baked enamel steel box, with Style A full acrylic panel door, and containing the following by Croker-Standard:
   1. Figure Number 3010 with 5068-PB 1-1/2 inch PRV valve fire hose rack assembly, 100 foot lined hose with fog nozzle Figure Number 3471-PB.
   2. Figure Number 5035-PB 2-1/2 inch 5066-PB 2-1/2 inch PRV fire department valve with Figure Number 5713-PB, 2-1/2 inch cap and chain.
   3. Provide Figure Numbers 1811 and 1813 decal lettering for cabinet. Exterior frame of cabinet shall be painted to match wall surface.

H. Fire Hose Rack (100' Hose): Croker-Standard, Figure Number 3210 with 5070-PB, 2-1/2 inch PRV valve, 2-1/2 inch by 1-1/2 inch fire hose rack assembly with 100 foot lined hose and fog nozzle Figure Number 3471-PB. Mount to make rigid.

I. Provide all hose threads, operating nuts, and accessories for fire hose valves, meeting local Fire Department Standard.

2.09 WET ALARM CHECK VALVES AND ACCESSORIES

A. Wet Alarm Check Valve and Accessories – Water Motor Gong:
   1. Alarm check valve shall be equal to Tyco AV-1-300 divided seat ring, rubber faced clapper (removable) and listed for installation in the horizontal or vertical position. Alarm check valve shall be equipped with gauge connections on the system side and supply side of the valve clapper. Refer to drawing for required size.
   2. Provide alarm check valve trim package to include as a minimum:
      a. External bypass check valve to reduce false water flow alarms.
      b. Main drain valve.
      c. Alarm test valve.
      d. Pressure gauges (system and supply).
      e. Connection for water flow pressure alarm switch.
      f. All trim piping shall be galvanized pipe.
      g. Restriction assembly with stainless steel screen.

3. Provide retarding chamber equal to Tyco RC-1. Retarding chamber to be cast iron and 3/4" x 1/2" x 3/4" tee for connection to water flow pressure alarm switch.
4. Waterflow pressure alarm switch equal to System Sensor EPS10-2 24 VDC. Waterflow pressure alarm switch shall be bellows-activated type with adjustment range 4 to 20 psi with operating rising pressure from 4 to 8 psi. Switch shall be provided with two sets of single pole double throw contacts and 1/2". NPT male threaded connection. Coordinate final voltage with Division 26.

B. Wet Alarm Check Valve and Accessories – Electric Bell
1. Alarm check valve shall be equal to Tyco CV-1FR with resilient elastomer seal facing on the spring-loaded clapper.
2. Provide trim package to control include as a minimum as follows:
   a. Main drain valve.
   b. Pressure gauges (system and supply).
3. Provide waterflow switch connected to electric bell and fire alarm system.

2.10 INSPECTOR TEST AND DRAIN

A. Where indicated on drawings (riser or remote location), Inspector test and equal to AGF3011ASG. Inspector test and drain shall have:
1. Body Material: Bronze body, brass stem, steel handle, chrome-plated bronze ball, virgin Teflon valve seat. Sight Glass: Bronze housing with viewing window.
2. Components: A tamper resistant test orifice and a tapped port for system access.
3. Pressure Relief Valve and Drainage Piping: AGF Model 7000.
   a. Pressure Rating: Factory rated at 175 psi.
   b. Body Material: Bronze body and stainless steel spring.
   c. Components: Nylobraid flexible tube, two 1/2" NPT by barbed 90 degree elbows, external identification plate and integral flushing handle to remove debris.
   d. 1/2 inch MIPT inlet, 1/2 inch FIPT outlet.
   e. Relief pressure shall be factory set to project specifications.
   f. Relief valve shall operate to the OPEN position between 90% and 105% of the set pressure.
   g. Relief valve shall reseat or CLOSE at a minimum of 80% of set pressure.
4. Test Orifice Size: As required by NFPA 13, latest edition.
5. Size: F.I.P.T., same as connected piping.
6. Inlet and Outlet: Threaded.

2.11 DRY PIPE SYSTEM

A. Dry Pipe System Alarm Check Valve :
1. Provide check type valve with divided seat ring, rubber faced clapper to automatically activate water motor alarm or electric alarm. Alarm check valve shall be equal to TYCO DPV-1 with trim package.
2. Accelerator
3. Test and drain
4. Air Maintenance device with low pressure alarm
5. Alarm switch with supervisory capability
6. Pressure gauges where required by NFPA 13

B. Air Compressor
1. Coordinate with Division 26 for all wiring connection to approved air compressor. Air compressor shall be selected for 120/1/60.
2. Contractor to select air compressor to:
   a. Restore system pressure within 30 minutes or as required by NFPA 13.
   b. Maintain system pressure as required by approved dry pipe valve or shall be 20 psi in calculated trip pressure of dry pipe valve.

C. Calculations:
1. Provide calculations for water delivery time by approved software.

2. Water delivery shall be:
    a. Light Hazard – 60 seconds
    b. Ordinary Group 1 Hazard – 50 seconds
    c. Ordinary Group 2 Hazard – 50 seconds
3. Provide quick opening device as required.

D. Drainage:
1. System branch lines shall be pitched at least ½ inch per 10 feet.
2. Mains shall be pitched at least ¼ inch per 10 feet.
3. Auxiliary Drains:
    a. Located in areas subject to freezing shall be readily accessible.
    b. If capacity of trapped section is less than 5 gallon drain shall consist of valve not less than ½ inch and drain plug.
    c. If capacity of trapped section more than 5 gallon drain shall consist of two 1 inch valves and one 2 inch by 12 inch condensate nipple and shall be accessibly located.
4. Test connection shall be located on end of most distant sprinkler pipe in upper story and equipped with readily accessible shut off valve and plug not less than 1 inch, at least one of which shall be brass.

E. Gridded systems are not acceptable.

2.12 FIRE EXTINGUISHERS

A. Fire Extinguisher Cabinet (ABC Extinguisher)
1. Croker-Standard, Figure Number 1610 white baked enamel steel box with full acrylic panel door, containing the following by Croker-Standard:
    a. Figure Number 4010 ten pound ABC multi-purpose dry chemical fire extinguisher with a UL rating of 4A:80B:C.
    b. Provide Figure Number 1807 decal lettering for cabinet. Exterior frame of cabinet shall be painted to match wall surface.

B. Fire Extinguisher Cabinet (Ten Pound, CO2, F. E.)
1. Croker-Standard, Figure Number 1620 fire extinguisher cabinet white baked enamel steel box, with full acrylic panel door, and containing the following by Croker-Standard, or equivalent:
    a. Figure Number 4410 ten pound carbon dioxide fire extinguisher with an UL rating of 10B:C.
    b. Provide figure number 1807 decal lettering for cabinet. Exterior frame of cabinet shall be painted to match wall surface.

C. Fire Extinguisher Cabinet (2-1/2 Gal. Press. H2O Ext.)
1. Croker-Standard, Figure Number 1620 white baked enamel steel box, with full acrylic panel door, and containing the following by Croker-Standard:
    a. Figure Number 4202 2-1/2 gallon pressurized water fire extinguisher with an UL rating of 2A.
    b. Provide figure number 1807 decal lettering for cabinet. Exterior frame of cabinet shall be painted to match wall surface.

D. Fire Extinguisher (Wall Hung, ABC): Croker-Standard, Figure Number 4010, ten pound, ABC wall hung fire extinguisher, with UL rating of 4A:80B:C. Provide wall mounting bracket.

E. Fire Extinguisher (Bc Type, Wall Hung): Croker-Standard, Figure Number 4310 ten pound dry chemical fire extinguisher with an UL rating of 40B:C. Provide wall mounting bracket.

F. Fire Extinguisher (CO2 Type, Wall Hung): Croker-Standard, Figure Number 4410 ten pound carbon dioxide fire extinguisher with an UL rating of 10B:C. Provide wall mounting bracket.

G. Fire Extinguisher (K Type, Wall Hung): Croker-Standard, Figure Number 4834 6 liters with an UL type K rating. Provide wall mounting bracket.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate installation with other Divisions to ensure there are no conflicts. Fire protection piping shall not take priority in routing over HVAC ductwork.

3.02 PIPE INSTALLATION

A. Connect to water main as shown on drawings.

B. Install underground piping to provide a minimum cover of 2.5 feet over the top of the pipe. Provide 3 feet of cover under roads and driveways.

C. Install underground service utility tape approximately 18 inches above pipe.

D. Attach hangers to structural steel work as specified above, except that structural work shall not be drilled and punched. Wherever necessary, furnish, install, and securely anchor to or between building members suitable angle iron or other steel members to support sprinkler work.

E. Provide support for grooved piping in conformance with requirements of MSS-SP-69, "Pipe Hangers and Supports - Selection and Application". In addition to these requirements, leave no horizontal pipe unsupported between any two couplings nor shall any pipe be left unsupported whenever a change in direction of flow takes place. Provide supports meeting the requirements stated above, but ensure that the distance between supports does not exceed the following:

PIPE SIZE	MAXIMUM SPAN BETWEEN HANGERS
1 Inch	8 Feet
1-1/4 through 2 Inch	10 Feet
2-1/2 through 4 Inch	12 Feet
5 through 8 Inch	14 Feet
10 through 12 Inch	15 Feet

F. Support vertical piping at every other floor or every other pipe length, whichever is most frequent. Set the base of the riser or base fitting on a pedestal or foundation.

G. Seismic application: The use of single sided or friction type C-clamps with retention straps for hanging pipe is expressly prohibited on the project.

H. Where seismic bracing is indicated on plans, the Contractor will submit with the working plans copies of seismic bracing work sheets (ref. NFPA 13 - Fig. A.9.3.5(a)) or copies of seismic bracing calculations from industry standard computer software in accordance with seismic design category and ASCE07.

I. Piping Above Grade:
   1. In areas with no ceilings, run piping as high as possible. Minimum head room shall be 10’-0”.
   2. Contractor is responsible for installation of seismic bracing required by code. The Contractor is responsible for coordinating with the Structural Engineer regarding proper seismic bracing.

J. Underground Pipe:
   1. Underground pipe and fittings shall be listed in the Underwriters’ Laboratories approved fire protection equipment list.
   2. All underground piping for fire mains shall be installed, clamped and anchors, flushed and hydrostatically pressure tested according to the requirements of the Authorities Having Jurisdiction and NFPA 13 and 24.
   3. Trench and excavation work of the depth required by the Authorities and/or Agencies Having Jurisdiction for the proper installation of underground piping and valve shall be furnished by the sprinkler contractor.
   4. Trench and excavation work shall include excavating, cutting of holes through foundation walls and floors, preparing of trenches, backfilling as specified.

K. Provide section valves where shown on drawings, complete with tamper switch, water flow alarm, and drain connections. Provide sight-glass where inspector's test discharge cannot be readily seen when operating valve.

L. All control valves and indicating valves shall be chained into the open position and equipped with signaling devices per NFPA 13 – 8.15.1.1.2.1.

M. All metallic sprinkler piping, including but not limited to, all risers, cross mains, drains, and branches are to be primed with at least one coat of rust inhibitive primer before installation. (Except where stainless steel or chrome plated piping is used.)

N. All sprinkler piping shall be hydrostatically tested at 200 psi and shall maintain that pressure with no loss for 2 hours or as required by NFPA 13 for normal pressure in excess of 150 psi.

O. Provide drain valves, pipes and test connections as required by NFPA 13. Pipe drain lines and test connections to outside building as shown on the drawings and details. Test lines must originate from the most hydraulically remote point of each sprinkler zone. All drain piping and fittings shall be galvanized coated, no exception.

P. Cross mains and feed mains shall not pass through electrical rooms or similar spaces. Only the branch line serving such spaces shall be permitted within the boundaries of these rooms.

Q. Drain plugs shall be installed on trapped sections of piping between 5 and 50 gallons. Auxiliary drain valves, 1 inch or larger, shall be installed on trapped sections of pipe greater than 50 gallons, and piped to an accessible location.

R. All dry pipe systems shall be tested in addition to hydrostatic test, an air pressure leakage test at 40 psi for 24 hours with a maximum pressure loss of 1-1/2 psi.

3.03 SPRINKLERS

A. Install sprinkler heads and required piping in areas such as concealed spaces, lab hoods, dietary freezer and chill boxes and other special areas and spaces as required by NFPA 13, NFPA 101, applicable state and local codes.

B. Install sprinkler heads centerline of corridors and locate in the center of the ceiling tiles. Install sprinkler heads in other designated spaces in the center of the ceiling tiles and symmetrically locate with other heads within the ceiling. (See Architectural reflected ceiling plans.) Do not install sprinkler heads in other locations any closer than six (6) inches to any ceiling grid or wall.

C. Pendant sprinklers below ceiling shall be in alignment and parallel to ceiling features, walls, etc.

D. When the light fixtures extend below the ceiling, the sprinklers shall be spaced so that the sprinkler spray pattern is not obstructed. See electrical plans.

E. Provide guards on sprinkler heads where within 7'-6" of finished floor or wherever sprinklers may be subject to mechanical injury.

F. Furnish one sprinkler cabinet complete with 12 sprinklers of assorted temperature ratings of the type necessary and in use throughout the installation, including one special sprinkler wrench. Locate and mount adjacent to riser.

3.04 MATERIAL AND TEST CERTIFICATE

A. Provide copy of Contractor's Material and Test Certificate for underground and above ground piping as required by NFPA 13 and NFPA 24 in Owners O&M Manual.

3.05 OWNER'S INFORMATION CERTIFICATE

A. Before commencing work, the sprinkler contractor shall obtain from the Owner, or his Agent, an Owner's Information Certification containing the elements outlined in NFPA 13 – 4.3.

B. The Contractor shall provide a copy of the Owner's Certificate to the Engineer.

3.06 GUARANTEE

A. The fire protection installation, as specified under this section of the specifications, shall be guaranteed for one year against defective equipment, materials, and workmanship.

B. Guarantee shall not be construed as requiring the sprinkler contractor to render service or maintenance required in the normal operation of the equipment or to make repairs that may be needed due to normal wear and tear or the Owner's negligence, abuse, or breakage.

3.07 INSPECTION SERVICE

A. After completion of the fire protection installation and at the start of the guarantee year, the Contractor shall execute the National Automatic Sprinkler and Fire Control Association, Inc., Standard form of "Inspection Agreement," without charge to the Owner, calling for four inspections of the sprinkler system during the guarantee year. These inspections will, at a minimum, comply with the provisions and requirements of NFPA 25. During the guarantee year, the inspections shall be made as per the inspection agreement, plus the following maintenance to be performed during the course of the fourth inspection.
   1. Operation of all control valves.
   2. Lubrication of operating stems of all interior control valves.
   3. Operation of water motor gong and/or electric alarms.
   4. Cleaning of alarm valves.
   5. Cleaning of dry pipe valves.
   6. Lubrication of Fire Department Connection inlets.

B. The Standard Form of the National Automatic Sprinkler and Fire Control Association, Inc., "Report of Inspection" shall be filled out in triplicate after each inspection and the copies sent to the Owner, Insurance Carriers, Fire Department, or other authorities that the Owner may designate.

END OF SECTION 21 10 00

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:
   1. Plumbing system.
   2. Medical gas system.
   3. Natural Gas/Propane System.
   4. Demolition of existing equipment, and piping.
   5. Seismic bracing and anchorage for equipment, and piping.

1.02 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Kitchen equipment.

C. Laboratory equipment.

D. Field painting of equipment, and piping.

1.03 INNOVATION MEMORANDUMS

A. The owner has obtained purchase agreements for select equipment and materials. These purchase agreements are documented as Innovation Memorandums and are to be included as part of this project.

B. Innovation Memorandum No. 6: All plumbing fixtures and related products to be purchased from Ferguson Enterprises. Refer to Section 22 43 00.

C. Innovation Memorandum No. 7: All piping, valves, pipe fittings and related products to be purchased from Ferguson Enterprises. Refer to Sections 221116, 221119, 221316, 221319, 221416, 221513, 221516.

1.04 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, ductwork, and piping prior to construction.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in mechanical discipline.

E. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

F. All piping and valves to be purchased from Ferguson Enterprises. Contact Bettina Dawson office (615) 316-1920 cell (931) 239-0466 or email HCA@Ferguson.com.

1.05 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water and sewage connections.

1.06 CODES

A. Comply with all pertinent local, state, and national codes.

1.07 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to Contractor and is not to be considered all inclusive.
   6. American Gas Association (AGA).
   7. CISPI Standard 301.
   8. ASTM A 74.

1.08 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed.
   9. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.
   10. Submittals shall be submitted in line by line format. Each submittal shall be provided with a cover letter and supporting documentation indicating how the submittal meets each line of the referenced specification section. All discrepancies between the construction documents and the submitted product shall be clearly identified for engineer evaluation.
   11. If a product other than the basis of design is rejected by the engineer for any reason, the Contractor shall provide the basis of design product at no additional cost to the Owner.
   12. Shop Drawings:
      a. Complete equipment and piping systems in equipment rooms.
      b. Complete equipment and piping systems in entire building.
      c. Owner furnished equipment rough-in layouts.
      d. Kitchen equipment rough-in layouts.
      e. Laboratory equipment rough-in layouts.
      f. Firestop systems.
   13. Seismic Certification: Submit letter of certification from each equipment manufacturer verifying that equipment is designed to withstand horizontal forces using a "cp" factor of 0.75 applied in any direction.

1.09 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.10 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:
   14. Field Instruction: Provide explanation of how systems and equipment are to operate during each season and during emergencies.
   15. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.
   16. Videotape: Provide videotape or DVD of field instruction and demonstration to Owner at completion.

1.11 CONSTRUCTION RECORD DOCUMENTS

A. Provide construction record documents. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

1.12 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacturer bearing the U.L. label when such label is available.

B. Cast Iron Soil Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate locations of equipment, and piping to eliminate conflict with other divisions.

B. Carefully examine contract documents to be thoroughly familiar with items which require plumbing or mechanical connections and coordination.

C. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of plumbing work.

C. Perform repairs with materials that match existing in accordance with the appropriate section of these specifications.

3.03 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal piping at penetrations of roofs and outside walls.

3.04 TRENCHING, EXCAVATION AND BACKFILLING

A. Excavate to a depth at least 6" below bottom of pipe and a minimum of 36" above top of pipe. Fill below pipe, around pipe, and minimum of 12" above pipe with sand or Class "B" crushed stone tamped firm and even. Provide topsoil for final layer of dirt (12" minimum). Provide 6" spacing between pipes and between pipe and trench sides. Hand-grade with batterboards placed every 25'. Backfill by hand. Do not use rock or stone above sand or Class "B" crushed stone.

3.05 CONNECTION TO EQUIPMENT

A. Rough-in and connect to sterilizers, lab equipment, kitchen equipment, and Owner furnished equipment and provide a shutoff valve and union at each connection. Operating valves and/or controls for this equipment will be provided as an integral part of the equipment. Do not rough-in until shop drawings showing rough-in locations have been reviewed by Designer.

3.06 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Contractors option to identify exposed or accessible piping with snap-on or strap-on type markers. Color code markers in accordance with ANSI. Indicate pipe contents and direction of flow on marker. Install markers on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

C. Color code piping exposed in equipment rooms in accordance with the following schedule. Paint to be Sherwin Williams Metaltex or approved substitute.
   17. Domestic cold water - dark blue.
   18. Domestic hot water - rose red.
   19. Natural gas - lavender.

D. Include design operating pressures in psig for compressed air services.

E. Sanitary waste, storm and buried lines need not be marked.

F. Identify all equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

G. Identify each valve with engraved brass, aluminum, or stainless steel identification tag indicating valve service and sequential identification number. Attach tag to valve handle with brass, aluminum or stainless steel chain. Provide two bound manuals to Owner listing each valve

sequentially and indicating valve manufacturer, style, size, service, normal position, and specific location for each valve.

3.07 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

B. Cleaning Domestic Water System: Flush domestic water system progressively by opening building outlets and permitting flow to continue from each until water runs clear. Sterilize system in accordance with requirements of State Department of Public Health by the following method or other method acceptable to local authorities:

20. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling lines slowly and applying sterilizing agent at a rate of 50 ppm of chlorine as determined by residual chlorine tests at ends of lines. Open and close all valves while the system is being chlorinated.
21. After sterilizing agent has been applied and left standing for 24 hours, test for residual chlorine at ends of lines. If less than 25 ppm is indicated, repeat sterilizing process.
22. After standing for 24 hours and tests show at least 25 ppm of residual chlorine, flush out system until all traces of chemical used are removed.

3.08 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

C. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at a water pressure of 125 psig for two hours without leaks.

D. Test Natural Gas/Propane piping installations per the requirements of NFPA 54 National Fuel Gas Code.

E. Test drainage and venting system with necessary openings plugged to permit system to be filled with water and subjected to a minimum water pressure of 10 feet head at top of system. System to hold water for two hours without a water level drop greater than 4" in a 4" standpipe and without visible leakage. Test system in sections if minimum head can be maintained in each section.

F. Conduct air or smoke test if in opinion of Designer reasonable cause exists to suspect leakage or low quality workmanship.

G. Test foundation drain system in sections of 100 foot lengths before and after backfilling. Pass plumbers tape or Roto-Rooter through drain sections to ensure there are no restrictions to water flow.

H. Test gas piping and compressed air piping with Nitrogen at 100 psi for two hours without leaks.

I. Test flush valves for proper operation.

END OF SECTION 22 05 00

SECTION 22 07 19
PLUMBING INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.

B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

C. All pipe fittings, valves, and strainers in insulated pipe systems to be insulated.

D. Thermal resistance "R" values used herein are expressed in units of "Hour, Degrees F., Sq. Ft./BTU per Inch of Thickness" on a flat surface at a mean temperature of 75 degrees F.

E. Note that where electric cable wrap is called for, insulation is to be applied over cable.

1.02 DEFINITIONS

A. "Exposed" equipment, and piping are areas which will be visible without removing ceilings or opening access panels.

B. Outdoors is considered exposed to the weather.

C. Underground is buried, whereas in a trench below grade is considered concealed.

1.03 CERTIFICATION/QUALITY ASSURANCE

A. Products shall meet applicable national, state, and local building codes and be U.L. (or other recognized testing lab) listed for intended service.

B. All insulations, jackets, adhesives, coatings, sealers, and tapes shall have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E-84, NFPA 225, U.L. 723, and further must meet the requirements of NFPA 90-A and applicable building, and plumbing, codes.

C. All insulation materials shall be delivered and stored in manufacturers' containers and kept free from dirt, water, chemical, and mechanical damage.

D. Insulation shall be applied in a workmanlike manner by experienced, qualified tradesmen.

E. Insulation shall not be applied until all pressure testing has been completed, inspected, and released for insulation application.

F. Surfaces shall be clean and dry.

G. Insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

H. Insulation for duct, pipe, and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D-1692.

1.04 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. State of Florida Energy Code.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Materials for Pipe and Equipment: Provide factory pre-molded or shop or site mitered segment type insulation for pipe, pipe fittings, and valves. Fitting insulation to be of same thickness and material as adjoining pipe insulation. All insulation and related materials such as tape and mastic to meet applicable building code requirements for fire and smoke development.

1. Flexible Tubular: Provide 25/50 rated, closed-cell, flexible tubular rubber type pipe insulation. Product to have continuous operational temperature limit of 200 degrees F. and a minimum "R" value of 3.7 per inch (K=0.27) at 75 degrees F mean temperature. Product to be Armstrong AP Armaflex or approved equal pipe insulation. Use flexible tubular for the following services:
    a. Horizontal runs of waste lines carrying cold condensate from air conditioning equipment: 1" thick.
    b. Horizontal runs of rainwater leaders, overflow leaders, and roof drain bodies (contractor option): 1" thick.
    c. Domestic cold water piping 2" and under (contractor option): 1/2" thick.
    d. Domestic hot water supply without recirculating system (contractor option): 1-1/4" and under - 1/2" thick; 1-1/2" - 1" thick.
    e. Domestic hot water supply and recirculating return piping (contractor option): All sizes – 1” thick.
2. Fiberglass: Provide factory-formed, factory-jacketed fiberglass piping insulation. Product to be Manville "Micro-Lok 650" with "Type AP-T" jacketing or equivalent product manufactured by CertainTeed, Knauf, or Owens-Corning. Product to have continuous operational temperature limit of 850 degrees F and a minimum "R" value of 4.3 per inch (K=0.23) at 75 degrees F mean temperature. Jacket to be fiberglass reinforced kraft paper with aluminum foil and pressure sensitive closure system. Vapor-barrier mastic for application to below ambient pipe insulation shall be fungus resistant per ASTM D 5590 with 0 growth rating; Water based; Permeance per ASTM E 96, Procedure B, 0.013 perm or less at 43-mil dry film thickness suitable for indoor and jacketed outdoor use. Products: Foster 30-80 AF. Color: White. A breather mastic for application to above ambient pipe insulation (fittings, tees, valves, etc) shall be water based Foster 46-50 mastic or Childers CP-10 / CP-11. Use fiberglass piping insulation for the following services:
    a. Domestic hot water supply without recirculating system: 1-1/4" and under - 1/2" thick; 1-1/2" and greater - 1" thick.
    b. Domestic hot water supply and recirculating return piping: All sizes – 1” thick.
    c. Domestic cold water piping: 1/2" thick.
    d. Horizontal rainwater leaders, overflow leaders, and roof drain bodies: 1" thick.
3. Cellular Glass (Foamglass): Pittsburgh Corning "Foamglass." Product must be guaranteed by manufacturer to have a continuous operational temperature limit of 250 degrees F. and a minimum "R" value of 3.4 per inch (K=0.29) at 75 degrees F mean temperature. Vapor-barrier mastic for application to below ambient pipe insulation shall be fungus resistant per ASTM D 5590 with 0 growth rating; Water based; Permeance per ASTM E 96, Procedure B, 0.013 perm or less at 43-mil dry film thickness suitable for indoor and jacketed outdoor use. Products: Foster 30-80 AF Color: White. For all butt joints, a pliable insulation joint sealant shall be used. Products: Foster 95-50 or Childers CP-76. Use foamglass for the following services:
    a. Domestic water make-up, drain, equalizer and condenser water piping outside above grade at cooling tower to 18" [below grade] [inside building]: 1-1/2" thick.
    b. Domestic water make-up, drain, overflow, piping outside above grade at closed-circuit cooler to 18" below grade inside building: 1-1/2" thick.
4. Semi-Rigid, High Temperature, Fiberglass Board: Provide semi-rigid, high temperature, fiberglass board insulation with 650 degree F. or greater temperature limit. Product to be Manville "Pipe and Tank Insulation." Insulation to have 3 lbs./cu. ft. density and a minimum "R" value of 4.3 per inch (K=0.23) at 75 degrees F mean temperature. Jacket to be aluminum or ASJ as set forth below. Use for the following:
    a. Domestic hot water tanks: 2" thick cover with aluminum jacket (if not factory insulated).

2.02 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. Provide coverings and finishes for specific items hereinafter specified.

1. Use pre-molded insulation fabricated by the manufacturer of insulation material or shop or site mitered segment type insulation for all pipe fittings, elbows, tees, valves, and couplings.
2. PVC fitting covers over blanket fiberglass are NOT acceptable.
3. Contractor's option to provide factory pre-molded one-piece PVC insulated fitting covers, precut fiberglass insulation inserts, and necessary installation materials for all pipe fittings. Materials to be equal to Manville Zeston white, U.V. resistant, 25/50 rated, 20 mil thickness insulated PVC fitting covers and insulation inserts.

B. For any service, when below grade direct buried, cover straight pipe and fitting insulation with equivalent of Pittsburgh Corning "Pittwrap", Foster C.I. Wrap 50 mil or "Pittwrap SS11" jacketing. Valves in systems operating above 60 degrees F. and installed in valve boxes shall not be insulated; however, the valves shall be painted with a rust resistant product equivalent to Rustoleum.

C. For flexible tubular pipe and fitting insulation when exposed-to-view inside building or exposed to the weather, finish with two coats of paint, custom color blended to match surrounding surfaces.

D. When specifically approved by designer, when it is impossible to completely insulate pipe, fittings, or valves with specified insulation, Armstrong Armaflex insulation tape may be used to prevent condensate drip on small piping. Use of cork insulation tape is prohibited.

PART 3 EXECUTION

3.01 GENERAL

A. No insulation shall be cut where a hanger is located. If hangers have been installed by pipefitter tradesmen which violates this strict requirement, notify Designer immediately.

B. Piping systems shall be tested and found free of all leaks prior to installation of insulation covering.

C. All surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and during application of any finish, unless such finish specifically requires a wetted surface for application.

D. All adhesives, cements, and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

E. Install insulation using professional insulators who have adequate experience and ability.

F. Exposed-to-view insulation shall have a well tailored appearance.

G. Treat insulated pipe in equipment rooms and where exposed to normal view, so surfaces may be painted with water base latex paint. Use of mastics, adhesives, or jacketing which cause "bleeding" is prohibited.

3.02 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where fiberglass or flexible tubular insulation is used on piping sized 2" and larger, insert a section of foamglass insulation at hanger or support points between pipe and metal shield for full length of shield to prevent crushing of insulation. Insulation thickness to be same as adjoining insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. On cold pipe, vapor barrier should be carried through the hanger and sealed.

B. Apply flexible tubular insulation to pipe and fittings using the slip-on method with all joints tightly fitted and sealed with Armstrong 520 adhesive or approved equal. Seal butt joints, miter joints and torn or damaged insulation with adhesive.

C. Apply PVC insulated fitting covers and precut insulation inserts as follows:
1. Installation for hot systems:
    a. Place the precut fiberglass insert around the fitting, positioning the points of the insert on the inside radius of the elbow.

b. Butt the ends of the fiberglass insert against the ends of the pipe covering. Tuck and fold the insulation so that it covers all bare surfaces. Keep the fiberglass fluffed up to the thickness of the adjacent pipe insulation to assure maximum thermal efficiency.
c. Insert two stainless steel serrated tacks approximately 1/4" from one of the lap edges of the fitting cover. Then snap the cover in place over the fiberglass insulation.
d. After the fitting cover is in position, push the tacks into the overlapping throat seam. Apply color-matched, pressure-sensitive tape to the butt joints.

2. Installation for cold systems:
   a. Position, tuck, and fold the fiberglass insulation insert as described above in steps (a) and (b) for hot systems.
   b. Apply a vapor barrier mastic around the edges of the adjoining pipe insulation. Apply the mastic along the inside of the fitting cover throat overlap seam.
   c. Place the fitting cover over the insulation, lapping the mastic-covered edge over the other side of the throat seam.
   d. Apply color-matched, pressure-sensitive tape over the circumferential joints. The tape should extend over the adjacent pipe insulation and overlap itself by at least 2" on the downward side of the lap.

END OF SECTION 22 07 19

SECTION 22 11 16
DOMESTIC WATER PIPING AND VALVES

PART 1 GENERAL

1.01 SYSTEM REQUIREMENTS

A. Submit pipe, valves, and fittings and have approved before starting installation. Pipe, valves, and fittings to be new, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

C. Provide seismic support and bracing of all piping systems in accordance with Seismic Specification Section 22 05 48 Vibration and Seismic Control for Plumbing Piping and Equipment.

D. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

PART 2 PRODUCTS

2.01 COPPER PIPES

A. Type "L" hard-drawn seamless copper tubing, ASTM B-88: Domestic hot and cold water.

B. Type "K" hard-drawn seamless copper tubing:
   1. Domestic water lines located under slab.
   2. Exterior domestic water lines 2-1/2" and smaller underground.
   3. Provide rolled, soft drawn type "K" seamless copper tubing for under slab and below grade where length of run between fittings exceeds maximum hard-drawn lengths.

C. Copper Pipe Fittings:
   1. Provide sweat fittings, ASTM B-62, dimensions conforming to ANSI B16.22, wrought copper, with sweep patterns for copper tubing smaller than 4".
   2. Provide brazed fittings, ASTM B-88, dimensions conforming to ANSI B16.50, wrought copper, with sweep patterns for copper tubing, 4" and larger.
   3. Dielectric connection: Provide Epco Sales, lead free dielectric couplers at junction of steel pipe and equipment with copper piping systems. Use of steel or cast iron fittings in copper piping systems prohibited. T-drill branch tee connections shall not be allowed for domestic water piping.

D. Unions to be brass ground joint, 250-pound working pressure.

E. Nipples used in conjunction with copper pipe to be brass.

2.02 VALVES:

A. Valves are specified by Manufacturer and Model Numbers to establish quality levels unless otherwise noted. Crane, Milwaukee, Hammond, Nibco, Stockham, Centerline, Apollo, Kitz, or Watts are considered equal manufacturers. Provide clamp lock hand lever operators on valves less than 8 inches. Provide hand wheel and closed housing worm gear on valves 8 inches and larger unless indicated otherwise below. Provide chain operators for all equipment room and powerhouse valves 4 inch and larger which are located over 6 feet 6 inches above the finish floor. All valves shall meet NSF-61 requirements.
   1. Gate Valves:
      a. Gate valves for 2-1/2" and larger steel piping systems to be Class 125, cast iron body, bronze mounted, flanged ends, Nibco F-607-RW. Valves to have solid wedge disc, outside stem and yoke with rising stem, and bolted bonnet. Provide dielectric bolt protectors at all flanges when connecting dissimilar metals.
      b. Gate valves for copper piping 2" and smaller systems to be Class 125, bronze body, solder ends, Nibco S-113 LF. Valve to have either solid or split wedge disc, inside screw, non-rising stem, and screwed bonnet.

2. Globe Valves:
   a. Globe valves 2-1/2" and larger to be Class 150, cast iron body, bronze mounted, flanged ends, Watts M6115-74 lead free. Valves to have renewable seat and disc, outside stem and yoke with rising stem, and bolted bonnet.
   b. Globe valves 2" and smaller to be Class 150, bronze body, screwed ends, Apollo 121T-LF. Valve to be plug type with renewable seat and disc, rising stem, and union bonnet.
3. Ball Valves: Ball valves for copper water piping systems 2" O.D. and smaller to be equal to Apollo "3" S-585-66LF, solder ends, and for 2-5/8" thru 3-1/8" O.D. to be equal to Nibco T T-585-66LF, threaded ends. Valves to have bronze body, chromium plated bronze ball, PTFE seats, stuffing box ring and seals, and quarter turn on-off. Provide memory stops for valves used for balancing service. Valves to be rated for 400-psi WOG at 200 degrees F. Install threaded end valves with lead free brass adapters.
4. Butterfly Valves: Butterfly valves for steel water piping systems to be Crane Centerline Series 200, or approved equal industrial quality lug type with threaded holes. Valves to provide bubble-tight shut-off at 150 psi working pressure and 200 degrees F. Valves to have ductile iron body, "EPT" seats and stem seals, 316 stainless steel or bronze disc, 316 or 304 stainless steel stems. Valves 4" and larger to have weatherproofed sealed gear operator consisting of fully enclosed worm, worm gear, and worm shaft with handwheel to provide necessary torque for close-off and infinite throttling positions. Valves 3" and smaller to have 10 position lever lock handle suitable for on-off and manual throttling service. All operators to have valve position indicator and memory stop.
5. Check Valves:
   a. Check valves for copper water piping systems to be swing type, Class 125, bronze body, screwed ends, Nibco T-413-Y-LF.
   b. Check valves for steel water piping systems to be Nibco-910 LF Silent Check Valve. Body to be iron with bronze disc plates. Stem to be 316 stainless steel, seat to be EPT. Valve to be suitable for 200 psi working pressure at 200 degrees F.
6. Flow balancing valves for domestic hot water service shall be Bell & Gossett lead free Circuit Setter Plus or approved equal. Valve shall provide flow balancing, flow measuring, and positive shutoff service. Provide valve with memory stop, capped differential pressure readout ports with internal check valves and preformed insulation. Valve construction to be bronze body and brass ball rated for 200 psig at 250 degrees F.
7. Thermostatic Balance Valve: Valves to be CircuitSolver Thermostatic Balance Valve, models CSUA as manufactured by ThermOmegaTech or approved equal.
   a. The valve shall be certified lead free according to NSF/ANSI 61 standards
   b. The valve body shall be constructed out of stainless steel.
   c. The valve shall be rated for 200 PSIG working pressure and 250°F max. temperature.
   d. The valve shall have a fixed, non-adjustable (tamper proof) temperature setpoint; temperature setpoints range from 80°F to 170°F in 5°F increments.
   e. The valve shall have a temperature accuracy of ±3.0°F.
   f. The valve shall have a wax thermostatic element.
   g. The valve shall come in 6 sizes: ½”, ¾”, 1”, 1-1/4:, 1-1/2”, 2”.

2.03 STRAINERS

A. Provide cleanable "Y" type strainers in pump suction lines. Strainers to have iron body with screwed bronze or bolted iron cap. Strainer baskets to be brass. Water strainers to be Monel 20 mesh screen. Strainers to be line size complete with blow-down hose bibbs. When Suction Diffusers are specified for end suction pumps, strainers are not required. Strainers to be as follows:
   1. Screwed 400# WOG – Watts LFS 77F-D1.
   2. Flanged 125# - Watts LFS 77F-D1-125.
   3. Flanged 250# - Watts LFS 77F-D1-250.
   4. Solder joint 125# - Nibco S 413-Y-LF.

2.04 HANGERS

A. Seismic application: The use of single-sided or friction type C-clamps with retention straps for hanging pipe is expressly prohibited on the project unless authorized by seismic bracing design engineer. Refer to Section 22 05 48 for requirements.

B. Copper piping 1/2" O.D. thru 4" O.D., with no longitudinal movement to be Grinnell Figure 260, MSS SP-69 Type 1, adjustable clevis hanger with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

C. Non-insulated copper tubing 1/2" O.D. thru 4" O.D. with no longitudinal movement to be Grinnell Figure CT-99C, MSS SP-69 TYPE 9, plastic coated adjustable tubing ring hanger.

D. Insulated steel piping 1" thru 30" with longitudinal movement to be Grinnell Figure 171, MSS SP-69 TYPE 41, pipe roll complete with Figure 160, MSS SP-69 TYPE 39A or 39B, pipe insulation protection saddle sized for proper pipe size and insulation thickness.

E. Insulated copper piping 1/2" O.D. thru 2-1/8" O.D. with longitudinal movement to be Grinnell Figure 171, MSS SP-69 TYPE 41, pipe roll complete with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

F. Support copper pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

G. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

H. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

I. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

J. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

K. Attention is called to pipe spring isolation specified to be furnished by this Contractor.

L. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with following tables.

COPPER TUBING SUPPORTS	
SIZE (IN.)	DISTANCE BETWEEN SUPPORTS (FT.)
5/8	6
7/8 - 1-1/8	8
1-3/8 - 2-1/8	10
2-5/8 - 5-1/8	12
6-1/8 - 8-1/8	14

M. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

N. See Insulation Section for requirements at pipe hangers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

3.02 FIRE-RATED PARTITIONS

A. Provide permanent firestop system at all piping penetrations of fire-rated walls and floors. Review details on drawing as well as this specification for permissible firestop systems. The firestop system shall have been tested and approved in accordance with ASTM E119 and U.L. 1479 (ASTM E814) and classified for up to 2 hours fire rating. Firestop system shall be type detailed on drawings or intumescent type capable of expanding up to 8 times its original volume. Firestop system to be 3M, Hilti, Nelson, Johns Manville, or Specified Technologies. Firestop system shall be installed in strict accordance with published U.L. approved installation instructions. Piping to pass through the fire-rated partition insulated or non-insulated as specified and detailed. Submit U.L. approved installation drawing for each type of penetration prior to construction.

3.03 NON-RATED PARTITIONS

A. Piping to pass through the walls insulated or non-insulated as specified. Wall should be finished to fit neatly around the piping. Firestopping is not required at non-rated partitions.

3.04 PIPE SLEEVES

A. Pipe sleeves shall be provided at non-rated partitions and floor penetrations. Pipe sleeves to be Schedule 40 or 18 gage steel. Sleeves to extend 1-1/2" in excess of partition depth on each side. Sleeves penetrating floors in wet areas, including all mechanical rooms, shall extend a minimum of 1 inch above the floor.
   1. Piping requiring sleeves: Copper pipes thru masonry walls

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Install copper fittings with suitable flux and silver solder with a melting temperature of at least 1000 degrees F. and 95/5 lead free solder. Type K copper pipe to be joined by means of suitable flux and silver or phos-copper.

K. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

L. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

M. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

3.05 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.06 VALVE ACCESS

A. Locate all shutoff and control valves for easy access and operation. Where valves must necessarily be located in enclosed spaces, they shall be provided with access panels of sufficient size for operation. Furnish these access panels to proper trades for installation.

END OF SECTION 22 11 16

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Backflow preventers.
   2. Shock absorbers.
   3. Trap primers.
   4. Equipment connection backflow device.
   5. Vacuum breakers.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All products to be purchased from Ferguson Enterprises. Contact Bettina Dawson office (615) 316-1920 cell (931) 239-0466 or email HCA@Ferguson.com.

B. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

2.02 BACKFLOW PREVENTERS

A. Acceptable Manufacturer: Wilkins.

B. Product must meet NSF-61.

C. Provide completely automatic, unit, fitted with tight closing shut-off valves and test cocks at each end.

D. Construct such that all parts are replaceable without removing unit from line.

E. Design such that total pressure drop through complete backflow preventer does not exceed 12 PSI at rated flow. Certified U.S.C. flow curves shall be provided for each device as part of the submittal package.

2.03 SHOCK ABSORBERS

A. Acceptable Manufacturer: Sioux Chief.

B. Refer to drawings for placement and size of shock absorbers.

C. Access Covers: Minimum size 12” x 12” located for access to shock absorbers.

2.04 TRAP PRIMERS

A. Acceptable Manufacturer: Precision Plumbing Products.

B. Construct trap primer valve of all bronze, chrome plated with removable operating parts, integral vacuum breaker, and gasketed access cover.

C. Access Covers: Minimum size 12” x 12” located for access to trap primers.

2.05 EQUIPMENT CONNECTION BACKFLOW DEVICE

A. Acceptable manufactures: McCann Engineering ASSE 1022 Backflow Preventer.

B. Must meet ASSE 1022

C. Provide the above referenced backflow device if beverage equipment does not have integral backflow device.

2.06 VACUUM BREAKERS

A. Wilkins model 420

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Backflow Preventers:
   1. Pipe relief through fixed air gap and discharge to sewer.

2. Install adjacent to wall and/or floor utilizing stand-off brackets, angle frame, and/or concrete piers.
3. Test unit for leaks and pressure drop. Clean and/or replace soiled strainer media.
4. Provide dual parallel reduced pressure backflow preventers on the main domestic water entrance to the facility.
5. Provide a reduced pressure backflow preventer on the domestic hot and cold water lines feeding the laboratory and morgue.
6. Provide backflow prevention vacuum breaker on any water line feeding any piece of equipment which could cause back siphonage such as mechanical equipment, trap primer lines, etc.

B. Shock Absorbers:
1. Install shock absorbers above ceiling, outside wall so access and maintenance can be performed without disturbing walls and non-liftouts ceilings.
2. Install shock absorbers on all flush valves, solenoid valves and quick closing devices.
3. Test and certify shock absorbers by plumbing and drainage institute.

C. Trap Primers: Trap primers to have approval of plumbing and drainage institute.

D. Equipment Connection Backflow device: Provide on all water lines feeding coffee makers, ice machines and beverage dispensers.

E. Vacuum Breakers: Provide on water lines feeding equipment to protect against back siphonage of contaminated water.

END OF SECTION 22 11 19

SECTION 22 11 23

DOMESTIC WATER PUMPS

PART 1 - GENERAL AND PRODUCTS

1.01 DOMESTIC WATER BOOSTER PUMPS

A. Acceptable Manufacturers: Taco, Grundfos, Systecon, Syncroflo, Bell & Gossett, or Canariis.

B. Provide the number of pumps scheduled and a hydro cumulator tank to automatically maintain system pressure even during low and no flow conditions.

C. Provide hydro cumulator with a usable capacity of 25 gallons and complete with a "maxi-start" switch.

D. Provide variable speed pumps, close-coupled, multi stage type.

E. Provide pump motor of electrical characteristics listed on schedule, 3500 rpm rated at 40 degrees C ambient, meeting NEMA standards and operating within the available service factor at any usable point on pump capacity-head curve.

F. Provide pump package including low suction pressure cut-off switch (to shut down total system), suction strainer (each pump station), check valves, shut-off valves, and central gauge panel consisting of suction and discharge pressure gauges.

G. Provide operating and maintenance instructions and factory representative for start-up.

1.02 HOT WATER RECIRCULATING PUMP

A. Acceptable Manufacturers: Taco, Paco, or Bell and Gossett.

B. Model number, capacity, and electrical characteristics as scheduled on drawings.

C. Provide in-line pump with all bronze construction, flange connections, hardened steel shaft, bronze impeller, and mechanical seal.

D. Provide flexible coupled motor with thermal overload protection Support motor from pump casing.

PART 2 - EXECUTION

2.01 INSTALLATION

A. Verify location and clearance requirements.

B. Install in accordance with manufacturers' published installation instructions.

C. Domestic water booster pumps: Provide factory representative or manufacturer's service representative to verify proper installation, operation and performance as specified.

2.02 START-UP AND TEST

A. Start-up pump, verify integrity of connection, electrical phasing.

B. Test pumps in operation under design load conditions.

END OF SECTION 22 11 23

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Submit pipe and fittings and have approved before starting installation. Pipe and fittings to be new, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

C. Provide seismic support and bracing of all piping systems in accordance with Seismic Specification Section 22 05 48 Vibration and Seismic Control for Plumbing Piping and Equipment.

PART 2 PRODUCTS

2.01 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, draining tube, drawn temper. Waste, vent and drainage piping 1-1/2 and smaller.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B 16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASME B 88, Type L, water tube, drawn temper.

D. Copper Pressure Fittings:
   1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
   2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

E. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
   1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

F. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.02 CAST IRON SOIL PIPE

A. Standard weight cast iron soil pipe with drainage fittings:
   1. Waste, drainage, and vent lines 2" and larger. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.
   2. Drain lines under concrete or other paving and under buildings, including to a distance of not less than 5'-0" from building. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF® International.
   3. Manufacturers: Charlotte Pipe and Foundry, Tyler Pipe, AB&I Foundry.
   4. Joints in cast iron soil pipe may be hub and spigot with neoprene compression gaskets conforming to ASTM C564 or "No-hub". No-hub shall not be permitted on underground systems. No-hub couplings shall be standard CISPI 310 couplings manufactured with 300 series stainless steel and neoprene rubber sleeve.
   5. No-hub couplings shall be heavy-duty coupling as manufactured by Husky series 2000. Coupling shall be constructed of stainless steel type 304, 26 gauge or thicker, with neoprene rubber gasket, ASTM C1540. Install per manufacturer's torque requirements.

2.03 PVC PIPE

A. Schedule 40 PVC DWV pipe, ASTM D-2665 solid wall Type 1, Grade 1.
   1. Schedule 40 DWV waste and drainage piping below grade ONLY. PVC piping not permitted within Boiler Room or Kitchen.

B. TYPE PSM SDR-35 PVC sewer pipe with gasket slip joints, ASTM D-3034.
   1. Outside gravity, underground sanitary sewer drainage, from 5'-0" outside building to connection to local sewer.

C. Fittings to match piping system. Fittings to have manufacturer's trademark permanently identified in accordance with MSS-SP-25. Supplier to include with submittal data certification that fittings and flanges have met requirements.

D. Joints for piping to be made with tetrahydrofuron solvent cement. Joints to be in accordance with manufacturer's recommendations.

E. Pipe, fittings, and cement to all be supplied by single manufacturer for entire project.

F. All solvent cements shall be low emitting VOC at 510 g/L or less.

2.04 HANGERS

A. Seismic application: The use of single-sided or friction type C-clamps with retention straps for hanging pipe is expressly prohibited on the project unless authorized by the seismic bracing design engineer refer to Specification Section 22 05 48 for requirements.

B. Non-insulated cast iron soil pipe thru 8" to be Grinnell Figure 104, MSS SP-69 TYPE 6, adjustable swivel ring, split ring type, and pipe 10" thru 15" Grinnell Figure 260, MSS SP-69 TYPE 1, adjustable clevis hanger.

C. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

D. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

E. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

F. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

G. Attention is called to pipe spring isolation specified to be furnished by this Contractor.

H. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with Cast Iron Supports. Support each fitting, at intervals of not more than 5 feet, and at least at each joint.

I. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

3.02 FIRE-RATED PARTITIONS

A. Provide permanent firestop system at all piping penetrations of fire-rated walls and floors. Review details on drawing as well as this specification for permissible firestop systems. The firestop system shall have been tested and approved in accordance with ASTM E119 and U.L. 1479 (ASTM E814) and classified for up to 2 hours fire rating. Firestop system shall be type detailed on drawings or intumescent type capable of expanding up to 8 times its original volume. Firestop system to be 3M, Hilti, Nelson, Johns Manville, or Specified Technologies. Firestop system shall be installed in strict accordance with published U.L. approved installation instructions. Piping to pass through the fire-rated partition insulated or non-insulated as

specified and detailed. Submit U.L. approved installation drawing for each type of penetration prior to construction.

3.03 NON-RATED PARTITIONS

A. Piping to pass through the walls insulated or non-insulated as specified. Wall should be finished to fit neatly around the piping. Firestopping is not required at non-rated partitions.

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

K. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

L. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

3.04 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.05 GRADES AND ELEVATIONS

A. Uniformly grade sanitary drainage lines to elevations shown. If no elevations are given, pitch sewers not less than 1/8" per foot.

END OF SECTION 22 13 16

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for:
   1. Cleanouts.
   2. Grease interceptors.
   3. Manholes.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Cleanouts and grease interceptors to be purchased from Ferguson Enterprises. Contact Bettina Dawson office (615) 316-1920 cell (931) 239-0466 or email HCA@Ferguson.com.

2.02 CLEANOUTS

A. Acceptable Manufacturer: Zurn. The following model numbers listed are Zurn.

B. Exterior: ZN-1402-HD cast iron cutoff ferrule with round nickel bronze scoriated frame and cover, secured.

C. Finished Concrete Floor: ZN-1400-HD inside caulk round nickel bronze scoriated frame and cover.

D. Resilient Tile Floor: ZN-1400-X inside caulk round nickel bronze scoriated frame and cover, secured.

E. Carpet: ZN-1400-CM inside caulk round nickel bronze scoriated frame and cover; provide carpet marker and permanent marker in ceiling above.

F. Wall: ZN-1440-1 cast iron caulking ferrule with Nikaloy smooth round frame and cover.

G. Wall: Z-1446 cast iron cleanout with bronze plug and round stainless steel cover.

H. Access Covers: Minimum size 12" x 12" located for access to valves, shock absorbers, trap primers, wall cleanouts, etc.

I. Furnish cleanouts occurring in waterproof floors with clamping devices.

2.03 GREASE INTERCEPTOR

A. Acceptable Manufacturer: Zurn.

B. Provide exterior grease interceptors constructed of reinforced concrete and of minimum capacity, location and detail as shown on drawings.

C. Construct units of cast iron enameled lined with grease draw-off feature and flow control device. Model number, capacity, and appurtenances are scheduled on drawings.

2.04 MANHOLES

A. Provide manhole frame and covers manufactured by Neenah Foundary, John Bouchard, or approved equal.

B. Provide frame, cover, steps, concrete, masonry, etc., to construct manholes.

C. Manhole may be built-in place brick masonry on preconstructed concrete as detailed on drawings.

PART 3 EXECUTION

3.01 INSTALLATION AND TESTING

A. Cleanouts:
   1. Locate line size cleanouts, except 4" largest required, at base of all soil and waste stacks, at all changes in direction and in straight runs. Ensure spacing in straight runs does not exceed 50 feet inside building and 100 feet outside the building.

2. Extend inaccessible cleanouts up through floor and/or wall provided easy accessibility cannot be obtained otherwise.

B. Grease Interceptors:
   1. Locate for easy access and cleaning.
   2. Obtain approval from local and state health department.

C. Manholes:
   1. Install such that frame and cover elevation is 1" higher than surrounding grade.
   2. Construct manholes per detail on drawings.

END OF SECTION 22 13 19

SECTION 22 14 00
STORM DRAINAGE

PART 1 GENERAL

1.01 SYSTEM REQUIREMENTS

A. Submit pipe and fittings and have approved before starting installation. Pipe, and fittings to be new, manufactured domestically, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

C. Provide seismic support and bracing of all piping systems in accordance with seismic details shown on drawings.

PART 2 PRODUCTS

2.01 CAST IRON SOIL PIPE

A. Standard weight cast iron soil pipe with drainage fittings:
   1. Storm water piping.
   2. Rainwater leaders inside building.
   3. Drain lines under concrete or other paving and under buildings, including to a distance of not less than 5'-0" from building.
   4. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF® International.
   5. Joints in cast iron soil pipe may be hub and spigot with neoprene compression gaskets or "No-hub". No-hub shall not be permitted on underground systems. No-hub couplings shall be standard CISPI 310 couplings manufactured with 300 series stainless steel and neoprene rubber sleeve.
   6. No-hub couplings shall be heavy-duty coupling as manufactured by Husky, Clamp-All or Charlotte Pipe and Foundry. Coupling shall be constructed of stainless steel type 304, 26 gauge or thicker, with neoprene rubber gasket, ASTM C1540. Install per manufacturer's torque requirements. Heavy-duty couplings shall be installed at the lower two floors of construction, and at the base of all rainwater, sanitary waste, and vent stacks.

2.02 PVC PIPE

A. Schedule 40 PVC pipe, ASTM D-1785 Type 1, Grade 1, 200-psi test:
   1. Storm water piping below grade.
   2. Foundation drainage: Perforated schedule 40 PVC laid in pea gravel may be used in lieu of perforated clay tile.

B. Fittings to match piping system. Fittings to have manufacturer's trademark permanently identified in accordance with MSS-SP-25. Supplier to include with submittal data certification that fittings and flanges have met requirements.

C. Joints for piping to be made with tetrahydrofuron solvent cement. Joints to be in accordance with manufacturer's recommendations.

D. Pipe, fittings, and cement to all be supplied by single manufacturer for entire project.

E. All solvent cements shall be low emitting VOC at 510 g/L or less.

2.03 HIGH DENSITY POLYETHYLENE PIPE

A. High density, perforated polyethylene pipe shall be manufactured to AASHTO M252 and M294, ASTM F405 and F667:
   1. Underfloor slab drainage pipe.
   2. Retaining wall drainage pipe.

B. Pipe shall be covered 100 percent polyester, knitted fabric to prevent infiltration of sand and soils.

C. Contractor shall backfill around pipe with Class 1 materials per ASTM D2321. Minimum compaction of 85 percent shall be required.

2.04 HANGERS

A. Seismic application: The use of C-clamps for hanging pipe is expressly prohibited on the project.

B. Non-insulated cast iron soil pipe thru 8" to be Grinnell Figure 104, MSS SP-69 TYPE 6, adjustable swivel ring, split ring type, and pipe 10" thru 15" Grinnell Figure 260, MSS SP-69 TYPE 1, adjustable clevis hanger.

C. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

D. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

E. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

F. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

G. Attention is called to pipe spring isolation specified to be furnished by this Contractor.

H. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with Cast Iron Supports. Support each fitting, at intervals of not more than 5 feet, and at least at each joint.

I. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

J. See Insulation Section for requirements at pipe hangers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

K. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

L. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

3.02 FIRE-RATED PARTITIONS

A. Provide permanent firestop system at all piping penetrations of fire-rated walls and floors. Review details on drawing as well as this specification for permissible firestop systems. The firestop system shall have been tested and approved in accordance with ASTM E119 and U.L. 1479 (ASTM E814) and classified for up to 2 hours fire rating. Firestop system shall be type detailed on drawings or intumescent type capable of expanding up to 8 times its original volume. Firestop system to be 3M, Hilti, Nelson, Johns Manville, or Specified Technologies. Firestop system shall be installed in strict accordance with published U.L. approved installation instructions. Piping to pass through the fire-rated partition insulated or non-insulated as specified and detailed. Submit U.L. approved installation drawing for each type of penetration prior to construction.

3.03 NON-RATED PARTITIONS

A. Piping to pass through the walls insulated or non-insulated as specified. Wall should be finished to fit neatly around the piping. Firestopping is not required at non-rated partitions.

3.04 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.05 GRADES AND ELEVATIONS

A. Uniformly grade storm drainage lines to elevations shown. If no elevations are given, pitch sewers not less than 1/8" per foot.

END OF SECTION 22 14 00

SECTION 22 33 31

COMMERCIAL STORAGE ELECTRIC DOMESTIC WATER HEATERS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide a factory packaged, electric storage type domestic water heater.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Unit manufactured by PVI, Hesco, A. O. Smith, Lochinvar, or State Industries. Model number, input, capacity, electrical characteristics, accessories scheduled on drawings as basis of design.

B. Storage tank shall be carbon steel, glass lined, cement, epoxy, nickel plated, LDX2101 and ASME Code stamped in accordance to Section IV, Part HLW of the ASME code, vessel shall be National Board Registered for 150 psi working pressure. Tank shall have a minimum of one manway opening allowing for complete access to the tank interior.

C. Electrical elements shall be 20 40 80 watts per sq. inch density, 9 KW each, and switched through magnetic contactors and protected by power fuses.

D. Element control shall be through a 2 step 3 step 6 step proportional sequencer time delay sequencer.

E. Safety controls shall include:
   1. Electronic low water cutoff.
   2. Low water pressure (below 30 psi).
   3. Door interlock.
   4. Power distribution blocks shall be solderless.
   5. Control circuit shall be fused and switched, 120 volts.
   6. Two immersion operating thermostats.
   7. Immersion temperature limiting device.

F. Provide 3-1/2 inch dial thermometer and 3-1/2 inch pressure gauge, console mounted.

G. ASME temperature and pressure relief valve.

H. Operating instructions and written warranties.

PART 3 EXECUTION

3.01 INSTALLATION

A. Verify location and clearance requirements.

B. Installation in accordance with manufacturers' recommendations and project drawings.

END OF SECTION 22 33 31

SECTION 22 34 00
FUEL FIRED DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide a factory package, direct natural, gas fired, forced draft, ASME storage type domestic water heater.

1.02 RELATED WORK

A. Section 23 51 23, Prefabricated Gas Vent Pipe.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Unit manufactured by PVI, Sellers, HTP, AO Smith, Lochinvar or approved equal. Model number, capacity, accessories scheduled on drawings are basis of design.

B. Storage tank to be carbon steel, epoxy, glass, stainless steel, nickel plated, LDX2101, stamped for 150 psi working pressure.

C. Burners to be stainless steel and 100% safety shutoff controls, spark ignition, combustion blower unit, gas-air mixer, pilot flame rod, regulators, pressure switches, relief door, low water cutoff, high limit control, panel-mounted temperature and pressure gauges.

D. ASME temperature and pressure relief valve.

E. Fiberglass insulation with steel jacket to meet latest ASHRAE standards.

F. Operating instructions and written warranties.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify location and clearance requirements.

B. Installation in accordance with manufacturers' recommendations and project drawings.

C. Furnish and install a Hesco Model HGD II-S, gas safety alarm monitor, 120/1/60, equipped with Power-ON indicator light, alarm indicator light, automatic audio alarm shut off, terminal strip with 24-volt contacts, 12-volt contacts, and 9-volt contacts to allow interface to remote alarm light, remote alarm bell, exhaust fan, or electric gas valve in the event hazardous gases reach alarm levels listed below.

D. The HGD II-S shall be calibrated at the factory with carbon monoxide, and shall be sensitive to the following gases at the levels listed below:

Gas	Alarm Level
Carbon Monoxide	300 PPM
Propane (L.P.)	5,250 PPM
Natural/Methane Gas	12,500 PPM

E. The HGD II-S shall be equipped with a built-in manual reset switch that will not allow the unit to be reset while hazardous gases are present in the equipment room at the above listed levels.

END OF SECTION 22 34 00

SECTION 22 43 00

HCA PLUMBING FIXTURES

PART 1 GENERAL

1.01 MANUFACTURERS

A. Provide plumbing fixtures and drains as listed on drawings and described herein. Fixture numbers are per HCA standard per purchase agreement for all products. All products to be purchased from Ferguson Enterprises. Contact Bettina Dawson office (615) 316-1920 cell (931) 239-0466 or email HCA@ferguson.com.

B. All drainage products to be Zurn no exceptions. All drains installed above slab to be complete with clamping device.

C. Stainless steel sinks shall be Elkay no exceptions.

D. Flush valves shall be Zurn-AV no exceptions.

E. Pressure balancing shower valves shall be Symmons

F. Commercial or public faucets shall be Zurn no exceptions.

G. Gooseneck faucets shall be Zurn no exceptions. All gooseneck water supply spouts for lavatories and sinks shall discharge a minimum of 5" above the rim of the specified fixture. All gooseneck faucets shall be furnished with plain end spouts; aerators shall not be accepted. An in-line flow control device to limit flow to 1.5 GPM maximum shall be installed on all gooseneck faucets, including gooseneck sensor faucets unless otherwise called for on specific fixtures.

H. Fixture supplies, stops, and traps to be commercial grade Proflo. Traps to be 17 gauge with wall flange. Supplies to be flexible stainless steel supply lines and stops to be Proflo quarter turn compression stops.

I. Water closet seats shall be Proflo, no exceptions.

J. Thermostatic master mixing valves shall be Symmons, Powers, or Leonard.

K. China or enamel fixtures to be white in color

L. All wall-mounted lavatories shall be capable of supporting a minimum vertical load of 250 pounds. Install wall-mounted lavatories with floor-anchored carriers which fit in standard stud walls.

M. All water supply spouts for lavatories and sinks shall discharge a minimum of 1" above the rim of the specified fixture.

N. Where blade handles are specified, they shall not be less than 3-1/2", or more than 4-1/2" in length, except that handles of clinical sinks shall not be less than 6" long.

O. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

P. InPro Solid Surface Shower receptacles no exceptions. Fixture color to be white per HCA design team

PART 2 PRODUCTS

2.01 FIXTURES

P101 Water Closet - Public, Floor Mounted, Barrier-Free, 1.28 Gallon:
Zurn Z5665-BWL1 Floor Mt water closet 1.28gpf Bowl
Zurn Z-6000-AV-HET 1.28gpf flush valve
Proflo PFTSCOF2000WH Comm Elongated OF Closet seat

P102 Water Closet - Public, Wall Mounted, Barrier-Free, 1.28 Gallon:
Zurn Z5615-BWL 1.28gpf Bowl
Zurn Z-6000-AV-HET 1.28gpf flush valve
Proflo PFTSCOF2000WH Comm Elongated OF Closet seat
Zurn Z1201N wall carrier

P104	Water Closet - Patient, Floor Mounted, Barrier-Free, 1.6 Gallon: Zurn Z5666-BWL-AM 1.6gpf Bowl Zurn Z-6011-AV-BWN-WS1 bedpan flush valve Proflo PFTSCOF2000WH Comm Elongated OF Closet seat
P105	Water Closet - Patient, Wall Hung, Barrier-Free, 1.6 Gallon: Zurn Z5616-BWL 1.6gpf Bowl Zurn Z-6011-AV-BWN-WS1 bedpan flush valve Proflo PFTSCOF2000WH Comm Elongated OF Closet seat Zurn Z1201N wall carrier
P106	Water Closet – Patient Bariatric, Floor Mounted, Barrier Free, 1.6 Gallon: Whitehall WH2125A-T-3-1.6 GPF-BL-HSBJ open front seat less cover Zurn Z6000AV-WS1 flush valve Zurn Z877P2-LKS-HK-SH2 bedpan washer
P107	Water Closet - Ligature Resistant, Exposed Flush Valve: Whitehall WH2142-ADA-T-0023 ADA water closet, top spud, integral seat. Whitehall WH2802-SLPT-ADA-1.6 flush valve cover with hydraulic flush valve
P108	Water Closet - Public, Floor Mounted, Barrier-Free, 1.28 Gallon: Zurn Z5665-BWL1 Floor Mt water closet 1.28gpf Bowl Zurn ZER-6000-AV-HET-CPM 1.28gpf flush valve Proflo PFTSCOF2000WH Comm Elongated OF Closet seat
P109	Water Closet - Public, Wall Mounted, Barrier-Free, 1.28 Gallon: Zurn Z5615-BWL Wall MT water closet 1.28gpf Bowl Zurn ZER-6000-AV-HET-CPM 1.28gpf flush valve Proflo PFTSCOF2000WH Comm Elongated OF Closet seat Zurn Z1201N wall carrier
P132	Water Closet - Ligature Resistant, Floor outlet, Sensor Flush Valve: Whitehall WH2142-ADA-W-0023 ADA water closet, back spud, integral seat. Zurn ZEMS6152AV-WS1-4L Conc sensor flush valve Zurn ZP6000HW6 Hardwire power converter Zurn ZEMS6199-BX12-C Stainless access panel 12x12
P201	Urinal: Zurn Z5755U 0.5gpf Urinal Zurn Z-6003-AV-EWS 0.5 gpf flush valve Zurn ZZ1222 wall carrier
P202	Urinal, Sensor: Zurn Z5755U 0.5gpf Urinal Zurn ZER-6003-AV-EWS-CPM 0.5 gpf flush valve Zurn ZZ1222 wall carrier
P301	Lavatory, Wall Hung, Public, TMV: Zurn Z5344 White 20x18 4cc wall mount lavatory Zurn Z812A4-XL-FC-05 gooseneck, wrist blades Wilkins ZW3870XLT4PC 3/8” point of use therm mixing valve 4-PORT Proflo PFGD100 1-1/4x6 CP 17ga grid drain Proflo PFPTB400 1-1/4” 17ga P trap Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFX146342 12" 3/8" flex riser (2) Proflo PFE7 ½” CP escutcheon (2) Proflo PF202WH Trap wrap kit Zurn ZZ1231 wall carrier

P302	Lavatory, Wall Hung, Gooseneck: Public, barrier free Zurn Z5344 White 20x18 4cc wall mount lavatory Zurn Z812A4-XL-FC-05 gooseneck, wrist blades Wilkins ZW3870XLT4PC 3/8” point of use therm mixing valve 4-PORT Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain Proflo PFPTB400 1-1/4” 17ga P trap Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFX146342 12" 3/8" flex riser (2) Proflo PFE7 ½” CP escutcheon (2) Proflo PF203WH Trap wrap kit Zurn ZZ1231 wall carrier
P303	Lavatory, Wall Hung, Sensor Gooseneck: Barrier free Zurn Z5344 White 20x18 4cc wall mount lavatory Zurn Z6920XL-CP4-FC1.5 CP 1.5gpm, GN sensor faucet with plain end spout Wilkins ZW3870XLTC 3/8” point of use therm mixing valve Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain Proflo PFPTB400 1-1/4” 17ga P trap Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFX146342 12" 3/8" flex riser (2) Proflo PFE7 ½” CP escutcheon (2) Proflo PF203WH Trap wrap kit Zurn ZZ1231 wall carrier
P304	Lavatory, Wall Hung, Patient, Barrier-Free, Gooseneck: Zurn Z5344 White 20x18 4cc wall mount lavatory Zurn Z812A4-XL-FC1.5 CP 1.5gpm, GN wrist blade hdl, plain end spout Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain Proflo PFPTB400 1-1/4” 17ga P trap Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFE7 ½” CP escutcheon (2) Proflo PF203WH Trap wrap kit Zurn ZZ1231 wall carrier
P305	Lavatory, Wall Hung, Public, Barrier-Free, Sensor: Zurn Z5344 White 20x18 4cc wall mount lavatory Zurn Z6955XLS-F CP battery sensor faucet Wilkins ZW3870XLTC 3/8” point of use therm mixing valve 3-PORT Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain Proflo PFPTB400 1-1/4” 17ga P trap Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFE7 ½” CP escutcheon (2) Proflo PF203WH Trap wrap kit Zurn ZZ1231 wall carrier
P306	Lavatory, Solid Surface, Barrier-Free, Gooseneck: Solid surface counter with integral bowl by others Zurn Z812A4-XL-FC1.5 CP 1.5gpm, GN wrist blade hdl, plain end spout Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain Proflo PFPTB400 1-1/4” 17ga P trap Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFE7 ½” CP escutcheon (2) Proflo PF203WH Trap wrap kit

P307 Lavatory, Solid Surface, Public, Barrier-Free, Sensor Faucet:
Solid surface counter with integral bowl by others
Zurn Z6955XLS-F CP battery sensor faucet
Wilkins ZW3870XLTC 3/8" point of use therm mixing valve
Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain
Proflo PFPTB400 1-1/4" 17ga P trap
Proflo PFXQAC32C ¼ turn angle stop (2)
Proflo PFX146324 20" Flex SS riser (2)
Proflo PFE7 ½" CP escutcheon (2)
Proflo PF203WH Trap wrap kit

P308 Lavatory, Wall Hung, Stainless Steel:
Elkay ELV2219CS3 Lavatory
Zurn Z812A4-XL-FC1.5 CP 1.5gpm, GN wrist blade hdl, plain end spout
Wilkins ZW3870XLT4PC 3/8" point of use therm mixing valve 4-PORT
Elkay ELK174 1-1/4x6 CP grid drain
Proflo PFPTB400 1-1/4" 17ga P trap
Proflo PFXQAC32C ¼ turn angle stop (2)
Proflo PFX146324 20" Flex SS riser (2)
Proflo PFE7 ½" CP escutcheon (2)
Zurn Z1224 plate style lavatory carrier

P309 Ligature Resistant Single-Station Lavatory:
Bradley HSL-1-BIR-TMA-TC-AL-BRKT-S-chrome single station, solid surface, infrared controls, thermostatic mixing valve, SS trap cover and chrome P-trap.
Proflo PFXQAC32C ¼ turn angle stop (2)
Proflo PFX146324 20" Flex SS riser (2)
Proflo PFE7 ½" CP escutcheon (2)

P310 Lavatory, Wall Hung, Faucet/Eyewash Combination:
Zurn Z5348 White 20x18 wall mount vitreous china lavatory
Speakman SEF1800-CA-LF-TW eyewash faucet & mixing valve
Proflo PFGD100 17ga CP grid drain
Proflo PFPTB400 17ga 1-1/4" chrome P trap
Proflo PFXQAC32C 5/8od compression angle stop (2)
Proflo PFX146324 SS braided supply lines (2)
Proflo PFE7 5/8od chrome escutcheon (2)
Proflo PF202WH Trap wrap kit
Zurn ZZ1231 wall carrier

P312 Lavatory, Wall Hung, Patient, Barrier-Free, Gooseneck:
Zurn Z5344 White 20x18 4cc wall mount lavatory
Zurn Z812A4-XL-FC1.5 CP 1.5gpm, GN wrist blade hdl, plain end spout
Proflo PFGD100 17ga grid drain CP
Ipex 156501 W501 1-1/2 Universal acid waste trap
Proflo PFXQAC32C ¼ turn angle stop (2)
Proflo PFX146324 20" Flex SS riser (2)
Proflo PFE7 ½" CP escutcheon (2)
Zurn ZZ1231 wall carrier

P313 Lavatory, Wall Hung, Bariatric, Barrier-Free, Gooseneck:
Willoughby BHS3123 ada bariatric wall mount lavatory with drain, bright white
Zurn Z812A4-XL-FC1.5 CP 1.5gpm, GN wrist blade hdl, plain end spout
Wilkins ZW3870XLT4PC 3/8" point of use therm mixing valve 4-PORT
Proflo PFPTB400 1-1/4" 17ga P trap
Proflo PFXQAC32C ¼ turn angle stop (2)
Proflo PFX146324 20" Flex SS riser (2)
Proflo PFE7 ½" CP escutcheon (2)
Zurn ZZ1224 wall carrier

P331	Ligature Resistant Single-Station Lavatory: Whitehall WH3776LWH3775SOBA solid surface, sensor controls, SS trap cover and P-trap. Wilkins ZW3870XLTC 3/8” point of use therm mixing valve 3-PORT Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFE7 ½” CP escutcheon (2)
P332	Ligature Resistant Single-Station Lavatory, Behave Tlt Rm: Whitehall WH3776-E500-LWH3775SOBATMXP solid surface, sensor controls, thermostatic missing valve, SS trap cover and P-trap. Proflo PFXQAC32C ¼ turn angle stop (2) Proflo PFX146324 20” Flex SS riser (2) Proflo PFE7 ½” CP escutcheon (2)
P401	Double Compartment Sink, Gooseneck Faucet: Elkay DLR-3319-10-3 stainless sink Zurn Z831C4-XL-FC gooseneck, wrist blades Proflo PFWTST wide top grid drain Proflo PFTPB100 17ga flanged tailpiece Proflo PFEWB105 continuous waste, 17 ga. Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P402	Single Compartment Sink, Gooseneck Faucet: Barrier free Elkay LRAD1919-55-3 stainless sink Zurn Z831B4-XL-FC gooseneck, wrist blades Proflo PFWTST wide top grid drain Proflo PFTPB100 17ga flanged tailpiece Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P403	Double Compartment Sink, Kitchen Faucet: Barrier free Elkay LRAD 3319-55-4 stainless sink Zurn Z7872CXL faucet w/ spray Proflo PF151ACP basket strainer Proflo PFEWB105 continuous waste, 17 ga. Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)

P404	Single Compartment Sink, Kitchen Faucet: Barrier free Elkay LRAD 1919-55-3 stainless sink Zurn Z7870XLC faucet Proflo PF151ACP basket strainer Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P405	Single Compartment Sink: Barrier free, gooseneck sensor faucet Elkay LRAD 1919-55-3 stainless sink Zurn Z6920-XL-FC1.5-CP8 gooseneck sensor faucet with plain end spout Wilkins ZW3870XLTC 3-PORT Proflo PFWTST wide top grid drain Proflo PFTPB100 17ga flanged tailpiece Proflo PFPTB403 1-1/2 P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P406	Sink: Solid surface counter with integral sink bowl by others Zurn Z6920-XL-FC1.5-CP8 gooseneck, sensor faucet with plain end spout Wilkins ZW3870XLTC 3-PORT Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFGD101 1-1/4x6 CP 17ga offset grid drain Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P407	Single Compartment Sink, Cast Room: Elkay DLR-1919-10-3 stainless sink Zurn Z831B4-XL-FC 1.5 gooseneck, wrist blades Proflo PFWTST wide top grid drain Proflo PFTPB100 17ga flanged tailpiece Zurn Z-1180 plaster trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2) Install trap so that basket may be removed for cleaning
P408	Single Compartment Sink, Gooseneck Faucet: Elkay DLR 1919-10-3 stainless sink Zurn Z831B4-XL-FC gooseneck, wrist blades Proflo PFWTS wide top grid drain Proflo PFTPB100 17ga flanged tailpiece Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)

P409	Single Compartment, Solid Surface: Zurn Z831B4-XL-FC gooseneck, wrist blades Proflo PFWTST wide top grid drain Proflo PFTPB100 17ga flanged tailpiece Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P410	Single Compartment, Decontamination Room Elkay DLR-1919-10-3 stainless sink Zurn Z831B4-XL-FC 1.5 gooseneck, wrist blades Elkay LK18B flat grid strainer with tailpiece Ipex 156501 W501 1-1/2 Universal acid waste trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2)
P413	Single compartment sink, Undermount, kitchen Faucet: Barrier free Elkay ELUHAD191645 stainless sink Zurn Z7870CXL faucet Proflo PF151ACP basket strainer Proflo PFPTB403 1-1/2 17 ga P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 1/2” CP escutcheon (2)
P501	Clinical Sink, Wall Mounted: Zurn Z5410 with rim guards Zurn Z6017-AV-H Zurn Z843D4-LVB-PE-2XT-FT-YJ Zurn Z85500WM-XL-EVB-HK-SE- bedpan washer with spray handle Zurn Z-1217 carrier Install 30" from rim to finished floor
P502	Clinical Sink, Floor Mounted: Zurn Z5420 with rim guards Zurn Z6017-AV-H Zurn Z843D4-LVB-PE-5XT-FT-YJ Zurn Z85500WM-XL-EVB-HK-SE bedpan washer, spray handle Stern Williams #1028 universal pedestal.
P503	Scrub Sink, Sensor Faucet: Kohler K-12794-0 wall mount scrub sink Zurn Z6920-XL-FC1.5-ADM2-H4 gooseneck, sensor faucet plain end spout Zurn Z8739-SW-PC CP strainer with tailpiece Proflo PFPTB403 P trap Proflo PFXQAC32C ¼ turn angle valve (2) Proflo PFX146324 20” flex riser (2) Proflo PFE7 ½” CP escutcheon (2) Zurn Z1236 carrier
P504	Service Sink: Stern-Williams SB-902 (24"x 24"x12") with stainless steel caps, two tiling flanges Zurn Z843-M4-CS-RC integral spring-loaded check stops Stern-Williams TC3 / TC3NH gasket Proflo PFWG24S 24x24 back panels
P601	Shower, Tile: Base, walls, grab bar, soap dish, fold-up seat furnished by others SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head Zurn ZN-415-5B shower drain

P602	Shower, Solid Surface: Base, walls, grab bar, soap dish, fold-up seat furnished by others Symmons SYMS9608PLR-L1-TRM Shower ADA trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head
P603	Ligature Resistant Shower trim Base, walls, grab bar, soap dish, fold-up seat furnished by others Bradley HSR10-HDSR-AS shower valve and shower trim / head
P604	Shower, 42” Solid Surface Base: Walls, grab bars, soap dish, fold-up seat furnished by others InPro E42115NEO 42” Neo-angle shower base, bright white color Symmons SYMS9608PLR-l1-TRM Shower ADA trim Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain
P605	Shower, 36” Solid Surface Base: Walls, grab bar, soap dish, fold-up seat furnished by others InPro E36NE 36” Neo-angle shower base with drain bright white Symmons SYMS9608PLR-L1-TRM Shower ADA trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain
P606	Shower, 60” Solid Surface Base: Walls, grab bar, soap dish, fold-up seat furnished by others InPro E3060LCCD 30”x60” low curb shower base, center drain bright white Symmons SYSMS9608PLR-L1-TRM Shower ADA Trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain
P607	Shower, 60” Solid Surface Base with trench drain cover: Walls, grab bar, soap dish, fold-up seat furnished by others InPro E3060FDTD 30”x60” shower base, front trench drain, bright white Symmons SYMS9608PLR-L1-TRM Shower ADA trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain
P608	Shower, 36” Solid Surface Base: Walls, grab bar, soap dish, fold-up seat furnished by others InPro E3636LCCD 36”x36” low curb shower base, center drain, bright white Symmons SYMS9608PLR-L1-TRM Shower ADA trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain
P609	Shower, 36” Solid Surface Base with trench drain cover: Walls, grab bar, soap dish, fold-up seat furnished by others InPro E3636FDTD 36”x36” shower base, front trench drain, bright white Symmons SYMS9608PLR-L1-TRM Shower ADA trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain
P610	Shower, 36” Solid Surface Base Full Curb Walls, grab bar, soap dish, fold-up seat furnished by others InPro E3636FCCD 36”x36” full curb shower base, center drain, bright white Symmons SYMS9608PLR-L1-TRM Shower ADA trim, Symmons SYMS262XBODY in wall shower valve with integral diverter, Symmons 4-231 shower head ProFlo PF140NC CP shower Drain

P631	Shower, 36” Solid Surface, ligature resistant Grab bar, soap dish furnished by others InPro E3636RDTDLC 36”x36” shower base, rear trench wall kit, bright white Oddball SP-10B ADA shower valve Oddball SP-7 ligature resistant shower head
P632	Shower, 60” Solid Surface, ligature resistant Grab bar, soap dish furnished by others InPro E3462RDTDLC 34” x 62” shower base, rear trench, wall kit, bright white Oddball SP-10-B shower valve Oddball SP-7 ligature resistant shower head Oddball SP-7-WC quick disconnect hand shower
P633	Shower, 36” Solid Surface, ligature resistant, center drain: Walls, grab bars, soap dish, fold-up seat furnished by others Inpro E3636LCCDBO 36”x36” low curb shower base, center drain, ~~bone~~ bright white Oddball SP-10-B ADA shower valve Oddball SP-7 ligature resistant shower head Oddball SP-7-WG quick disconnect hand shower Whitehall WHPD-2N4 ligature resistant shower drain
P701	Floor Drain, Regular: Zurn ZN-415-P-Y type B strainer, nickel bronze top, trap primer, sediment bucket
P702	Floor Drain, 12" Mechanical Room: Zurn ZN-541-P, nickel bronze top, sediment bucket, trap primer
P703	Floor Drain, 9" Mechanical Room: Zurn ZN-508-P-Y, nickel bronze top, sediment bucket, trap primer
P704	Kitchen Drain, 12" Square, Full Grate: Zurn ZN-1901-KC, nickel bronze grate, flange, A.R.E. coating, 8" sump
P705	Kitchen Drain, 12" Square, Half Grate: Zurn ZN-1901-KC-2, nickel bronze half grate, flange, A.R.E. coating, 8" sump
P710	Roof Drain, 15" Diameter: Zurn ZA-100-DR, aluminum dome, adjustable drain riser extension assembly
P711	Roof Drain, Overflow: Zurn ZA-100-W2-DR, aluminum dome, adjustable drain riser extension assembly, internal 2" dam
P712	Roof Drain, 8" Diameter: Zurn ZA-125-DP-E, aluminum, deck plate extension
P713	Floor Drain with Funnel: Zurn ZN-415-P-Y type B strainer, nickel bronze top, trap primer, sediment bucket, nickel bronze funnel
P714	Area Drain, 14" Square: Zurn ZN-150-DP, nickel bronze grate, deck riser plate
P715	Trench Drain, HDPE, Mechanical Room, 12” wide: Zurn Z882- DGC high density polyethylene, pre-sloped trench drain system with heavy-duty, powder coated, steel frame with integral lockdowns and ductile iron Class E grate. See drawings for length and outlet configuration.
P721	Floor Drain, Process, A.R.E. Coated: Zurn Z-550-P-Y-AR, trap primer, sediment bucket All components shall be A.R.E coated, interior and exterior
P722	Floor Drain, Process, A.R.E. Coated, Funnel: Zurn Z-550-P-Y-AR, with Z-328-AR funnel All components shall be A.R.E. coated (interior and exterior)
P724	Downspout Nozzle Zurn ZARB199-IP-SS
P725	Ligature Resistant Floor drain: Whitehall WHFD-5RD-2NH strainer, nickel bronze top, trap primer, secured top

P801	Wall Hydrant, Exterior: Zurn Z-1310, non-freeze with vacuum breaker and stainless steel face Install 18" above finished grade
P802	Hose Bibb, Interior: Zurn Z1341-P34-PC polished chrome finish with vacuum breaker Install 18" above finished floor
P803	Washing Machine Connection: Oatey 38203 with water hammer arrestors
P804	Ice Machine Connection: Oatey No. 39140 metal ice maker box with metal face plate. Box with valve and water hammer arrestor
P805	Steris Machine Connection: Whitehall 8195-SV Stainless supply box, door, vacuum breaker, (2) stainless ball valves, install drain 24" above finished floor Symmons T-425 thermometer kit Symmons 7-225CK low capacity thermostatic mixing valve
P807	Dialysis Connection Box: Whitehall 8196-SV stainless supply box with single stainless valve (ADD AS REQUIRED) Symmons 7-200 Thermostatic mixing valve located in ceiling
P808	Electric Water Cooler, Barrier-Free: Elkay EZS8S with stainless steel finish Proflo PFPTB400 1-1/4” chrome P trap Proflo PFXQAC32C 5/8od compression angle stop Proflo PFE 7 5/8od chrome escutcheon Zurn ZZ1225 carrier, plate type single Install with bubbler 36" above finished floor
P808B	Electric Water Cooler Barrier-Free: Elkay EZS8WSSK EZH2O cooler with bottle filler stainless finish Proflo PFPTB400 1-1/4” chrome P trap Proflo PFXQAC32C 5/8od compression angle stop Proflo PFE 7 5/8od chrome escutcheon Zurn ZZ1225 carrier, plate type single Install with bubbler 36" above finished floor
P809	Electric Water Cooler (Split Level): Elkay EZSTL8-S-C with stainless steel finish Elkay ELKAPREZL ADA cane guard for EZ cooler Proflo PFPTB403 1-1/2 chrome P trap Proflo PFXQAC32C 5/8od compression angle stop Proflo PFE7 5/8od compression escutcheon Zurn ZZ1225BL carrier, plate type, Bi-Level
P809B	Electric Water Cooler (Split Level): Elkay ELZSTL8WSSK bi-level cooler with bottle filler stainless finish Elkay ELKAPREZL ADA cane guard for EZ cooler Proflo PFPTB403 1-1/2 chrome P trap Proflo PFXQAC32C 5/8od compression angle stop Proflo PFE 7 5/8od compression escutcheon Zurn ZZ1225BL carrier, plate type, Bi-Level
P811	Drinking Fountain, Remote Chiller Elkay EEDFPBM117C Swirl-flow fountain, mounting plate Elkay EACCESS12X385 access panel with L-bracket Elkay ELKAPR1 ADA Cane Guard for Swirl-flow fountain Elkay ECH8 remote chiller Proflo PFPTB400 1-1/4” chrome P trap Proflo PFXQAC32C 5/8od compression angle stop Proflo PFE 7 5/8od chrome escutcheon

P811B Drinking Fountain, Remote Chiller with Bottle Filler:
Elkay EZWS-EDFPBM117K Swirl-flow fountain, Bottle filler
Elkay EACCESS12X385 access panel with L-bracket
Elkay ELKAPR1 ADA Cane Guard for Swirl-flow fountain
Elkay ECH8 remote chiller
Proflo PFPTB400 1-1/4” chrome P trap
Proflo PFXQAC32C 5/8od compression angle stop
Proflo PFE 7 5/8od chrome escutcheon

P812 Emergency Eyewash/Shower:
Bradley S19314EW shower and eyewash, manual close valves
Bradley S19-2100 thermostatic control valve

P813 Emergency Eye Wash:
Bradley S19-460EFW countertop mount
Bradley S19-2000 thermostatic mixing valve

P814 Wall Hydrant, Exterior, Hot/Cold:
Zurn Z-1325, dual-temp, non-freeze, enclosed in nickel bronze box with hinged cover
Install 18" above finished grade

P815 Ice Machine/ Vending Connection with drain:
IPS Corp 88436 metal drain box with metal face plate.
Box with 3/8” supply valve and water hammer arrestor

P816 Emergency Eye Wash:
Bradley S19-44011ABC wall mount
Bradley S19-2000 thermostatic mixing valve

P817 Decontamination Room Shower – Interior
Symmons 125-VT-FSX-72 Visu-temp shower faucet, with hose and Attachment hooks

P818 Decontamination Shower – Exterior
Symmons 4-5000-VT-X Visu-temp mixing valve
Zurn ZZ1310 non-freeze with vacuum breaker and stainless-steel face
Install 18" above finished grade

P819 Roof Hydrant
Zurn ZZ1388XL34VBAC Non-freeze roof hydrant, vacuum breaker and casing guard

P820 Dialysis Supply Box
Whitehall 8193 Stainless steel fabricated supply box with Backflow Preventer, and Wall Flange with Door
Symmons 7-200 Thermostatic mixing valve located in ceiling

P821 Bottle Filler
Elkay ELZWSGRNM8K bottle filler Chiller
Proflo PFPTB400 1-1/4” chrome P trap

PART 3 EXECUTION

3.01 REQUIREMENTS

Q. Water closets shall be installed complete with wall carriers, wax rings, bolt caps, and flush valves (or float valves).

R. Elevated vacuum breakers, where specified, shall be installed 7'-6" above the finished floor.

S. Countertop sinks shall be installed complete with required mounting rim or clips.

T. After installation, all fixtures shall be cleaned and labels removed. Where fixtures are in contact with walls, floors, or countertops, caulking shall be applied. Caulking shall be General Electric white silicon sanitary sealant.

U. Water closets identified on plans as barrier free fixtures shall have the flush valves installed per American Disabilities Act. Flush valves shall have the handle installed on the wide side of the stall. Coordinate with the architectural drawings.

V. Non pre-fabricated showers shall have chloraloy 240 brand non-plasticized chlorinated polyethylene concealed waterproofing membrane .040 inch thick. Installation shall be per manufacturers recommendations.

W. At each floor drain installed above slab on grade, install a 36" x 36" apron equal to chloraloy 240 brand non-plasticized chlorinated polyethylene concealed waterproofing membrane, .040 inch thick, waterproofing membrane to be installed per manufacturers recommendations.

X. At each flush valve, solenoid valve and other quick closing devices provide shock absorber.

END OF SECTION 22 43 00

SECTION 22 45 00
EMERGENCY PLUMBING FIXTURES

PART 1 GENERAL

1.01 MANUFACTURERS

A. Provide plumbing fixtures and drains as listed on drawings and described herein. Fixture numbers are Zurn products. All products to be purchased from Ferguson Enterprises. Contact Bettina Dawson office (615) 316-1920 cell (931) 239-0466 or Randy Akin (615) 316-1853 or email HCA@ferguson.com.

B. All drainage products to be Zurn no exceptions. All drains installed above slab to be complete with clamping device.

C. Fixture supplies, stops, and traps to be commercial grade Zurn, no exceptions. Traps to be 17 gauge with wall flange. Supplies and stops to be heavy pattern with wheel handle unless noted otherwise.

D. Thermostatic mixing valves shall be Symmons, Holby, Powers, or Leonard.

PART 2 PRODUCTS

2.01 FIXTURES

P310 Lavatory, Wall Hung, Faucet/Eyewash Combination:
Zurn Z5348 White 20x18 wall mount vitreous china lavatory
Speakman SEF1800-CA-LF-TW eyewash faucet & mixing valve
Proflo PFGD100 17ga CP grid drain
Proflo PFPTB400 17ga 1-1/4” chrome P trap
Proflo PFXQAC32C 5/8od compression angle stop (2)
Proflo PFX146324 SS braided supply lines (2)
Proflo PFE7 5/8od chrome escutcheon (2)
Proflo PF202WH Trap wrap kit
Zurn ZZ1231 wall carrier

P812 Emergency Eyewash/Shower:
Bradley S19314EW shower and eyewash, manual close valves
Bradley S19-2100 thermostatic control valve

P813 Emergency Eye Wash:
Bradley S19-460EFW countertop mount
Bradley S19-2000 thermostatic mixing valve

P816 Emergency Eye Wash:
Bradley S19-44011ABC wall mount
Bradley S19-2000 thermostatic mixing valve

PART 3 EXECUTION

3.01 REQUIREMENTS

A. Elevated vacuum breakers, where specified, shall be installed 7'-6" above the finished floor.

B. After installation, all fixtures shall be cleaned and labels removed. Where fixtures are in contact with walls, floors, or countertops, caulking shall be applied. Caulking shall be General Electric white silicon sanitary sealant.

END OF SECTION 22 45 00

SECTION 22 47 00
DRINKING FOUNTAINS & WATER COOLERS

PART 1 GENERAL

1.01 MANUFACTURERS

A. Provide plumbing fixtures and drains as listed on drawings and described herein. Fixture numbers are Zurn products. All products to be purchased from Ferguson Enterprises. Contact Bettina Dawson office (615) 316-1920 cell (931) 239-0466 or Randy Akin (615) 316-1853 or email HCA@ferguson.com.

B. All drainage products to be Zurn no exceptions. All drains installed above slab to be complete with clamping device.

C. Fixture supplies, stops, and traps to be commercial grade Zurn, no exceptions. Traps to be 17 gauge with wall flange. Supplies and stops to be heavy pattern with wheel handle unless noted otherwise.

D. All products used for dispensing potable drinking water must be lead free and meet the requirements of NSF 61 and NSF 372 test standards via third party testing and certification.

PART 2 PRODUCTS

2.01 FIXTURE

P808 Electric Water Cooler, Barrier-Free:
Elkay EZS8S with stainless steel finish
Proflo PFPTB400 1-1/4” chrome P trap
Proflo PFXQAC32C 5/8od compression angle stop
Proflo PFE 7 5/8od chrome escutcheon
Zurn ZZ1225 carrier, plate type single
Install with bubbler 36" above finished floor

P809 Electric Water Cooler (Split Level):
Elkay EZSTL8-S-C with stainless steel finish
Elkay ELKAPREZL ADA cane guard for EZ cooler
Proflo PFPTB403 1-1/2 chrome P trap
Proflo PFXQAC32C 5/8od compression angle stop
Proflo PFE7 5/8od compression escutcheon
Zurn ZZ1225BL carrier, plate type, Bi-Level

P811 Drinking Fountain, Remote Chiller
Elkay EEDFPBM117C Swirl-flow fountain, mounting plate
Elkay EACCESS12X385 access panel with L-bracket
Elkay ELKAPR1 ADA Cane Guard for Swirl-flow fountain
Elkay ECH8 remote chiller
Proflo PFPTB400 1-1/4” chrome P trap
Proflo PFXQAC32C 5/8od compression angle stop
Proflo PFE 7 5/8od chrome escutcheon

PART 3 EXECUTION

3.01 REQUIREMENTS

A. After installation, all fixtures shall be cleaned and labels removed. Where fixtures are in contact with walls, floors, or countertops, caulking shall be applied. Caulking shall be General Electric white silicon sanitary sealant.

END OF SECTION 22 47 00

SECTION 22 60 06

CERTIFICATION PROCEDURE FOR MEDICAL GAS PIPELINES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section is to outline the responsibilities and procedures to be followed in final certification of the medical gas pipelines and included as a supplement to Section 22 60 13 Medical Gas Piping System.

B. When new piping is "cut-in" to previously installed piping, it is possible that previously installed piping could be disturbed so as to cause crossed piping in previously installed systems. It is imperative that previously installed systems be inspected for crossed piping in conjunction with new system medical gas pipeline inspection and certification to the point of source.

C. The certification procedure shall comply with all requirements of NFPA 99, latest published edition and as stated herein.

D. Pipeline certification shall be performed by an independent third party Certification Agency. The Certification Agency qualifications data to be submitted and approved before any work to certify the systems has been performed.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Refer to Section 22 60 13 Medical Gas Piping System.

PART 3 EXECUTION

3.01 INSTALLATION

A. The General Contractor shall furnish a verified list designating number and location of all medical gas outlets to the Certification Agent. The General Contractor shall review and check this list with the appropriate subcontractors and the medical gas system personnel performing the medical gas pipeline inspection.

B. The Plumbing Contractor is to perform mechanical check of all medical gas outlets prior to the certification inspection. Any necessary repairs or rework to be done prior to system suppliers inspection. Check to include:
   1. Outlets properly supported.
   2. Installation complete.
   3. Appropriate adapters fit and securely lock in place.

C. The Owner is responsible for ensuring that bulk tank and/or cylinder supplies are installed, connected, and filled (or partially filled) prior to system suppliers inspection.

D. All medical gas outlets shall be tested by the Certification Agent, excluding none.

E. Certification Agent shall provide factory trained, qualified representatives to perform pipeline inspection and to provide report and certification in accordance with NFPA 99, latest published edition.
   1. Any discrepancies discovered during the inspection shall be noted, corrected, and any and all portions of the system affected by corrective action shall be retested and findings recorded after retest.

F. Plumbing Contractor to provide representative who shall serve as customer contact person and who shall witness the inspection and certify that all outlets on the list furnished by the General Contractor have been checked and is in accord with inspection procedure and findings as witnessed.

G. Hospital Engineering Department shall provide a representative who shall witness the inspection and certify that all spaces and the outlets therein listed on the list furnished by the General Contractor have been checked in accordance with inspection procedure.

H. Certification Agent shall perform a cross connection test on all medical gas outlets using oil-free nitrogen as described in NFPA 99, latest published edition. Each pipe system shall be reduced

to atmospheric pressure. Certification Agent shall then pressurize and test each piping system, one system at a time.

I. Contractor shall connect all designated gas systems and purge the systems, completely. Certification Agent shall then analyze each medical gas outlet for proper oxygen content.

J. The Certification Agent to furnish copies of Medical Gas Pipeline Inspection Report and Medical Gas Pipeline Certification to General Contractor to be distributed as follows:
   1. Plumbing Contractor
   2. Owner's Construction Manager
   3. Consulting Engineer
   4. Hospital

K. The following procedure should be followed in addition to the above on extensions to existing systems:
   1. Owner's Representative shall, with adequate advance notice, request that system supplier's inspector or inspection team be on-site when old piping is cut-in for installation of new lines.
   2. Owner's Representative and system supplier's representative shall arrange to have inspector or inspection team on-site when the existing piping is cut into for installation of new lines.
   3. Main line shut-off vales shall be installed in new piping as close as possible to point of cut-in to previously installed piping.
   4. NOTE: Following verification of proper labeling or proper gas distribution of previously installed piping after cut-in procedure, the aforementioned valves (Item 3) shall be considered the "source" of supply for the new piping.

GAS ANALYSIS		
Gas	Concentration (%)	Pressure (psig)
Oxygen	99-100	50 +/- 5
N_2O	99+	50 +/- 5
N_2	99+	Normal regulated pressure Plus/Minus 5 (usually set from 160 to 200)
Vacuum	–	Negative
Air	19.5 - 23.5 O_2 content	50 +/- 5
CO_2	0	Temporarily reduced pressure at source to 30. Outlet pressure shall be 30 +/- 5

END OF SECTION 22 60 06

SECTION 22 60 13
MEDICAL GAS PIPING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and test the following systems:
   1. Oxygen (O2).
   2. Vacuum (V).
   3. Medical/clinical compressed air (A).

B. Outlets, valve boxes, valves, alarm systems, pressure and vacuum switches, and miscellaneous accessories for complete systems.

C. Reserve oxygen manifold system.

D. Emergency oxygen supply connection.

E. Nitrous oxide manifold system.

F. Nitrogen manifold system.

G. Carbon dioxide manifold system.

H. Pressure testing, cross connection testing and final testing, including purging and analyzing.

I. Electrical power wiring for ceiling columns/hose drops, alarms, vacuum pumps, medical air compressor, and other electrical accessories associated with the system shall be furnished and installed under Division 26.

J. Medical gas contractor shall furnish and install all low voltage control raceways and wiring associated with alarms and controls.

K. Anesthesia evacuation connectors.

1.02 CODE COMPLIANCE/QUALITY ASSURANCE

A. Install in compliance with the recommendations of the National Fire Protection Association (NFPA) as set forth in locally enforced editions of NFPA 99, Latest Edition, and NFPA 50.

B. Comply with all local, state or federal codes applicable in this jurisdiction.

C. Employ only qualified journeymen for this work. Employ a competent qualified mechanic/piping foreman, who has satisfactorily completed at least five other similar hospital installations, for this work. Provide brazers performance qualification test records for each brazer used on installation.

1.03 COORDINATION

A. Coordinate with other trades to assure timely installations and to avoid conflicts and interference.

B. Work closely with the metal stud partition installer and/or mason to assure that anchors, sleeves and similar items are provided in sufficient time to avoid delays; chases and openings are properly sized and prepared.

C. Coordinate layout of medical gas systems in all spaces and identify all piping accurately.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Piping System Components:
   1. Allied Health Products, Chemtron Division.
   2. AMICO Corporation with Chemtron Medaes compatible outlets.
   3. Puritan Bennett with Chemtron Medaes compatible outlets.
   4. Powerex with Chemtron Medaes compatible outlets.
   5. Beacon Medical Systems to match existing hospital outlets.
   6. Medical gas outlets shall match or be compatible with existing outlets, no exception.

2.02 QUALIFICATION OF MANUFACTURER

A. Pipeline System Components:

1. One manufacturer shall supply the medical gas piping system(s) equipment to include outlets, valves and gauges, valve boxes, alarm boxes, nitrous oxide manifold system, nitrogen manifold system, reserve oxygen manifold system, and nitrogen control cabinet.
2. This manufacturer shall have a pipeline system engineer or product specialist available to periodically check with the contractor during installation of pipeline system equipment and provide a service organization to certify the system. The contractor may use a third party certification agency at his discretion.
3. Provide ongoing service support to the hospital after turnover to the Owner.

2.03 PIPING MATERIALS AND HANGERS

A. Piping: All piping including vacuum shall be seamless Type K or L (ASTM B819) copper tubing, pre-cleaned for oxygen use, in accordance with NFPA 9. Piping shall be pre-cleaned, marked and plugged by supplier before shipment to job site. Any system operating above 200 psi shall have Type K tubing.

B. Fittings: Wrought copper, brass or bronze designed expressly for brazed connection. All fittings shall comply with ANSI B16.22. Cast fittings shall not be used. T-drill branch tee connections shall not be allowed for medical gas piping.

C. Brazing alloy: Melting point of at least 1000 degrees F.

D. Flux: Do not use for copper-to-copper joints. Use flux for joining copper to brass or bronze. In those cases where flux is used, exercise particular care in applying the flux to avoid leaving any excess inside the completed joints.

E. Pipe hangers shall be copper coated adjustable swivel ring, typical of B-Line B3170CT. Strut systems may be incorporated with rubber isolators, typical of B-Line Vibra Cushion or Vibra Clamp pipe clamps. The taping of pipes for isolation shall not be permitted. Medical gas piping within metal stud walls shall be supported with plastic isolators such as Pipe-Tytes System or equivalent.

F. Exterior, buried medical gas piping shall be encased in PVC, continuous split conduits minimum Schedule 40 pipe (or equivalent). Spacers shall be installed to prevent piping from resting on bottom of conduit. Piping shall be installed with a minimum 36 inches of cover.

G. All exterior, buried medical gas piping shall be buried with two levels of standard, permanent, bright colored, continuous printed plastic tape. Tape shall be intended for direct burial service and buried directly above the medical gas piping and at one-half the depth of bury (approximately 18 inches). The tape shall be 6 inches by 4 mils thick minimum. Tape shall be printed with proper identification of the service located below it.

2.04 LIQUID OXYGEN STATION

A. The liquid oxygen station shall be provided by the oxygen supplier under separate contract with the hospital.

B. Furnish the concrete equipment pad, concrete delivery pad and fencing under other Divisions of these specifications.

C. Furnish and install lighting, electrical power and final connection of the alarm systems under Division 26.

D. Install main oxygen line, main line valve, stub-up at the park, as well as the emergency oxygen supply line and components per NFPA 99 as indicated on the drawings.

2.05 EMERGENCY OXYGEN SUPPLY CONNECTION

A. Provide an emergency low pressure oxygen connection box. The connection shall be contained in a recessed weathertight, lockable enclosure. The connection box shall consist of the following components:
1. Brass shutoff ball valve.
2. Preset relief valve (75 psi), pipe discharge to exterior of building.
3. Emergency supply pressure gauge (0-100 psi).
4. Emergency supply bronze body check valve, 1" 1-1/4" 1-1/2"in size.
5. Primary supply bronze body check valve 1" 1-1/4" 1-1/2" in size.

2.06 HIGH PRESSURE CYLINDER MANIFOLDS

A. Provide automatic manifold control including self-shifting to reserve bank on exhaustion of the primary service bank and automatic reset of replaced bank to reserve status. Incorporate pressure switches for the purpose of actuating designated signals when the primary service bank is exhausted. Incorporate in control unit a visible means of determining when either bank is exhausted and operation has automatically switched to "reserve in use". Visible indication shall be by red light over exhausted bank and by gauges showing remainder pressure in each bank. Continuous visible indication of electrical circuits in effective operation shall be by means of green light. Line pressure shall be shown by separate visible gauge. Manifolds shall be installed as shown on drawings.

B. Install heater bars on both the primary and reserve bank headers for all gas manifolds.

2.07 MEDICAL GAS OUTLET STATIONS

A. Quick-Connect Recessed Wall Outlets:
   1. Medical Gas Outlet Stations shall be modular, Quick-Disconnect recessed type. Modular outlet stations shall be field-assembled with sequences and services indicated on the plans. Centerline spacing of multiple outlets shall be 5 inches minimum.
   2. Outlet stations for medical gases shall have a stainless steel faceplate mounted on a chrome-plated, zinc die-cast cover plate. The cover plate assembly shall contain the quick-connect latch release mechanism, indexing pins for safety keying the gas-specific cover plate to the appropriate rough-in box, and color-coded gas service identification. The safety-keying index pins shall be permanently captured between the cover plate and latch assembly. Designs with index pins molded in plastic will not be accepted.
   3. The latch mechanisms shall be designed for one-handed, single thrust mounting and one-handed fingertip release of secondary equipment. The outlet stations shall be capable of supporting common secondary equipment, including suction regulator and half-gallon collection bottle, without the use of slide brackets.
   4. The cover plate shall attach to the primary valve assembly. The primary valve shall be threaded into the rough-in box separately from the cover plate to facilitate leak-testing around the valve. Designs which prevent this test will not be acceptable. The primary valve body shall be made of brass and shall be adjustable to compensate for variation in plaster thickness. Provide an O-ring within the valve to seal mating adapter plugs. Future replacement of the O-ring shall not require disassembly of the cover plate. The primary valve poppet shall be self-sealing in service, requiring no dust cap or cover.
   5. Each rough-in box shall contain a base and tube assembly consisting of a Type K copper pigtail, flared to accept 1/4" ID, 3/8" O.D. supply line, brass block and base housing a secondary check valve per NFPA 99 (not required in vacuum), primary valve O-ring seal, check valve deflator spring (except vacuum), pressure testing cap plug, and plaster shield. The copper inlet tube shall be capable of rotating 360 degrees to adjust for field piping conditions.
   6. Medical gas outlets shall be cleaned for oxygen service in accordance with CGA Pamphlet G-4.1. The assembly shall be capped and internal parts poly-bagged for shipment. The outlet assembly shall bear the label of listing under Re-examination Service of Underwriters' Laboratory.
   7. Quantity and gas type shall be provided as indicated on plans.

B. Nitrogen (N2) Control Panel:
   1. Nitrogen Control Panel shall be designed to deliver variable pressures to power pneumatic surgical tools. The unit shall have inlet supply gauge, 0-300 psig. (0 kPa to 2067 kPa), to indicate the supply line pressure.
   2. Located immediately upstream of this gauge shall be a supply line shut-off valve, rated at not less than 250 psig, (1722.5 kPa) pressure. A quarter turn of the valve handle shall be required to obtain a fully "open" or "closed" position.
   3. An adjustable relieving type pressure regulator, with an operating range of 0-250 psig. (0 kPa to 1722.5 kPa) shall provide required pressure to the nitrogen service outlet.

4. There shall be an outlet supply gauge, 0-300 psig. (0 kPa to 2067 kPa), to give indication of the outlet pressure being supplied to the outlet(s). The nitrogen control panel shall be pre-piped internally requiring only external supply line connection(s). Additional outlets in the same room may be connected to the remote outlet pigtail furnished in the control panel. Remote outlets shall be regulated by the adjustable pressure regulator within the panel and shall match the Nitrogen Control Panel outlet.
5. The control panel shall have a D.I.S.S. service outlet.

2.08 MEDICAL GAS CEILING OUTLET STATIONS

A. D.I.S.S. Recessed Ceiling Outlets:
1. Medical Gas Outlet Stations located in ceilings shall be D.I.S.S. type. Modular outlet stations shall be field-assembled with sequences and services indicated on the plans. Centerline spacing of multiple outlets shall be 5 inches minimum.
2. Outlet stations for medical gases shall have a stainless steel faceplate mounted on a chrome-plated, zinc die-cast cover plate. The cover plate assembly shall contain indexing pins for safety keying the gas-specific cover plate to the appropriate rough-in box. The safety keying index pins shall be permanently captured between the cover plate and index pin retainer. Designs with index pins molded in plastic will not be acceptable. Provide a color-coded, molded plastic gas service identification label on each cover plate.
3. The outlet stations shall be capable of supporting common secondary equipment, including suction regulator and half-gallon collection bottle, without the use of slide brackets.
4. The cover plate shall attach to the primary valve assembly and rough-in box. The primary D.I.S.S. valve shall be independently safety-keyed to prevent cross-connection. In addition, the D.I.S.S. valve shall thread into the rough-in box separately from the cover plate to facilitate leak-testing around the valve. Designs which prevent this test will not be acceptable. The primary valve shall be made of brass, chrome plated and shall contain a poppet that is self-sealing in service, requiring no dust cap or cover. The primary valve shall be adjustable to compensate for variations in plaster thickness.
5. Quantity and gas type shall be provided as indicated on plans.
6. Each rough-in box shall contain a base and tube assembly consisting of a Type K copper pigtail, flared to accept a 1/4" ID, 3/8" O.D. supply line, brass block and base housing a secondary check valve per NFPA 99 (not required in vacuum), primary valve O-ring seal, check valve deflator spring (except vacuum), pressure testing cap plug, and plaster shield. The copper inlet tube shall be capable of rotating 360 degrees to adjust for field piping conditions.
7. Medical gas outlets shall be cleaned for oxygen service in accordance CGA Pamphlet G-4.1. The assembly shall be capped and internal parts poly-bagged for shipment. The outlet assembly shall bear the label of listing under Re-examination Service of Underwriters' Laboratory.

B. Hose Drop Assemblies:
1. Hose assemblies shall utilize gas specific color coded hose that meet or exceed conductivity requirements as specified in NFPA 99. Hose assemblies shall consist of a D.I.S.S. female fitting for attaching to the ceiling outlet, a hose retractor and quick-connect coupler (D.I.S.S. for N2) with inherent primary and secondary check valves, for attaching to hoses connected to patient care equipment.
2. Hose assemblies are to be supplied for a finished ceiling height as shown on drawings. Quantities and gas services as indicated on drawings.

C. Anesthesia Evacuation Connectors: Provide exhaust grille connector and flexible tubing to provide for anesthesia evacuation from anesthesia machine to anesthesia evacuation grille. Part Nos. as follows:
1. Exhaust grille connection, 19mm, Chemtron Part #83-16-0005.
2. Corrugated tubing, 19 mm, 96" long.

2.09 MEDICAL GAS VALVING

A. Main and Base of Riser Valves (Valves Not in Boxes):

1. All valves and tubing shall be specially prepared for oxygen service and shall conform in all particulars to NFPA 99. All valves shall be a lockable ball-type, with teflon seats and adjustable stem packing gland with teflon stem seal, through 2-inch sizes. 2-1/2" to 3" valves have teflon seats and double teflon stem seal. 4-inch valves shall have Buna-N ball seats.
2. All ball valves rated at 400 psig, actuate from full "ON" to full "OFF" by 90 degrees turn of vinyl gripped valve handle. Factory installed copper tubing shall be extended sufficiently to help prevent valve seat damage during soldering.
3. Unless specifically noted or obviously required, main and riser valves located in other than public areas are not required to be installed in box.
4. Lock valves in the open position, and turn keys over to hospital maintenance upon completion of the project.

B. Area/Zone Valves (Valves in Boxes):
1. Zone valve boxes shall be constructed of extruded aluminum or 18 gauge sheet steel with air dried lacquer finish. The cover frame shall be made of an anodized aluminum and attached to the box by concealed screws. The finished assembly shall be substantially dust-tight. The frame assembly shall be capable of adjusting for variances in wall thickness up to one inch. The frame assembly shall contain an easily removable cover window with pull ring. The window shall conceal exposed piping and valves within the box and shall be labeled "Caution - Medical Gas Shut-Off Valves - Close Only in Emergency". Clean viewing space shall be provided in the window to display the gas service, the area controlled by the valve, and pressure gauges on units so equipped.
2. Frames for all valve boxes shall have uniform width for balanced appearance. Manufacturer shall provide color-coded self-adhesive gas service labels for compliance with NFPA 99 labeling requirements. Apply labels to each valve within the assembly for proper gas service identification according to the manufacturer's instructions.
3. Placement of the valve within the zone valve box shall be such that the removable window cannot be replaced when any valve is closed. Factory installed Type K copper pipe extensions shall extend three (3) inches outside the valve box. Design of the valve box shall be such that valves may be removed prior to brazing, without disassembly of the box, to permit field rearrangement of valves if necessary. Valves shall be ball type, cleaned for oxygen service, supplied with capped ends, and shall operate full open to closed position with 90 degree handle rotation. Provide chrome finish on valves and piping within valve boxes.
4. Gauge model zone valve assemblies shall include 1-1/2" pressure gauges reading 0-100 psig for oxygen, nitrous oxide and air; 0-300 psi for nitrogen, and 0-30" Hg for vacuum or evacuation vacuum. The gauge port shall be equipped with removable plug for pressure testing prior to final assembly of gauge.
5. All gauge model zone valve box assemblies shall read pressure downstream and vacuum upstream of the valve per NFPA 99. Valves shall be piped left to right.

2.10 MEDICAL GAS ALARM SYSTEMS

A. Line pressure alarms shall be digital LCD microprocessor based. The alarm assembly shall be U.L. listed requiring 115-volt supply. Internal voltage shall be stepped down to 24 or 12 volts for control circuit power. Each service (gas or vacuum) shall be provided with an audible alarm and visual red light flasher for abnormal pressure conditions. Audible alarm may be silenced by push-button, but visual alarm will continue to flash until abnormal condition is corrected. A green indicator for each service shall indicate normal pressure conditions. A LCD display readout shall display the pressure of each service.
1. The alarm assembly shall be recessed within standard 3-5/8" stud walls.

B. Master alarm panel shall be digital LCD microprocessor based. The alarm assembly shall be U.L. listed requiring 115-volt supply. Internal voltage supply shall be stepped down to 24 or 12 volts for control circuit power. Each service (gas or vacuum) shall be provided with an audible alarm and a visual red indicator for abnormal pressure conditions. Audible alarm may be canceled but visual alarm will continue until abnormal condition is corrected. Alarm signals shall

be received from master pressure switches located at the supply source downstream of the main line shutoff valves.

1. A minimum of two master alarm panels shall be installed. Reference the drawings for locations. Panels shall be wired in parallel to the pressure switches, not in series. Control wiring between switches and alarm panels shall be in 3/4" minimum EMT conduit. Wiring shall be 22-gauge shielded, twisted pair cable equal to Belden #8451 or West Penn #452 or per manufacturer requirements.
2. Master alarm panel shall be recessed within standard 3-5/8" stud wall.
3. The Multi-Signal Alarm Panel functions to be as follows:

FUNCTION	
0_2	Changeover to reserve
0_2	Liquid level low
0_2	Reserve in use
0_2	Reserve low
0_2	Line pressure high
0_2	Line pressure low
N_20	Reserve in use
N_20	Line pressure high
N_20	Line pressure low
N_2	Reserve in use
N_2	Line pressure high
N_2	Line pressure low
Air	Line pressure high
Air	Line pressure low
Vacuum	Line pressure low
Vacuum	Reserve pump in use
Air	Reserve compressor in use
Air	High water (liquid ring)
Air	High air temperature (oil-free or oil-less compressors)
Air	High carbon monoxide levels
CO	Reserve in use
CO	Line pressure high
CO	Line pressure low

C. Provide pressure and vacuum switches, as companion to each Master alarm of the Hi-Lo single-pole double-throw approved snap-acting type enclosed in a NEMA 4 watertight housing. Switches to be factory set to activate alarms as follows:
   1. 02--40 psi-low and 60 psi-high
   2. N20--40 psi-low and 60 psi-high
   3. N2--140 psi-low and 160 psi-high (two switches required)
   4. Air--40 psi-low and 60 psi-high
   5. Vacuum--12" Hg-low
   6. CO--40 psi-low and 60 psi-high

D. Provide monitoring gauges in accordance with NFPA 99 for nonflammable medical gases using lettered identification labels and color coding.

PART 3 EXECUTION

3.01 IDENTIFICATION

A. All medical gas piping to be labeled with self-adhesive markers including the name of the gas, direction of flow, operating pressure and pipe size. Labels to be spaced not more than 20 feet intervals and at least once in each room and on each floor at the risers for each story traversed by the piping system. Labels shall be color coded per NFPA 99.

3.02 INSTALLATION

A. Copper pipe, tubing, valves, and fittings shall be pre-cleaned and prepared for medical gas service in accordance with NFPA 99, except those supplied especially prepared for such service by the manufacturer and received sealed on the job.

B. Joints in all the piping including vacuum piping, except those at equipment requiring screwed connections, shall be made with silver brazing alloy or similar high melting point (at least 1000 degrees F) brazing metal. Silver brazing material for pipes and fittings in the medical gas system shall be Stay-Silv-15 or equal to the following: Silvaloy-15, Aircosil No. 15, or Phos-Silver-15. The silver brazing alloy shall contain a minimum of 15% silver, 80% copper, and 5% phosphorus and shall not contain cadmium alloy. The silver brazing alloy shall have a minimum of 1000 degrees F. liquidux melting point and shall have an ASTM rating of "BCuP5". The use of flux is prohibited from the making of joints between copper to copper pipes and fittings. Appropriate flux similar to "Stay-Silv-Black Flux" or "Stay-Silv-White Flux" is required between dissimilar metals such as copper to brass or bronze material, when parts are heated over a prolonged period. DURING THE BRAZING OF PIPE CONNECTIONS, THE INTERIOR OF THE PIPE SHALL BE PURGED CONTINUOUSLY WITH NITROGEN. The outside of the tube and fittings shall be cleaned by washing with hot water after assembly.

C. Threaded joints in piping systems shall be tinned or made up with polytetrafluorethylene (such as teflon) tape or other thread sealants suitable for oxygen service. Sealants shall be applied to the male threads only.

D. All piping shall be supported with pipe hangers or strut systems at intervals per NFPA 99, and NOT supported by other piping. Isolation of all copper piping from dissimilar metals shall be of a firm, positive nature. Duct tape is not acceptable as isolation material. Hanger Spacing Shall be as Follows:

Pipe Size	Hanger Spacing
1/2 inch	6 feet
3/4 inch	7 feet
1 inch	8 feet
1-1/4 inch	9 feet
1-1/2 inch and larger	10 feet

E. Install screw joints used in shutoff valves, including station outlet valves, by tinning the male thread with soft solder. Litharge and glycerin or an approved oxygen luting or sealing compound are acceptable.

F. Use prepared flux manufactured by Handy and Harman which consists of dry boric and water boric for hard solder joints. Alcohol mixture is prohibited. Resin or petroleum base of similar paste flux may contain compounds objectionable for oxygen service and shall not be employed.

G. All pipe, pipe fittings, and valves not furnished pre-washed and degreased shall be cleaned and degreased by washing in a hot solution of sodium carbonate or tri-sodium phosphate (Oakite #24) and then thoroughly rinsed with water. Oakite #24 solution of six to eight ounces of Oakite per gallon of water is prepared by mixing one-third the total quantity of water with the total amount of Oakite #24 required. When this has been dissolved, the remaining water shall be added. The pipe and fitting shall be immersed for five to fifteen minutes or until all deposits are removed. Scrubbing shall be employed where necessary to ensure complete cleaning. After washing, the material shall be rinsed thoroughly in clean, hot water. After cleaning particular care shall be exercised in the storage and handling of all pipe and fittings. Pipe and fittings shall be temporarily capped or plugged to prevent re-contamination before final assembly. Tools used in cutting or reaming shall be kept free from oil or grease. Where such contamination has occurred, the items affected shall be re-washed and rinsed. Pipe may be washed on the job site with written permission of the Owner only.

H. After installation of the piping, but before installation of the outlet valves, blow lines clear by means of oil-free, dry air or nitrogen.

I. Buried piping shall be adequately protected against frost, corrosion, and physical damage. Ducts or casings shall be used on all buried piping.

J. Identification tape shall be buried approximately 18 inches above the piping, and immediately on top of the conduit.

K. Piping exposed to physical damage shall be adequately protected.

3.03 INSTALLATION OF EMERGENCY OXYGEN SUPPLY CONNECTION

A. Install emergency oxygen supply connection (low pressure type) in location and per detail as set forth on plumbing drawings. Test connection in conjunction with other tests and inspections set forth in this section.

3.04 ANESTHESIA EVACUATION CONNECTORS

A. Connect anesthesia evacuation grille connector and corrugated evacuation hose to anesthesia exhaust grille's in each surgery and or delivery room. See mechanical and plumbing drawings for details.

3.05 PRESSURE TESTING

A. After installation of the piping and valves, but before installation of the service outlets, alarm actuating switches and gauges, the line shall be blown clear by means of oil-free, dry air or nitrogen.

B. Next, each section of the piping system shall be subjected to a test pressure of one and one-half (1-1/2) times the maximum working pressure, but not less than 150 psig, with oil-free, dry nitrogen. This test pressure shall be maintained for at least 24 hours. Then each joint shall be examined for leakage by means of soapy water or other effective means of leak detection safe for use with oxygen.

C. All leaks shall be repaired and the section retested.

D. After completing the testing of each individual piping system, all of the medical gas systems shall be subjected to a pressure test at one and one-half (1-1/2) times the maximum working pressure, but not less than 150 psig. The test gas shall be oil-free, dry nitrogen. The main line shut-off valve shall be closed during the test.

E. After completion of the above test procedure the finishing assemblies of station outlets, alarms, and all components (e.g. pressure switches, gauges, relief valves, etc.) shall be installed and all medical gas piping systems shall be subjected to a 24 hour standing pressure test at 20% above the normal operating line pressure with oil-free, dry nitrogen. The main line shut-off valve shall be closed during this test.

F. Leaks, if any, shall be located, repaired, and the system retested.

G. To determine that no cross connection to other pipeline systems exists, reduce all systems to atmospheric pressure. Disconnect all sources to test gas from all of the systems with the exception of the one system to be checked. Pressure this system with oil-free, dry air or nitrogen to a pressure of 50 psig. With appropriate adapters matching outlet labels, check each individual station outlet of all systems installed to determine that test gas is being dispensed from only the outlets of this system.

H. When all medical gas piping systems have been tested, the source of test gas shall be disconnected and the proper gas source of supply connected to each respective system. Following this connection and pressurization, all outlets shall be opened in a progressive order, starting nearest the source and completing the process of purge flushing at the outlet farthest from the source. Gas shall be permitted to flow from each outlet until each system is purged of test gas used during previous tests. After completion of purge flushing of the pipeline system, the outflow from each designated and labeled oxygen outlet station, anesthesia machine, and other oxygen dispensing equipment shall be tested (using an oxygen analyzer) to confirm the presence of the desired purity of oxygen.

3.06 CROSS CONNECTION TESTING AND CERTIFICATION

A. General Requirements:

1. This section is to outline the responsibilities and procedures to be followed in final certification of the medical gas pipelines and outlets.
2. When new piping is "cut-in" to previously installed piping, it is possible that previously installed piping could be disturbed so as to cause cross connections. It is imperative that previously installed systems be inspected for crossed piping in conjunction with new system medical gas pipeline inspection and certification to the point of source.
3. The certification procedure shall comply with all requirements of NFPA 99, Latest Edition and as stated herein.
4. Pipeline certification shall be performed by an independent subcontractor (certification agent) not associated with the medical gas equipment supplier.

B. Certification Procedure:
1. The Contractor shall furnish a verified list designating number and location of all medical gas outlets to the Certification Agent. The Contractor shall review and check this list with the medical gas system personnel performing the medical gas pipeline inspection.
2. The Contractor is to perform mechanical check of all medical gas outlets prior to the certification inspection. Any necessary repairs or rework to be done prior to system suppliers inspection. Check to include:
   a. Outlets properly supported.
   b. Installation complete.
   c. Appropriate adapters fit and securely lock in place.
3. The Owner is responsible for ensuring that bulk tank and/or cylinder supplies are installed, connected, and filled (or partially filled) prior to system suppliers inspection.
4. All medical gas outlets shall be tested by the Certification Agent, excluding none.
5. Certification Agent shall provide factory trained, qualified representatives to perform pipeline inspection and to provide report and certification in accordance with NFPA 99, Latest Edition.
   a. Any discrepancies discovered during the inspection shall be noted, corrected, and any and all portions of the system affected by corrective action shall be retested and findings recorded after retest.
6. Contractor to provide representative who shall serve as customer contact person and who shall witness the inspection and certify that all outlets on the list furnished by the Contractor have been checked and is in accord with inspection procedure and findings as witnessed.
7. Hospital Engineering Department shall provide a representative who shall witness the inspection and certify that all spaces and the outlets therein listed on the list furnished by the Contractor have been checked in accordance with inspection procedure.
8. Certification Agent shall perform a cross connection test on all medical gas outlets using oil-free nitrogen as described in NFPA 99, Latest Edition. Each pipe system shall be reduced to atmospheric pressure. Certification Agent shall then pressurize and test each piping system, one system at a time.
9. Contractor shall connect all designated gas systems and purge the systems, completely. Certification Agent shall then analyze each medical gas outlet for proper oxygen content.
10. The Certification Agent to furnish copies of Medical Gas Pipeline Inspection Report and Medical Gas Pipeline Certification to General Contractor to be distributed as follows:
    a. Plumbing Contractor
    b. Owner's Construction Manager
    c. Consulting Engineer
    d. Hospital
11. The following procedure should be followed in addition to the above on extensions to existing systems:
    a. Owner's Representative shall, with adequate advance notice, request that system supplier's inspector or inspection team be on-site when old piping is cut-in for installation of new lines.
    b. Owner's Representative and system supplier's representative shall arrange to have inspector or inspection team on-site when the existing piping is cut into for installation of new lines.

c. Main line shut-off vales shall be installed in new piping as close as possible to the point of cut-in to existing piping.

d. NOTE: Following verification of proper labeling or proper gas distribution of previously installed piping after cut-in procedure, the aforementioned valves (Item 3) shall be considered the "source" of supply for the new piping.

GAS ANALYSIS		
Gas	Concentration (%)	Pressure (psig)
Oxygen	99-100	50 +/- 5
N_2O	99+	50 +/- 5
N_2	99+	Normal regulated pressure +/-5 (usually set from 160 to 200)
Vacuum	–	Negative
Air	19.5 - 23.5 O_2 content	50 +/- 5
CO_2	0	Temporarily reduced pressure at source to 30. Outlet pressure shall be 30 +/- 5

END OF SECTION 22 60 13

SECTION 22 62 19

MEDICAL VACUUM EQUIPMENT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and test Vacuum (V) system.

B. Pressure and vacuum switches, vacuum pump and miscellaneous accessories for complete systems.

C. Pressure testing, cross connection testing and final testing, including purging and analyzing.

D. Electrical power wiring for alarms, vacuum pumps, and other electrical accessories associated with the system shall be furnished and installed under Division 26.

E. Medical gas contractor shall furnish and install all low voltage control raceways and wiring associated with alarms and controls.

1.02 CODE COMPLIANCE/QUALITY ASSURANCE

A. Install in compliance with the recommendations of the National Fire Protection Association (NFPA) as set forth in locally enforced editions of NFPA 99, Latest Edition, and NFPA 50.

B. Comply with all local, state or federal codes applicable in this jurisdiction.

C. Employ only qualified journeymen for this work. Employ a competent qualified mechanic/piping foreman, who has satisfactorily completed at least five other similar hospital installations, for this work. Provide brazers performance qualification test records for each brazer used on installation.

1.03 COORDINATION

A. Coordinate with other trades to assure timely installations and to avoid conflicts and interference.

B. Work closely with the metal stud partition installer and/or mason to assure that anchors, sleeves and similar items are provided in sufficient time to avoid delays; chases and openings are properly sized and prepared.

C. Coordinate layout of medical gas systems in all spaces and identify all piping accurately.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Vacuum Pump Systems:
   1. Allied Health Products, Chemtron Division
   2. Beacon Medaes
   3. Becker Pumps Corp. (vacuum pumps only)
   4. Powerex
   5. Amico Products
   6. Pattons Medical

2.02 QUALIFICATION OF MANUFACTURER

A. Vacuum Pump:
   1. Manufacturer/supplier shall have had at least fifteen (15) years' experience in the manufacture of oil-less medical vacuum pumps.
   2. Provide a service organization with staffing during working days, and repair parts, within 200 miles of the facility.
   3. The supplier shall supply drawings for installation operating and maintenance instructions manuals, and parts lists. The supplier shall provide both warranty and after warranty service for the total package. The service representative shall not be third party and shall be factory trained.

2.03 MEDICAL VACUUM PUMPS

A. Medical vacuum pumps shall be a factory assembled and tested duplex triplex quadraplex package, pre-wired and pre-piped on a fabricated steel base, ready for single point connection at the job site. Specifically, there is one electrical connection, single manifold discharge connection, and one vacuum connection to hospital.

B. The vacuum pumps shall have a rated SCFM capacity at 19" HG, horsepower and electrical requirements as scheduled on the drawings.

C. Furnish all required accessories for installing the vacuum pump (vibration dampeners, isolation pads or springs, flex connectors on incoming and exhaust lines, etc.).

D. The control cabinet shall be a U.L. listed NEMA 12 dustproof cabinet. The cabinet shall contain the following:
   1. Fusible disconnect or circuit breaker switches for each pump.
   2. Magnetic motor starters with thermal overload protection for each pump.
   3. Vacuum control switches set to maintain the vacuum level between a minimum of 19 inches H.G. and a maximum setting of 25 inches H.G.
   4. Thermal overload reset buttons.
   5. Redundant control circuit transformers.
   6. Hand-Off-Automatic selector switch for each pump.
   7. Local alarm for reserve pump operation and output signal for master alarm panel.
   8. Automatic alternator between pumps.
   9. Minimum run timers to prevent short cycle.
   10. Local alarm for high discharge temperature and output signal for master alarm panel.
   11. Vacuum gauges.

E. The warranty for the vacuum pump system shall be 18 months from start-up or 24 months from date of shipment, whichever comes first.

F. Motors shall be drip-proof, 40 degree C rise, 3 phase, NEMA Design B type motors.

G. Vacuum pumps shall be claw type, air-cooled type pumps. Oil supply shall be totally recirculating. Oil separator shall be capable of removing 99.9 percent of oil from the pump exhaust. Each pump shall have isolation valving, check valves, flexible connectors, and drive enclosures.

H. Receiver tank shall be ASME rated and galvanized coated. Receiver tank shall have drain valve and isolation valve. A three-valve bypass shall be provided to permit servicing the receiver.

I. Vacuum pumps, control cabinet and receiver shall be a complete unit, factory assembled. The system shall be factory tested prior to shipment. Manufacturer shall provide representative to assist in system start-up at the project site.

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION 22 62 19

SECTION 22 66 53

ACID WASTE, PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers as indicated in subsequent paragraphs.

1.02 EQUIPMENT

A. Corrosive Waste and Vent Piping:
   1. Material: Provide Schedule 40 polypropylene pipe and fittings that conform to dimensions and tolerances per ASTM F1412. Pipe and fittings to be manufactured with a chemically resistant polypropylene material conforming to ASTM D4101.
   2. Pipe:
      a. Below grade pipe shall be either flame retardant or non-flame retardant Schedule 40 polypropylene in accordance with ASTM D4101.
      b. Above ground pipe shall be flame retardant Schedule 40 polypropylene in accordance with ASTM D4101.
   3. Fittings: All fittings shall be manufactured to Schedule 40 polypropylene pipe dimensions of a chemically resistant and fire retardant polypropylene material conforming to ASTM D4101. Polypropylene Fittings to conform to applicable tolerances in ASTM F1412.
   4. Acceptable Manufacturer: U.S Shott or equal.
   5. Provide tempered glass pipe, fittings and joints as manufactured by O. I. Shott or equal.

B. Acid Neutralization Basin:
   1. Acceptable Manufacturer: Zurn.
   2. Configuration: Size, shape, and connections as shown on drawings.
   3. Access cover, outside building: Neenah, Cast Iron.
   4. Access cover, inside building: Zurn, cast aluminum.
   5. Fill basin with limestone chips of at least 90% calcium carbonate content and be 1" - 3" diameter.

PART 2 PRODUCTS

2.01 INSTALLATION

A. Corrosive Waste and Vent Piping:
   1. Joints: All joints shall be fusion except those under casework.
   2. Install at minimum slope of 1/8 inch per foot.
   3. Follow manufacturers' recommendation for hanging and burial.
   4. Each section or floor shall be tested with not less than 10 feet head of water for 24 hours with no leaks.
   5. Polypropylene pipe shall be installed with appropriate expansion loops so as to eliminate creeping and/or bowing of the pipe due to temperature changes.
   6. Where polypropylene pipe penetrates fire-rated floors or walls, approved UL listed fire stops must be installed.

B. Acid Neutralization Basin:
   1. Install basin in underground concrete pit.
   2. Furnish Owner two extra sacks of limestone chips for replenishing media in basin.

PART 3 EXECUTION - NOT APPLICABLE

END OF SECTION 22 66 53

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all labor, materials, tools, and services for a complete installation of equipment and systems contained in contract documents.

B. Principal features of work included are:
   1. Heating, ventilating, and air-conditioning system.
   2. Control system including low voltage control wiring and conduit.
   3. Demolition of existing equipment, ductwork, and piping.
   4. General Commissioning Refer to Section 019113.

1.02 RELATED WORK

A. Electrical power and interlock wiring and conduit.

B. Laboratory equipment.

1.03 INNOVATION MEMORANDUMS

A. The owner has obtained purchase agreements for select equipment and materials. These purchase agreements are documented as Innovation Memorandums and are to be included as part of this project.
   1. Innovation Memorandum No. 7: All piping, valves, pipe fittings and related products to be purchased from Ferguson Enterprises. Refer to Section 23 2113.
   2. Innovation Memorandum No. 9: All VAV boxes to be purchased from Scheider Electric. Refer to Section 23 36 00.
   3. Innovation Memorandum No. 12: All Rooftop air handling units to be purchased from Carrier. Refer to Sections 23 7313, 23 7413, 23 7500 add other sections as necessary.
   4. Innovation Memorandum No. 13: All building automation systems to be purchased from Schneider Electric StruxureWare. Refer to Section 23 09 23.

1.04 GENERAL

A. The contract documents form a guide for a complete system. Provide all items necessary to provide a complete system but not specifically mentioned, such as hangers, transitions, offsets, and drains.

B. Layouts indicated on drawings are diagrammatical only. Coordinate exact location of equipment, ductwork, and piping to eliminate conflict with other divisions. Designer reserves right to make reasonable changes in location of equipment, ductwork, and piping prior to construction. Coordination drawings shall be submitted prior to any equipment/systems being installed to ensure that installation conflicts between trades are minimized.

C. Should Contractor find during progress of work that in his judgment existing conditions make desirable a modification, report such item promptly to Designer for instructions. Do not make deviations from contract documents without review of Designer.

D. Supervise all work with a competent mechanic specifically qualified in mechanical discipline.

1.05 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this division.

1.06 CODES

A. Comply with all pertinent local, state, and national codes. Refer to Division 01.

1.07 STANDARDS

A. Comply with all pertinent standards. This list is provided as a convenience to Contractor and is not to be considered all inclusive.
   1. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA).
   2. American Gas Association (AGA).

3. Air Moving and Conditioning Association (AMCA).
4. Air-Conditioning, Heating and Refrigeration Institute (AHRI).
5. American Society of Mechanical Engineers (ASME).

1.08 SUBMITTALS

A. Submit for review complete brochures and shop drawings for materials and equipment proposed in accordance with Division 01.
   1. Brochures: Submit complete descriptions, illustrations and specification data for materials and equipment proposed. Clearly indicate proposed items when other items are shown on same sheet. Submit samples on request and/or set up for inspection. Samples will be returned to Contractor.
   2. Submittals shall be submitted in line by line format. Each submittal shall be provided with a cover letter and supporting documentation indicating how the submittal meets each line of the referenced specification section. All discrepancies between the construction documents and the submitted product shall be clearly identified for engineer evaluation.
   3. If a product other than the basis of design is rejected by the engineer for any reason, the Contractor shall provide the basis of design product at no additional cost to the Owner.
   4. Shop Drawings:
      a. Control systems.
      b. Complete equipment, ductwork, and piping systems.
      c. Equipment room layouts with actual equipment, piping and duct.
      d. Roof layouts.
      e. Dimensioned floor drain locations.

1.09 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals in accordance with Division 01.

1.10 PROJECT TECHNICAL INSTRUCTION

A. Prior to final inspection of project, provide technical instruction to Owner as follows:
   1. Field Instruction: Provide explanation of how systems and equipment are to operate during each season and during emergencies.
   2. Field Demonstration: Demonstrate operation and routine maintenance for systems and equipment.
   3. Video: Provide digital video of all field instruction and demonstration to Owner at completion.

1.11 PROTECTION

A. Protect all materials and equipment in accordance with Division 01.

B. The contractor must take appropriate precautions, during construction, to prevent unnecessary dust and debris from getting into air and water handling systems by covering equipment, controls and open-ended ducts and pipes as the installation progresses.

1.12 CONSTRUCTION RECORD DOCUMENT

A. Provide construction record documents in accordance with Division 01. Keep at the project one set of drawings and daily record changes at the time they are made. Give drawings to Owner at project completion.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacture bearing the U.L. label when such label is available.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate work in accordance with Division 01. Coordinate locations of equipment, ductwork, and piping to eliminate conflict with other divisions.

B. Carefully examine contract documents to be thoroughly familiar with items which require plumbing or mechanical connections and coordination.

C. Provide proper chases and openings. Place sleeves and supports prior to pouring concrete or installation of masonry.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of contract.

B. Correct unnecessary damage caused due to installation of mechanical work.

C. Perform repairs with materials that match existing in accordance with the appropriate section of these specifications.

D. Duct floor penetrations and plenum floor penetrations in mechanical rooms shall have a minimum 2” curb.

E. Floor sleeves in wet areas and mechanical rooms shall extend a minimum of 2” above the floor to prevent water entrance to the sleeve. Vertical pipe supports shall be extended to the floor rather than support from the sleeve.

3.03 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal ductwork and piping at penetrations of roofs and outside walls.

3.04 TRENCHING, EXCAVATION AND BACKFILLING

A. Provide trenching, excavation, and backfilling necessary for performance of mechanical work accordance with Division 02.

B. Trenching and excavation of rock to be as described in Division 02.

C. Excavate to a depth at least 6" below bottom of pipe and a minimum of 36" above top of pipe. Fill below pipe, around pipe, and minimum of 12" above pipe with sand or Class "B" crushed stone tamped firm and even. Provide topsoil for final layer of dirt (12" minimum). Provide 6" spacing between pipes and between pipe and trench sides. Hand-grade with batterboards placed every 25'. Backfill by hand. Do not use rock or stone above sand or Class "B" crushed stone.

3.05 CONNECTION TO EQUIPMENT

A. Rough-in and connect to, lab equipment, and Owner furnished equipment and provide a shutoff valve and union at each connection. Operating valves and/or controls for this equipment will be provided as an integral part of the equipment. Do not rough-in until shop drawings showing rough-in locations have been reviewed by Designer.

3.06 IDENTIFICATION

A. Identify exposed or accessible piping with stenciling contents indicating pipe contents and direction of flow on piping not more than 20 feet apart, at valves, at access panels, and at least once above each space.

B. Valve tags are required for all emergency shutoff valves and all manual valves 1” and larger. These shall be engraved brass tags hung from valves with minimum 1″ high lettering. Submit valve tag directory in close-out documents. Mark ceiling grid with colored marker indicating valve locations above the ceiling. Emergency shutoff valves shall include all valves 2″ and larger for the following services: domestic hot and cold water, heating hot water, and natural gas.

C. CAV/VAV terminal units concealed above lay-in ceilings shall be marked by a physical tag clipped or adhered to the grid.

D. Identify all mechanical equipment with engraved brass, aluminum, or stainless steel nameplates or tags. Use equipment names and numbers appearing in schedules on drawings. Fasten nameplates to equipment using screws. Glue or adhesive is not acceptable. Fasten tags to equipment using brass, aluminum or stainless steel chains.

E. Air terminal units (CAV/VAV) concealed above ceilings shall be marked by a marker clipped or adhered to the grid. Include box ID number on marker.

F. Frame and mount control diagrams and sequences in each equipment room. Use non-fading black and white prints encased in aluminum frame with plexiglass cover.

3.07 CLEANING

A. Thoroughly clean ductwork and equipment casings before fans and filters are operated.

B. Repair damaged factory finishes covering all bare places and scratches.

C. Cleaning HVAC Systems Water Piping:
   1. Clean all equipment and piping of iron cuttings and other foreign matter as they are installed.
   2. Do not install devices in which foreign matter could become lodged, such as control valves, until cleaning and flushing are completed. Position valves to bypass chiller, boiler and heat exchanger. Connect supply and return runouts together at each coil location. Make connection of supply and return runouts with short lengths of high pressure rubber hose and brass fittings. One fitting shall be swivel type to eliminate turning fitting in hose.
   3. Fill system at city water make-up connection with all air vents open. After filling, close vents.
   4. Start main pump with pressure reducing valve makeup open. Check vents in sequence to bleed off any trapped air in order to assure circulation through all components of system. Verify pumps are properly aligned and bolted down before start-up to prevent damage to seals or couplings. Circulate water for at least two hours and then drain completely to flush out foreign matter.
   5. Remove, clean, and replace all strainer baskets. Clean all dirt legs. If indications are found of excessive dirt, repeat the above flushing.
   6. Fill the system with fresh water, adding precleaning chemicals designed to remove depositions such as pipe dope, oils, rust, mill scale, and other extraneous materials. Provide dosages of precleaner chemicals recommended by water treatment supplier. Alternate operation of primary and standby pumps, and circulate the cleaning solution for 24 hours. Then turn off the pump and completely drain the system.
   7. Remove, clean, and replace all strainer baskets. Clean all dirt legs. Replace suction diffuser start-up strainer with conventional strainer. Refill the system with clean water, venting all high points and equipment of air and gases. Bring water systems to operating temperature. Recheck all vent points during this process and remove all air.
   8. After the system has been completely cleaned, test system by litmus paper or other dependable method and leave system on slightly alkaline side (ph 7.5 to 8.5). If system is still on acid side (ph 7.0 or lower), add water conditioner.

3.08 TESTING

A. Test all installed equipment and systems and demonstrate proper operation. Correct and retest work found defective when tested.

B. Thoroughly check piping system for leaks. Do not add any leak-stop compounds to the system. Make repairs to piping system with new materials. Peening, doping, or caulking of joints or holes is not acceptable.

C. Conduct air or smoke test if in opinion of Designer reasonable cause exists to suspect leakage or low quality workmanship.

D. Test HVAC systems water piping at a water pressure of 125 psig for two hours without leaks.

E. Vibration Tests:
   1. Test vibration isolation system in accordance with methods and procedures described in the Testing, Adjusting, and Balancing Chapter in the latest edition of ASHRAE Applications Handbook.
   2. Verify all vibration isolation systems are free floating and not short circuited by any connection between equipment and building structure.
   3. Operate mechanical systems and verify visually and audibly that there is no excessive vibration or noise generated by the system.

END OF SECTION 23 05 00

SECTION 23 05 13

ELECTRIC MOTORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide and install electric motors for mechanical and plumbing equipment.

1.02 SUBMITTALS

A. Submittal data is NOT required for products under this section as separate items. It is assumed they will be reviewed with appropriate equipment submittal.

PART 2 PRODUCTS

2.01 MOTORS

A. Electric motors shall be new NEMA Standard, sized and designed to operate at full load and full speed continuously without causing noise, vibration, and temperature rise in excess of their rating.

B. Motors on belt driven equipment shall have slide rails with adjusting screws for belt tension adjustment. Motors exposed to the weather shall be weather protected.

C. Premium efficiency electric motors shall be provided for all motors 1 horsepower and greater. Any motor used with a variable speed motor controller shall be premium efficiency type and VFD compatible.

D. Inverter-duty motor design shall include:
   1. Spike-proof inverter motor such that voltage spikes will not damage motor insulation.
   2. No distance restrictions between any inverter and motor - no carrier frequency limitations.
   3. Motor design shall not require inverter power conditioning equipment to protect motor. Grounding rings on driven end of shaft are required on all motors with VFDs.
   4. Motor must meet NEMA MG-1, Part 31, part H.
   5. Provide inverter-duty motors with a 5-year warranty.

E. Acceptable Manufacturers: MagneTek/ Century, Lincoln, Marathon, Gould, Toshiba, Baldor, Reliance, US Motors, General Electric.

F. Premium efficiency motors shall have efficiency and losses determined in accordance with the latest revisions of IEEE Standard 112. Polyphase squirrel-cage motors rated 1 through 125 horsepower shall be tested by dynamometer method B. The efficiency shall be determined using segregated losses in which stray load loss is obtained from a linear regression analysis to reduce the effect of random errors in the test measurements. Guaranteed minimum full load efficiency shall be as follows:

MINIMUM NOMINAL FULL-LOAD EFFICIENCY (%)		
	Open Motors	Enclosed Motors
Number of Poles	4	4
Synchronous Speed (RPM)	1750	1750
Motor Horsepower		
3	89.5	89.5
5	89.5	89.5
7.5	91.0	91.7
10	91.7	91.7
15	93.0	92.4
20	93.0	93.0
25	93.6	93.6
30	94.1	93.6
40 – 75	94.1	94.1
100 above	95.4	95.4

MINIMUM NOMINAL FULL-LOAD EFFICIENCY (%)		
	Open Motors	Enclosed Motors
Refer to Latest Edition of ASHRAE 90.1 for other motor rpm and efficiencies.		

G. Motor sound power levels shall not be greater than recommended in NEMA M61-12.49.

H. Motors shall be provided with drive shafts long enough to extend completely through belt sheaves.

I. Motor characteristics shall be as follows:
   1. 120V/1/60 Hz: Capacitor start, open drip-proof type, ball bearing, rated 40 degrees C. continuous rise.
   2. 460V/3/60 Hz: NEMA Design B, normal starting torque, single speed, squirrel cage type, open drip-proof, rated 40 degrees C. continuous rise, with ball bearings rated for B-10 life of 100,000 hours and fitted with grease fittings and relief ports. Provide motors with aluminum end brackets with steel inserts in bearing cavities.

J. Provide grounding rings on all motors equipped with a VFD.

PART 3 EXECUTION

3.01 INSTALLATION

A. Arrange and set motors.

B. Line up motors on direct drive equipment using dial type gauges.

C. Electrical Contractor to make connections and test motor for proper rotation/phasing.

3.02 ADJUSTMENTS

A. All motors together with driven equipment shall be statically and dynamically balanced by equipment supplier, start-up representative, or this contractor using approved balancing equipment. Fan vibration should be limited to manufacturers' recommendations, but should not exceed 2 mils in any case.

END OF SECTION 23 05 13

SECTION 23 05 48
VIBRATION ISOLATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Isolate equipment as shown on drawings and specified herein with factory-fabricated vibration isolators in accordance with recommendations in the latest edition of ASHRAE Applications Handbook. Provide isolators of proper sizes and weight loading to meet the requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Mason Industries, Kinetics Noise Control, Vibration Eliminator Co., Vibration Mountings & Control, Inc., Korfund Co., Amber Booth, Vibro-Acoustics, or Hyspan. Provide isolators by a single manufacturer.

2.02 FLOOR MOUNTED SPRING ISOLATORS

A. Provide Kinetics Model FLS freestanding isolators for:
   1. Clinical vacuum pumps if not provided by equipment manufacturer as part of a packaged system (minimum 2" deflection).

2.03 FIBERGLASS OR NEOPRENE PADS

A. Provide Kinetics Model KIP for:
   1. Hot water pumps.

2.04 SPRING AND RUBBER ISOLATION HANGERS

A. Provide Kinetics Model SFH or SRH for:
   1. Suspended square in-line centrifugal fans (minimum 1.0" deflection).
   2. Horizontal fan coil units (minimum 1.0" deflection).

2.05 FLEXIBLE PIPE CONNECTORS

A. Provide Metraflex or approved substitute twin-sphere flexible rubber pipe connectors with female unions or floating flanges on piping connections to equipment subject to vibration.

B. Provide connectors rated for 150 PSI working pressure.

C. Provide flexible pipe connectors for the following:
   1. Water connections to pumps.
   2. Vacuum connections to vacuum pump.

2.06 SPRING VIBRATION ISOLATION ROOF CURBS

A. Support all rooftop air handling units with spring vibration isolation roof curbs, Kinetics Model KSCR, Mason Model RSC or approved substitute. The isolation curbs shall be complete assemblies designed to resiliently support the equipment at the proper elevation and shall provide a fully enclosed, air- and weathertight system.

B. The isolation curb shall consist of an upper support frame on which the equipment rests and a lower support assembly which is attached to the roof structure separated by freestanding unhoused laterally stable steel springs.

C. The lower support assembly shall incorporate means of attachment to the building as well as a continuous 2" x 2" wood nailer for attachment of the roofing material. The lower support assembly shall also contain provisions for supporting rigid insulation board.

D. Select spring isolators to provide minimum 2" operating static deflection. Space spring isolators a maximum of 96" O.C. Provide a neoprene pad under springs.

E. Design springs with lateral stiffness greater than one times the rated vertical stiffness and minimum 50 percent overload capacity.

F. Include an adjustment bolt to permit leveling of the equipment after installation. Each spring isolator shall be fully accessible for adjustment without interfering with the integrity of the roof.

G. Provide isolation curb with vertical and lateral restraints as required in order to withstand the project specific wind loads as indicated on the structural drawings. Provide signed and sealed installation details for attachment to structure as part of the equipment submittal to document compliance.

H. The isolation curb shall be air and weathertight using an elastomeric boot which is attached to the upper support frame, extends down past the wood nailer of the lower support assembly, and is counterflashed over the roof materials. Provide sloped to drain cap below any portions of the unit that are not weather tight.

I. Provide isolation curb with cross bracing on the upper and lower assemblies as required to assure stability.

2.07 SPRING VIBRATION ISOLATION ROOF CURB RAILS

A. Support all roof mounted HVAC units with spring vibration isolation roof curb rails, Kinetics Model KSR, Mason Model CMAB or approved substitute. The isolation curb rails shall be complete assemblies and provide a fully enclosed, air and weathertight system. Coordinate locations with all trades to prevent interruption of roof drainage layout and function.

B. Isolation curb rails shall consist of extruded aluminum or roll-formed steel top and bottom members connected with spring isolators. Provide continuous air and water seal for the entire rail perimeter. Select and space spring isolators according to weight distribution of the supported equipment.

C. Provide means for attachment to the roof curb and the supported equipment. Provide additional stiffening members as required to assure stability. Provide vertical and lateral restraints as required in order to withstand the project specific wind loads as indicated on the structural drawings. Provide signed and sealed installation details for attachment to structure as part of the equipment submittal to document compliance.

D. Select spring isolators to provide minimum 1" operating static deflection. Spring components shall be freestanding, unhoused, laterally stable steel springs. Design springs with lateral stiffness greater than 0.8 times the rated vertical stiffness and minimum 50 percent overload capacity.

2.08 OUTDOOR APPLICATIONS:

A. All isolators located outside exposed to weather shall be corrosion resistant construction with hot dip galvanizing or PVC coating.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install vibration isolation in accordance with the isolator and equipment manufacturer's published installation instructions.

B. Size vibration isolation in accordance with weight distribution, pull or the imposed torque of actual equipment provided.

C. Set anchor bolts when concrete is placed. Install vibration isolation roof curb [**vibration isolation roof curb rails**] in accordance with manufacturers' published installation instructions to provide an air and watertight seal.

END OF SECTION 23 05 48

SECTION 23 05 49

BASIC MATERIALS AND METHODS FOR HVAC

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work required under this section of the specifications consists of basic materials and methods applicable to work under Division 23.

PART 2 PRODUCTS

2.01 V-BELT DRIVES

A. Provide all fan drives with V-belts rated for 150% of nameplate motor horsepower. Provide adjustable pitch motor sheaves for motor sizes through 20 hp. For motor sizes 25 hp and larger provide fixed pitch motor sheaves after balancing to within plus 5% of design air quantity. Select motor sheaves so centerline does not extend past end of motor shaft and such that motor bearing grease fitting and relief port is not obstructed.

B. Provide belt guards for all belt driven equipment. Provide expanded metal cover with access to driven shaft for tachometer.

2.02 FOUNDATIONS AND PADS

A. Provide foundations, pads, and bases required for equipment. Concrete to be in accordance with concrete division of specifications.

B. Coordinate proper sizes and locations of foundations, pads, bases, louvers, anchors, supports, and other items to be built into structure. Housekeeping pads for all air handling units to be tall enough to allow for proper p-trap installation.

2.03 FASTENINGS TO STRUCTURES

A. Provide structural fastening devices for equipment, materials, piping and ductwork. Devices to be concrete inserts, expansion shields and lag bolts, and through bolts-washers-nuts. All bolted devices to use jamb nuts. Inserts to be continuous type as manufactured by Unistrut or approved substitute. Install per manufacturer's published installation instructions in lengths to suit specific application, complete with spring nuts, end caps, and plastic coated filler to prevent concrete seepage.

B. Use of power drive "shot-pins" is permitted only for ducts 20" in width and smaller and single pipes 1" and smaller.

2.04 ACCESS PANELS

A. Wall and ceiling access panels to be provided by Division 01. Coordinate locations so panels will provide proper access to equipment served. Minimum size: 24" x 24".

2.05 ROOF CURBS

A. Provide prefabricated metal roof curbs at all roof ductwork and piping penetrations and for support of all roof-mounted equipment, fans and ductwork. Construct curbs according to National Roof Contractor's Association guidelines. Prefabricated metal roof curbs shall be manufactured by ThyCurb, Custom Curb, or approved substitute.

B. Construct curbs with minimum 18 gauge galvanized steel (14 gauge for curbs with any side longer than 4'-0" and for all curbs supporting equipment) with fully mitered and welded corners, raised 3" integral cant for roof deck insulation, integral base plate, internal reinforcing with 1" x 1" x 1/8" steel angle for curbs with any side longer than 3'-0", factory installed 1-1/2" thick, 3-pound density fiberglass insulation and factory installed pressure treated wood nailer. Minimum height of curb shall be 12" above finished roof surface. (Consult architectural plans for roof type and thickness.) Curbs for kitchen hood exhaust fan shall be height necessary to provide 40" minimum height from finished roof surface to fan discharge. Construct curbs to match slope of roof and provide a level top surface for mounting of mechanical equipment.

C. Curb types shall be as follows:

1. Fan and duct penetration curbs with standard curb construction as described above - ThyCurb Model TC.
2. Equipment piping and ductwork support curbs with minimum 18 gauge galvanized steel shell, base plate and counterflashing, wood nailer, and internal bulkhead reinforcement - ThyCurb Model TEMS.
3. Pipe penetration curbs with standard curb construction as described above and insulated metal piping cover - ThyCurb Model TC with Model TP-2 piping cover.

D. Install curbs in strict accordance with manufacturer's published installation instructions and as detailed on the drawings. Coordinate proper curb size, construction, and base prior to fabrication.

PART 3 EXECUTION - NOT APPLICABLE

END OF SECTION 23 05 49

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Perform test and balance work by a Test and Balance Agency which is engaged solely in full time test and balance work, is a member of the Associated Air Balance Control (AABC) or approved equal, and is selected and employed by the General Contractor.

B. Perform test and balance in accordance with AABC Standards.

C. Contract to the Test and Balance Agency shall be issued by the General Contractor. Coordination with the agency at the job site shall be the responsibility of the contractor in order to ensure proper scheduling and operation of the systems. All correspondence (reports, letters and communications) between any parties shall have copies sent directly to the designer and contractor.

D. The TAB agency shall review construction plans and specifications. If any discrepancies are noted which would hinder balancing, notify the designer with copy to the contractor. Make inspections of the job during construction for proper installation of the system(s) and of balancing aids in the system(s). Any discrepancies noted shall be brought to the attention of the contractor and designer. The number of inspections vary with the size and complexity of the job and shall be adequate for the purpose intended. Report ALL job visits in writing -MANDATORY.

E. The TAB agency shall work in close coordination with the contractor in calibrating all airflow and water flow stations and all duct and pipe mounted differential pressure sensor / transmitters. The tests shall be documented and included in the final TAB report.

F. The Owner has hired an independent Cx agent to commission the mechanical and controls systems serving this facility. The TAB agency should refer to Specification 019113 General Commissioning Requirements, in order to be apprised of, and become familiar with his responsibilities and accountabilities throughout the Cx process.

1.02 RESPONSIBILITIES OF PROJECT CONTRACTOR

A. The contractor shall:
   1. Provide approved Test and Balance Agency with copy of plans and specifications upon issue of construction documents.
   2. Have the building and HVAC systems in operational readiness for TAB work to begin.
   3. Correct prompt deficiencies of materials and workmanship identified as delaying completion of TAB work.
   4. Be responsible for any added costs to the owner resulting from his failure to have the building and HVAC systems ready or from his failure to correct deficiencies promptly.

B. Complete operational readiness of the building requires that construction status of the building shall permit closing of doors, windows, ceilings installed, etc., to obtain projected operating conditions.

C. Complete operational readiness of the air conditioning systems requires that the following be accomplished:
   1. Air Distribution Systems:
      a. Verify installation conforms to design. All supply, return and exhaust ducts terminated and pressure tested for leakage as required by specifications.
      b. All volume, control, fire and smoke dampers properly located and functional. All dampers shall be fully open. MVD gradients and spin damper handles should be exposed through insulation. Dampers serving requirements of minimum and maximum outside, return and relief air shall provide tight closure and full opening, smooth and free operation.
      c. All supply, return, exhaust and transfer grilles, registers, diffusers, terminal boxes and filters installed.

d. Air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., shall be sealed to eliminate bypass or leakage of air.
e. All fans operating at full load and verified for freedom from vibration, proper fan rotation and belt tension; heater elements in motor starters to be of proper size and rating. Check motor amperage and verify that it is under nameplate rating.

2. Water Circulating Systems:
   a. Check and verify pump alignment and rotation. Verify location of thermometers, gages, and PT test plugs.
   b. Open all valves to full open position. Close bypass stop valves. Set mixing valves to full flow through system components. Remove and clean all strainers. Verify specified pipe cleaning has taken place. Repeat operation until circulating water is clean.
   c. Record pump motor amperage on each phase and voltage after reaching rated speed. Readings shall not exceed nameplate rating. Verify heater elements in motor starters to be of proper size and rating.
   d. All water circulating systems shall be full and free of air; expansion tanks set for proper water level; all air vents installed at high points of systems and operating freely. System static pressure to be set minimum 5 psig above highest system elevation.
   e. Check and set operating temperatures of heat exchangers to design requirements.
   f. Verify that piping to coils is complete and set for counter flow. Verify location of thermometers, gauges, PT test plugs, and flow balancing/measuring valves.
3. Automatic Controls:
   a. Verify that all control components are installed and functional in accordance with project requirements, including all electrical interlocks, damper sequences, temperature resets, and safeties.
   b. Verify that pressure controllers are calibrated and control variable speed motor controllers as required to maintain a stable pressure.
   c. All controlling instruments calibrated and set for designed operating conditions.
4. Notification of System Readiness: After completion of the work above, the contractor shall notify the TAB firm and designer certifying that the work has been accomplished and that the building and HVAC systems are in readiness for testing, adjusting, and balancing.

D. As part of this project contract, the contractor shall make any changes in the sheaves, belts and dampers required for correct balance as required by the TAB firm.

E. The contractor shall provide and coordinate services of qualified, responsible contractors, suppliers and personnel as required to correct, repair, or replace any and all deficient items or conditions found during the testing, adjusting and balancing period.

F. In order that all systems may be properly tested, balanced, and adjusted, the contractor shall operate systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB.

G. Project schedules shall provide sufficient time to permit the completion of TAB services prior to owner occupancy.

H. The plans and specifications have indicated valves, dampers and miscellaneous adjustment devices for the purpose of adjustment to obtain optimum operating conditions, and it will be the responsibility of the contractor to install these devices in a manner that will leave them accessible and readily adjustable. Should any such device not be readily accessible, the contractor shall provide access as requested by the TAB firm. Also, any malfunction encountered by TAB personnel shall be reported to the contractor and designer and corrected by the contractor immediately so the balancing work can proceed.

I. The TAB fieldwork shall not begin on any system / equipment item until signed prefunctional, startup checklists, pertaining to applicable equipment, have been submitted by the installing contractor to the Cx team.

1.03 QUALIFICATIONS OF THE TAB CONTRACTOR

A. The firm shall submit six (6) completed projects of like size and scope. Provide references for each project.

B. The test and balance firm shall submit a resume for the individual proposed to directly supervise the project. The supervisory personnel for the test and balance firm shall be certified test and balance engineers. All project managers and technicians shall be permanent, full-time employees of the agency.

C. The test and balance firm shall submit a list of its calibrated instrumentation to perform the work.

1.04 DOCUMENTS

A. The contractor shall furnish to the TAB firm the following:
   1. One set of mechanical specifications.
   2. Three sets of mechanical drawings.
   3. All pertinent addenda and change orders.
   4. One set of control submittal drawings.
   5. Approved submittal data on equipment installed, and related changes as required to accomplish the TAB test procedures outlined below.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 RESPONSIBILITIES OF THE TAB FIRM

A. The TAB personnel shall check, adjust, and balance the components of the HVAC system which will result in minimum noise, specified temperature, and air flow conditions in the conditioned spaces of the building while the equipment of the system is operating economically. This is intended to be accomplished after the system components are installed and operating as provided for in the contract documents.

B. GC to engage TAB at the start of the project if there are existing airside or hydronic systems affected and an existing TAB report is required. GC should set up a meeting with design team to define the overall scope of existing TAB to be performed before any new tie in or demolition.

C. TAB contractor is responsible for meeting requirements in Cx Specification 019113.

3.02 LIAISON AND EARLY INSPECTION

A. The personnel on the job shall act as liaison between the owner, designer and contractor. They shall inspect the installation of piping systems, ductwork systems, control systems, and other component parts of the HVAC systems during the construction stage to verify proper arrangement and adequate provisions for the testing and balancing.

B. During the balancing process, as abnormalities and malfunctions of equipment or components are discovered by the TAB personnel, the contractor shall be advised in writing so that the condition can be corrected by the contractor. The TAB firm shall suggest solutions to noted problems. Data from malfunctioning equipment shall not be recorded in the final TAB report.

3.03 THE TAB REPORT

A. TAB activities shall culminate in a report to be provided in triplicate to the designer. The intent of the final report is to provide a reference of actual operating conditions for the owner's operating personnel.

B. All measurements and recorded readings (of air, water, electricity, sound, etc.) that appear in the reports must be done on-site by permanently employed technicians or engineers of the firm.

C. All comment sheets (punch lists) shall be signed by the contractor to acknowledge receipt. Any outstanding items at the time of completion shall be included in the report.

D. The report shall be certified and approved by the firm's test and balance engineer. The report shall be recorded on standard forms.

3.04 ACTUAL TESTING AND BALANCING PROCEDURES

A. Airside:
   1. Supply Fan:
      a. Fans checked for rotation, amperage, static pressure, etc.
      b. Terminal boxes set to maximum cfm and adjust supply fan to within 0% to +10% of design cfm.
      c. Main supply duct pitot tube traverse and adjustment of fan speed to produce design cfm while maintaining minimum system static pressure for proper terminal box operation.
      d. The report shall record the VFD speed for the supply fan.
   2. Outside Air:
      a. Fans checked for rotation, amperage, static pressure, etc.
      b. With supply system in the maximum and minimum mode, traverse return duct and adjust minimum outside air damper to design cfm.
      c. Documents down the building as net zero pressure for AHJ compliance, but building is to be balanced to positive pressure by increasing balanced exhaust fan total CFM+10% for OA minimum. Record required minimum damper position.
   3. Exhaust Fan:
      a. Fans checked for rotation, amperage, static pressure, etc.
      b. With supply system in the maximum mode, traverse and adjust exhaust fan to within +/- 10% of design cfm.
      c. Confirmed exhaust fan operation with building static pressure sensor. Fan to only turn on when building static pressure sensor. Fan to only turn on when building static pressure is above +0.07” and modulate to maintain +0.04” positive pressure. Fan to be off at building pressure of +0.03” and below.
   4. Diffusers, Registers, and Grilles:
      a. Balance each supply air outlet to within 0% to 10% of design cfm.
      b. Balance each return air outlet to within +/- 10% of design cfm.
      c. Balance each exhaust air outlet to within 0% to -10% of design cfm.
      d. Check and/or adjust pressure relationships so that each positive pressure and each negative pressure area is at least 10% positive or negative as appropriate.
   5. After completion, take total air-handling system static profile and record all final statics, amperages, rpm, cfm, etc.
   6. The TAB contractor shall compare the sum of the CAV/VAV box diffuser readings with the flow indicated by the box controller prior to calibrating the box controller. If the two readings agree within ±5%, the factory calibration factors shall not be changed. If the readings are not within ±5%, a documented trouble-shooting procedure consisting of checking and resolving the following shall be conducted prior to calibrating the controller to verify:
      a. Box size is per the approved submittal
      b. Manufacturer gain/flow factor has been correctly entered into the controller
      c. Low pressure duct/connections are tight
      d. Velocity pressure connections at the box inlet and controller are tight and undamaged
      e. Static pressure at the box inlet exceeds the minimum required
      f. Box flow measuring device is undamaged.
   7. This procedure and results for carrying out steps 1 – 7 above are to be retained by the Mechanical Contractor for delivery to the Owner/Design Engineer on request.
   8. After completion, take total air handling system static profile and record all final statics, amperages, RPM, airflow, etc.
   9. Measure and include in the report AHU supply and return fan flow, RPM, HP, and sensed duct static pressure at the dirty differential pressure drop across both the pre-filter and final filter.
   10. Measure system performance with the pressure drop across filters at the value specified for dirty filters.

B. Waterside:
   1. Hot Water:
      a. Check system for cleanliness.
      b. With all hot water coils (including terminal box reheat coils) calling for full heating, test, set and record pump head and flow.
      c. Test, set and record pressure drop and flow through each boiler to within 0% to 5% of design.
      d. Test, set and record pressure drop and flow through each flow balancing station.
      e. Test, set and record pressure drop and flow through each heating coil to within 0% to 5% of design.
      f. Verify that piping system is vented.
      g. Verify removal of pump start-up strainer and replacement with operating strainer.
   2. Domestic Hot Water Recirculation System:
      a. Balance recirculation pumps ±5% of design gpm flow.
      b. Set balancing valves to gpm settings as noted on plumbing drawings.
      c. Ensure domestic water balance is completed prior to sanitization or ultra-sonic testing is to be used.

C. Controls:
   1. AHU Controls:
      a. Check temperature controls for proper calibration and setpoint.
      b. Check economizer controls for proper damper operation and control calibration.
      c. Check exhaust fan economizer system under maximum and minimum conditions for proper operation and confirm positive building pressure throughout operation with calibrated building differential pressure sensor.
      d. Check static pressure control under maximum and minimum conditions for proper operation.
      e. Record the following: The supply duct static pressure reading, VFD Hz, and fan rpm when the AHU supply fan is meeting the design airflow of all terminal units simultaneously. Also record the supply static pressure set point established and transmitted to the controls subcontractor.
   2. Thermostats and Controllers:
      a. Check for proper control of valves, dampers, terminal boxes, exhaust fans, etc.
      b. Set at design set point.
      c. Verify calibration of thermostats.

D. Hydronics in Control Verification:
   1. Record the following: The hydronic system pressure setpoint, VFD Hz, and pump RPM when the system is meeting the design water flow of all associated coils simultaneously. Also record the operating system pressure established and transmitted to the controls contractor.

E. Capacity and Performance Test:
   1. Cooling Coils:
      a. Test, set and record pressure drop and flow through each coil.
      b. Measure entering and leaving dry and wet bulb air temperatures with glass stem, mercury thermometers accurate to 1/2 degrees F.
      c. Measure entering and leaving water temperature with glass stem, mercury thermometer if thermometer wells are provided. If P.T. plugs are provided, use a bi-metal thermometer which reads in 1 degree F. increments and use the same thermometer for both supply and return water temperature measurements.
      d. Record final temperatures, BTU/HR. and GPM.
      e. Convert actual test conditions to design conditions to insure design coil capacities at design temperatures.
   2. Terminal Box Heating Coils: Test, set and record flow through hot water branch main balancing valves or individual terminal box heating coil. HCA standard is that heating coils on VAV boxes are not provided with individual balancing valves. The contractor shall review the drawings to determine the number of balancing valves on the project.

3. Thermostat Calibration:
    a. Measure and record dry and wet bulb temperatures at each thermostat.
    b. Report any thermostat which is not controlling with +/-1-1/2 degree F.
4. Control Temperature Readouts:
    a. Test actual temperature next to sensor (if possible) and compare to readout.
    b. Report any sensor which is not within +/-1/1-2 degrees F.

F. Noise Level:
1. The TAB Contractor shall measure the HVAC background noise level in all the spaces as follows:
    a. The sound level shall be measured at the patient head location in patient sleeping and therapy rooms.
    b. In all other rooms the sound level is to be measured at the approximate center of the room 48″ above floor level.
    c. The TAB report shall document the measure NC level for each space.
    d. The TAB report shall also include an NC curve for any space that exceeds the specified NC limit.
    e. HVAC system produced noise shall not exceed the requirements in the FGI Guidelines.
    f. The only exception is that operating rooms and C-Section rooms shall not exceed NC 42.

G. The General Contractor and the Mechanical Contractor shall be responsible for reviewing the NC curve for spaces which exceed the required levels and make appropriate adjustments to the system to bring the NC level into range. The final TAB report shall document all spaces with appropriate NC levels.

3.05 REPORTS

A. Problems Encountered: Any items not installed, improperly installed or not functioning properly shall be reported to the contractor.

B. Final Report:
1. Any unresolved problems shall be reported in a general remarks section in front of the test and balance report.
2. Any unusual operations or pertinent remarks which may aid the maintenance personnel or ease the reading of the report shall be made in the general remarks section of the report.
3. All operating data and final tests shall be reported in the final report. This data shall include, but not necessarily be limited to the scope of work outlined above.
4. TAB contractor shall compile an Excel spreadsheet for all terminal boxes, listing each box by its unique identification number, the inlet flow area established by the box manufacturer, the manufacturer’s gain factor for the box, final TAB calibrated gain factor for the box if field calibrated, and the ratio of the calibrated gain factor to the manufacturer’s gain factor.
5. Report shall include building and space pressure relationships in all modes of operation. Critical space pressures that include pressure monitors shall be provided in the report as well as air change rates.

3.06 CALLBACK

A. Test and Balance Agency shall retest any unresolved problems noted in the final report. The revised results shall be forwarded after completion of test.

B. At the discretion of the designer before final acceptance of the TAB report, the report data shall be verified one time on the job site by selection of random check points in the presence of the designer. Representatives of the testing firm shall be present and provide the necessary equipment for test data verifications.

C. The firm shall be responsible for testing, adjusting, balancing, and reporting on the performance of all fans, dampers, air distribution devices, pumps and heat exchangers, the flow through all coils, pumps and heat exchangers, and the power consumption of all motors. The contractors and the suppliers of the equipment installed shall cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components and shall furnish all labor and material required to eliminate any deficiency.

D. Make one (1) inspection within ninety (90) days after occupancy of the building to ensure that satisfactory conditions are being maintained.

3.07 OPPOSED SEASON TESTING

A. This service allows for testing of equipment that, due to extreme weather conditions, cannot be accurately tested at the time of the initial balance. If a project is balanced during the summer, the opposed season testing is performed during the winter months and vice-versa.

B. During the opposed season testing, any necessary modifications to the initial adjustment required to produce optimum operation of the system components shall be made to produce the proper seasonal conditions in each conditioned space. At the time of opposite season testing, the designer and owner shall be given timely notification before any readings or adjustments are made so that he may participate.

END OF SECTION 23 05 93

SECTION 23 07 10

INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall provide all necessary labor, materials, tools, and equipment to perform work required on the drawings and specified herein.

B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.

C. All pipe fittings, valves, and strainers in insulated pipe systems to be insulated.

D. Thermal resistance "R" values used herein are expressed in units of "Hour, Degrees F., Sq. Ft./BTU per Inch of Thickness" on a flat surface at a mean temperature of 75 degrees F.

1.02 DEFINITIONS

A. "Exposed" equipment, ducts, and piping are areas which will be visible without removing ceilings or opening access panels.

B. Outdoors is considered exposed to the weather.

C. Underground is buried, whereas in a trench below grade is considered concealed.

1.03 CERTIFICATION/QUALITY ASSURANCE

A. Products shall meet applicable national, state, and local building codes and be U.L. (or other recognized testing lab) listed for intended service.

B. All insulations, jackets, adhesives, coatings, sealers, and tapes shall have a flame spread rating of 25 or less and smoke development rating of 50 or less when tested in accordance with ASTM E-84, NFPA 225, U.L. 723, and further must meet the requirements of NFPA 90-A and applicable building, plumbing, and mechanical codes.

C. All insulation materials shall be delivered and stored in manufacturers' containers and kept free from dirt, water, chemical, and mechanical damage. Under no circumstances shall insulation applied to exterior ductwork be allowed to get wet prior to final material covering.

D. Insulation shall be applied in a workmanlike manner by experienced, qualified tradesmen.

E. Insulation shall not be applied until all pressure testing has been completed, inspected, and released for insulation application.

F. Surfaces shall be clean and dry.

G. Insulation joints shall be butted firmly together and all jackets and tapes shall be smoothly and securely installed.

H. Insulation for duct, pipe, and equipment for above grade exposed to weather outside building shall be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D-1692.

1.04 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. NFPA 90-A.

D. ASHRAE 90.1

E. Florida Energy Conservation Code.

PART 2 PRODUCTS

2.01 MATERIALS FOR PIPE AND EQUIPMENT

A. Materials for Pipe and Equipment: Provide factory pre-molded or shop or site mitered segment type insulation for pipe, pipe fittings, and valves. Fitting insulation to be of same thickness and

material as adjoining pipe insulation. All insulation and related materials such as tape and mastic to meet applicable building code requirements for fire and smoke development.

1. Cellular Glass (Foamglass): Pittsburgh Corning "Foamglass." Product must be guaranteed by manufacturer to have a continuous operational temperature limit of 250 degrees F. and a minimum "R" value of 3.7 per inch (K=0.27) at 75 degrees F mean temperature. Vapor-barrier mastic for application to below ambient pipe insulation shall be fungus resistant per ASTM D 5590 with 0 growth rating; Water based; Permeance per ASTM E 96, Procedure B, 0.013 perm or less at 43-mil dry film thickness suitable for indoor and jacketed outdoor use. Products: Foster 30-80 AF. Color: White. Fittings on foam glass insulation shall be made up of mitered sections of foam glass. For all butt joints, a pliable insulation joint sealant shall be used. Products: Foster 95-50 or Childers CP-76. Use foamglass for the following services:
    a. Where hanger saddles are installed instead of other piping insulation (fiberglass, flexible tubular) to prevent crushing of insulation at hangers.
2. Flexible Tubular: Provide 25/50 rated, closed-cell, flexible tubular rubber type pipe insulation. Product to have continuous operational temperature limit of 200 degrees F. and a minimum "R" value of 3.7 per inch (K=0.27) at 75 degrees F mean temperature. Product to be Armstrong AP Armaflex or approved equal pipe insulation. Use flexible tubular for the following services:
    a. Moisture condensate drains: 1" thick.
    b. Refrigerant suction lines for split systems: 1" thick.
    c. Provide multiple layers as required to obtain minimum thickness.
3. Fiberglass: Provide factory-formed, factory-jacketed fiberglass piping insulation. Product to be Manville "Micro-Lok 650" with "Type AP-T" jacketing or equivalent product manufactured by CertainTeed, Knauf, or Owens-Corning. Product to have continuous operational temperature limit of 850 degrees F and a minimum "R" value of 3.5 per inch thickness (K=0.28) at 75 degrees F mean temperature. Jacket to be fiberglass reinforced kraft paper with aluminum foil and pressure sensitive closure system. Vapor-barrier mastic for application to **below** ambient pipe insulation shall be fungus resistant per ASTM D 5590 with 0 growth rating; Water based; Permeance per ASTM E 96, Procedure B, 0.013 perm or less at 43-mil dry film thickness suitable for indoor and jacketed outdoor use. Products: Foster 30-80 AF. Color: White. A breather mastic for application to above ambient pipe insulation (fittings, tees, valves, etc) shall be water based Foster 46-50 mastic or Childers CP-10 / CP-11. Use fiberglass piping insulation for the following services:
    a. Heating hot water piping: below 1-5/8" – 1-1/2" thick; 1-5/8" and greater - 2" thick.
    b. Vents from condensate receiver tank, flash tank, and pressure reducing station relief valve where exposed in building: 1" thick.

2.02 MATERIALS FOR DUCTS

A. Blanket Type Duct Insulation: Provide minimum 3/4 pound per cubic foot density, flexible blanket fiberglass duct insulation with FSKL aluminum foil vapor barrier facing and 2" tab. Insulation shall have minimum ‘R’ value of 3.4 per inch (K=0.29) at 75 degrees F mean temperature. Product to be Manville "Microlite" or equivalent standard duct wrap by CertainTeed, Knauf, or Owens-Corning. Use blanket type duct insulation for the following:
    1. Unlined heating and/or cooling supply air ductwork concealed from view: 2" thick.

B. Board Type Duct Insulation: Provide minimum 3 pound per cubic foot density, semi-rigid fiberglass duct insulation with FSKL aluminum foil vapor barrier facing. Insulation shall have a minimum ‘R’ value of 3.8 per inch (K=0.26) at 75 degrees F mean temperature. Product to be Manville "800 series Spin-Glas" or equivalent by CertainTeed, Knauf, or Owens-Corning. Use board type duct insulation for the following services:
    1. Unlined exposed heating and/or cooling supply air ducts: 1-1/2" thick.

2.03 MATERIALS FOR FITTINGS, VALVES, AND SPECIAL COVERINGS

A. Provide coverings and finishes for specific items hereinafter specified.
    1. Use pre-molded insulation fabricated by the manufacturer of insulation material or shop or site mitered segment type insulation for: All pipe fittings, elbows, tees, valves, and

couplings. Fittings on fiberglass pipe insulation shall be mitered insulation for piping up to 2” diameter and molded fittings for pipe 2-1/2” diameter and larger.

2. PVC fitting covers over blanket fiberglass are NOT acceptable.

B. For heat exchangers, air separators, large pipes, etc., in systems operating over 60 degrees F., when exposed-to-view inside building or in equipment rooms, cover insulation with a smoothing coat of Keane Powerhouse cement, one layer of white colored glass mesh embedded and finished with Foster 46-50 mastic or Childers CP-10 / CP-11 mastic.

C. Fabricate and install readily removable insulation caps to facilitate service and maintenance accessibility to all strainers including suction diffusers in systems operating below 60 degrees F.

D. For any service when above grade exposed-to-the-weather outside building, cover straight pipe insulation with 0.016" thick aluminum jacket equivalent to ITW or RPR and cover valves and fittings with .024" thick aluminum factory formed covers equivalent to Childers Ell-Jacs.

E. For flexible tubular pipe and fitting insulation when exposed-to-view inside building finish with two coats of paint, custom color blended to match surrounding surfaces.

F. When specifically approved by designer, when it is impossible to completely insulate pipe, fittings, or valves with specified insulation, Armstrong Armaflex insulation tape may be used to prevent condensate drip on small piping. Use of cork insulation tape is prohibited.

PART 3 EXECUTION

3.01 GENERAL

A. No insulation shall be cut where a hanger is located. If hangers have been installed by pipefitter tradesmen which violates this strict requirement, notify Designer immediately.

B. Piping and ductwork systems shall be tested and found free of all leaks prior to installation of insulation covering.

C. All surfaces shall be clean and dry when covering is applied. Covering to be dry when installed and during application of any finish, unless such finish specifically requires a wetted surface for application.

D. All adhesives, cements, and mastics shall be compatible with materials applied and shall not attack materials in either wet or dry state.

E. Install insulation using professional insulators who have adequate experience and ability.

F. Exposed-to-view insulation shall have a well tailored appearance.

G. See Section 23 21 13 and 23 22 13 for sleeves and insulation requirements.

H. Stop all duct coverings, including jacket and insulation, at fire and smoke dampered penetrations of partitions. "Fan-Out" or extend jacketed insulation at least 2" beyond angle frames of dampers and secure insulation to partition. Maintain vapor barrier. Where insulated duct access door is not used, install covering over damper access panel so as to be readily removable and identifiable.

I. Treat insulated pipe and duct surfaces in equipment rooms and where exposed to normal view, so surfaces may be painted with water base latex paint. Use of mastics, adhesives, or jacketing which cause "bleeding" is prohibited.

3.02 INSTALLATION OF DUCT COVERING

A. Apply jacketed blanket type fiberglass covering to ducts pulled snug but not so tight as to compress corners more than 1/4". Use insulation having 2" tab, or cut insulation long enough to allow for "peel off" of insulation from jacket to effect a minimum overlap of 2". Secure 2" jacket laps using equivalent of Foster 85-75 or CP-82 adhesive and staple lap with flare type staples on 2" centers. Cover standing seams, stiffeners, and braces with same insulation blanket, using 2" jacket lap and staple lap as hereinbefore outlined. Cover and seal all staples with Foster 30/80 AF, fire resistant vapor barrier coating reinforced with glass cloth.

B. For duct 24" or wider, mechanically fasten insulation to duct bottom, using weld pins or nylon "stick-clip" base plates having self-locking coated metal or nylon discs. Locate fasteners on not over 12" centers laterally and longitudinally. Seal pins as above.

C. For ducts more than 20” deep, mechanically fasten insulation to duct sides, using one row of pins, plates, or discs located on not over 12" centers longitudinally and equidistant laterally between duct top and bottom. For ducts over 24" deep, apply fasteners as before only using minimum of two rows.

D. Apply jacketed board type fiberglass covering to ducts using weld pins or nylon "stick-clip" base plates having self-locking coated metal or nylon discs. Locate fasteners on not over 12" centers laterally and longitudinally. If insulation is grooved to fit around corners, in order to eliminate as many joints as possible, pin as required to hold insulation tight to duct, especially on bottom of duct. Seal pins and joints with Foster 30-80 AF reinforced with glass mesh.

E. Cover all joints, rips, tears, punctures, disc heads, staples, or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in Foster 30-80 AF fire resistant vapor barrier coating. PRESSURE SENSITIVE TAPE NOT ALLOWED.

F. Ductwork manual volume damper (MVD) handles, airflow station pressure ports, access door handles, duct-mounted instrumentation, etc., shall be left exposed and/or accessible above the insulation vapor barrier.

3.03 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where fiberglass or flexible tubular insulation is used on piping sized 2" and larger, insert a section of foamglass insulation at hanger or support points between pipe and metal shield for full length of shield to prevent crushing of insulation. Insulation thickness to be same as adjoining insulation. Where insulation passes through pipe hangers and across trapeze supports, 12" long metal saddles shall be used. On cold pipe, vapor barrier should be carried through the hanger and sealed.

B. Apply flexible tubular insulation to pipe and fittings using the slip-on method with all joints tightly fitted and sealed with Armstrong 520, Foster 85-75, Childres CP-82 adhesive or approved equal. Seal butt joints, miter joints and torn or damaged insulation with adhesive.

C. Prior to application of flexible sheet insulation, thoroughly clean all metal surfaces, making sure that all dirt, scale, loose paint, plaster, and oil have been removed and that surfaces are dry. If surface has been primed, test a 2 square foot section using adhesive equivalent to Armstrong No. 520, Foster 85-75, Childers CP-82 in order to determine whether solvent in adhesive will loosen or lift the primer. If primer is loosened, then remove it. When testing proves acceptable, adhere insulation with smooth side out, using thin but adequate coating of same adhesive. Follow manufacturers’ instructions. Coat all butt edges of each sheet. Stagger all joints. Insulate all standing seams or flanges with same thickness of insulation material as that used on main surface.

D. All hot water pump casings shall be insulated with readily removable insulation sections that allow easy access to all pump components, pressure gauges, P/T ports, etc., requiring testing or maintenance access.

E. Piping insulation on in-line mounted P/T ports, circuit setting pressure ports, calibrated balancing valve pressure ports, etc., shall be made easily removable so that access to the ports can be readily obtained without destroying the insulation.

END OF SECTION 23 07 10

SECTION 23 09 23

DIRECT DIGITAL CONTROL/BUILDING AUTOMATION SYSTEM (DDC/BAS)

PART 1 GENERAL

1.01 DESCRIPTION

A. Direct Digital Control/Building Automation Systems (DDC/BAS) shall be Johnson Controls. For pricing contact:

1. Johnson Controls, Inc.
   Contact: Kevin P. Tolbert
   507 E. Michigan St, M-30
   Milwaukee, WI 53202
   email: BE-HCA@jci.com
   478-952-8740

B. All new points are to be mapped back to and integrated with existing HCA Florida Memorial Hospital Jacksonville, FL front end. Provide software upgrade to accept new controllers and graphics updates if required to integrate project.

C. The work specified under this section of the specifications includes furnishing, installing, programming, and placing into operation the DDC/BAS systems.

D. The BAS/DDC shall use BACNet/IP protocol capable of communicating over an Ethernet system. It shall be capable of residing on the HCA Enterprise WAN/LAN by having an assigned IP address. BAS/DDC systems are required to permit a remote user with password access, monitor points and issue basic commands over the HCA WAN/LAN using a PC type terminal without the need for proprietary BAS/DDC software. The system front end shall reside on a server not a PC. The user interface is to be installed on an owner-furnished workstation. Controls Contractor to coordinate and verify with FacilitiGroup Automation Services Manager full BAS communication between facility and FacilitGroup Automation Services. Provide a new laptop with BAS software to the facility when a new BAS is installed or there is a major upgrade to the system.

E. The DDC/BAS systems shall be furnished and installed under this section of the specifications and shall consist of microprocessor based digital system controllers. The systems shall be complete in every respect, including all auxiliary and accessory items as required, and shall be thoroughly coordinated so as to provide a compatible and completely workable system.

F. Provide a complete control system including electrical interlocks, wiring, conduit, relays, switches, control transformers, and other devices as required to accomplish automatic control of the mechanical systems. Refer to drawings for details.

G. All systems shall be guaranteed against defects of any nature and to operate properly for a period of not less than 12 months after final acceptance of the job by the Owner. During this period, the BAS manufacturer shall service and adjust the systems as required for proper operation, replacing components as required.

H. The contractor shall work in close cooperation with the TAB agency in calibrating all airflow and water flow stations and all duct and pipe mounted differential pressure sensor/transmitters.

I. Commissioning of the mechanical and control systems is part of this project. The Cx procedures shall include Prefunctional Performance Testing and final Functional Performance Test. The contractor should refer to Specification Sections 01 9113, in order to be apprised of, and become familiar with his responsibilities and accountabilities throughout the Cx process.

J. The controls contractor shall furnish the test and balance contractor with appropriate DDC system software available to assist in the TAB process. The contractor shall work in close cooperation with the TAB agency in calibrating all airflow and water flow stations and all duct and pipe mounted differential pressure sensor/transmitters. The controls contractor shall provide a technician for 8 hours to assist/train the TAB technician in the coordination/interface of the BAS with TAB activities.

1.02 SUBMITTALS

A. Submit complete shop drawings, equipment and component brochures, list of control valve CV and pressure drops, list of control dampers, written sequences of operations, diagrams indicating panels, gauges, components, spring ranges, and setpoints, and complete composite wiring diagrams indicating all equipment interlocks for entire control system.

B. At the time of submission to architect/engineer, the contractor shall submit an information only copy of the complete BAS/DDC submittal to HCA Engineering, HCA Healthcare Building 3, 2545 Park Plaza, Nashville, TN 37203.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT DESCRIPTION

A. The building automation system shall consist of the following:
   1. Stand-alone DDC panels.
   2. Stand-alone application specific controllers (ASCs).
   3. Portable laptop PC operator terminal.
   4. DDC panel-mounted operator terminal.

B. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, stand-alone DDC panels, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC panel shall operate independently by performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

D. Stand-alone DDC panels shall be able to access any data from or send control commands and alarm reports directly to any other DDC panel or combination of panels on the network without dependence upon a central processing device. Stand-alone DDC panels shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

2.02 NETWORKING/COMMUNICATIONS

A. The design of the BAS shall network operator workstations and stand-alone DDC panels.

B. Local Area Network:
   1. Workstation/DDC Panel Support: Operator workstations and DDC panels shall directly reside on a local area network such that communications may be executed directly between controllers, directly between workstations, and between controllers and workstations on a peer-to-peer basis.
   2. Dynamic Data Access: All operator devices shall have the ability to access all point status and application report data, or execute control functions for any and all other devices via the local area network.
   3. General Network Design: Network design shall include the following provisions:
      a. High speed data transfer rates. The minimum transfer rate shall be 100 Mb (Mb/s).
      b. Commonly available, multiple source, networking components and protocols shall be used to allow the BAS to coexist with other networking applications. MAP, ETHERNET, IBM Token Ring and ARCNET are acceptable technologies.
      c. Use of an industry standard IEEE protocol.
      d. Synchronization of the realtime clocks in all DDC panels shall be provided.
      e. Permit at least four simultaneous users to access the system over the LAN, based on password level. Users shall have access to monitor parameters, change set points, set up trends, or start/stop controlled equipment. A remote user shall have this capability without having the system data base loaded on his/her remote computer.
      f. Text/Email feature shall be provided with capability to telephone/email selected facility maintenance personnel to notify them of critical BAS alarms.

4. Connection to Facility's LAN: The BAS shall be connected to the facility's Ethernet LAN to the extent possible to avoid duplication of LAN wiring. Coordinate connection with owner.
    a. The BAS shall be connected to the facility LAN and shall permit unlimited simultaneous users to access the system over the LAN and to (based on password level), monitor parameters, change set points, set up trends, or start/stop controlled equipment.
    b. A remote user shall have this capability without having the system data base loaded on his/her remote computer.
    c. Connection by remote Energy Management system shall be accommodated by allowing polling of BAS parameters over Bacnet IP.

2.03 STAND-ALONE DDC PANELS

A. General: Stand-alone DDC panels shall be microprocessor based, multi-tasking, multi-user, real-time digital control processors. Each stand-alone DDC panel shall consist of modular hardware with plug-in enclosed processors, communication controllers, power supplies, and input/output modules.

B. Memory: Each DDC panel shall have sufficient memory to support its own operating system and databases.

C. Point Types: Each DDC panel shall support the following types of point inputs and outputs:
    1. Digital Inputs for status/alarm contacts
    2. Digital Outputs for on/off equipment control
    3. Analog Inputs for temperature, pressure, humidity, flow, and position measurements
    4. Analog Outputs for valve and damper position control, and capacity control of primary equipment
    5. Pulse Inputs for pulsed contact monitoring

D. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, field controllers, sensors, and actuators.

E. Serial Communication Ports: Stand-alone DDC panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as industry standard printers, laptop workstations, PC workstations, and panel mounted or portable DDC panel operator's terminals. Stand-alone DDC panels shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers, or network terminals.

F. Hardware Override Switches: The operator shall have the ability to manually override automatic or centrally executed commands at the DDC panel via local, point discrete, on-board hand/off/auto operator override switches for binary control points and gradual switches for analog control type points. These override switches shall be operable whether the panel is powered or not.

G. Hardware Override Monitoring: DDC panels shall monitor the status or position of all overrides and inform the operator that automatic control has been inhibited.

H. Local Status Indicator Lamps: The DDC panel shall provide local status indication for each binary input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

I. Integrated On-Line Diagnostics: Each DDC panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment.

J. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

K. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of all stand-alone DDC panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum

of 72 hours. Upon restoration of normal power, the DDC panel shall automatically resume full operation without manual intervention.

L. Provide a battery backup (UPS) system to support DDC panel functions for a minimum of 15 minutes upon loss of power. The UPS system shall be provided regardless of connection to facility emergency power system.

2.04 SYSTEM SOFTWARE FEATURES

A. General:
   1. All necessary software to form a complete operating system as described in this specification and on drawings shall be provided.
   2. The software programs shall be provided as an integral part of the DDC panel and shall not be dependent upon any higher level computer for execution.

B. Control Software Description:
   1. Pre-Tested Control Algorithms:
      a. Two Position Control
      b. Proportional Control
      c. Proportional plus Integral Control
      d. Proportional, Integral, plus Derivative Control
      e. Automatic Control Loop Tuning
   2. Equipment Cycling Protection.
   3. Heavy Equipment Time Delays.
   4. Powerfail Motor Restart.

C. Energy Management Applications: DDC panel shall have the ability to perform any or all of the following energy management routines:
   1. Time of Day Scheduling
   2. Calendar Based Scheduling
   3. Holiday Scheduling
   4. Temporary Schedule Overrides
   5. Optimal Start/Stop
   6. Night Setback/Setup Control
   7. Economizer
   8. Peak Demand Limiting
   9. Temperature Reset

D. Custom Process Programming Capability: DDC panels shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

E. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each DDC panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to noncritical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the DDC panel's ability to report alarms be affected by either operator activity at a PC workstation or local I/O device, or communications with other panels on the network.

F. Historical Data and Trend Analysis: A variety of historical data collection utilities shall be provided to automatically sample, store, and display system data in all of the following ways:
   1. Continuous Point Histories.
   2. Control Loop Performance Trends.
   3. Extended Sample Period Trends.
   4. Data Storage and Archiving.

G. Runtime Totalization: Stand-alone DDC panels shall automatically accumulate and store runtime hours for binary input and output points.

H. Analog/Pulse Totalization: Stand-alone DDC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

I. Event Totalization: Stand-alone DDC panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off.

2.05 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each stand-alone DDC controller shall be able to extend its performance and capacity through the use of remote Application Specific Controllers (ASCs).

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases.

D. The operator interface to any ASC point data or programs shall be through any network-resident PC workstation or portable operator's terminal connected to any DDC panel in the network.

E. Application specific controllers shall directly support the temporary use of a portable service terminal.

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

G. Battery Backup (UPS): UPS shall be provided to support ASC functions for a minimum of 15 minutes upon loss of power. The UPS system shall be provided regardless of connection to facility emergency power system.

H. The modes of operation supported by each ASC shall minimally include, but not be limited to, the following:
   1. Daily/Weekly Schedules
   2. Occupancy Mode
   3. Economy Mode
   4. Temporary override Mode

I. Continuous Zone Temperature Histories: Each ASC shall automatically and continuously maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.

J. Alarm Management: Each ASC shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

K. Application Descriptions:
   1. VAV Terminal Unit Controllers:
      a. VAV terminal unit controllers shall support, but not be limited to, the control of the following configurations of VAV boxes to address current requirements as described in the Execution portion of this specification, and for future expansion.
         1) Single Duct (Cooling Only or Cooling With Reheat)
      b. VAV terminal unit controllers shall support the following types of point inputs and outputs:
         1) Proportional Cooling Outputs
         2) Heating Outputs (Proportional Analog Hot Water Control Valve or SCR Electrical)
      c. Each VAV terminal unit space temperature sensor shall include setpoint potentiometer, room temperature indication, and communication port for portable operators terminal. Controller shall be capable of controlling to a discharge temperature that is reset based on the difference between space temperature and space temperature set point changes.
      d. VAV box differential pressure transmitter shall be by JCI or Setra, 0 to 1.5” pressure range, +/- 0.0008” w.c. linearity, +/- 0.00075 w.c. repeatability.
   2. Unitary Controllers:
      a. Unitary controllers shall support, but not be limited to, the following types of systems to address specific applications indicated on the drawings:
         1) Heat Pumps (Air-to-Air, Water-to-Air)

2) Packaged Rooftops

b. Unitary controllers shall support the following types of point inputs and outputs:
   1) Economizer Switchover Inputs
   2) Drybulb
   3) Outdoor Air Enthalpy
   4) Differential Temperature
   5) Differential Enthalpy
   6) Binary Input from a separate controller
   7) Economizer Outputs
   8) Integrated Analog with minimum position
   9) Binary output to enable self-contained economizer actuator
   10) Heating and Cooling Outputs
   11) 1 to 3 Stages
   12) Analog Output with two-pipe logic
   13) Reversing valve logic for Heat Pumps
   14) Fan Output
   15) On/Off Logic Control

3. AHU Controllers:
   a. AHU controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally stand-alone fashion.
   b. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation.

2.06 OPERATOR INTERFACE

A. Command Entry/Menu Selection Process: Operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software.

B. The operator interface shall minimize the use of a typewriter style keyboard through the use of a mouse or similar pointing device, and "point and click" approach to menu selection. Users shall be able to start and stop equipment or change setpoints from graphical displays through the use of a mouse or similar pointing device.

C. Graphical and Text-Based Displays: Operator workstations shall provide consistent graphical or text-based displays of all system point and application data described in this specification. Point identification, engineering units, status indication, and application naming conventions shall be the same at all workstations.

D. Password Protection: Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as he deems appropriate for each user, based upon an assigned password.

E. Operator Commands: The operator interface shall allow the operator to perform commands including, but not limited to, the following:
   1. Start-up or shutdown selected equipment.
   2. Adjust setpoints.
   3. Add/Modify/Delete time programming.
   4. Enable/Disable process execution.
   5. Lock/Unlock alarm reporting for each point.
   6. Enable/Disable Totalization for each point.
   7. Enable/Disable Trending for each point.
   8. Override PID Loop setpoints.
   9. Enter temporary override schedules.
   10. Define Holiday Schedules.
   11. Change time/date.
   12. Enter/Modify analog alarm limits.
   13. Enter/Modify analog warning limits.
   14. View limits.
   15. Enable/Disable Demand Limiting for each meter.

16. Enable/Disable Duty Cycle for each load.

F. Logs and Summaries: Reports shall be generated automatically or manually, and directed to either CRT displays, printers, or disk files. Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the building automation system. Under no conditions shall the operator need to specify the address of hardware controller to obtain system information.

G. Dynamic Color Graphic Displays:
   1. Color graphic floor plan displays, and system schematics for each piece of mechanical equipment shall be provided to optimize system performance analysis and speed alarm recognition.
   2. The BAS shall include a trend viewing utility that shall have access to all data base points. It shall be possible to display trend data in histogram (X-Y plots) format without exporting the data to another application. Refer to the enclosed sheets at the end of this section for an example of summary sheet displays.

H. System Configuration and Definition: All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.
   1. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently add/delete/modify all functions.
   2. Programming Description: Definition of operator device characteristics, DDC panels, individual points, applications, and control sequences shall be performed through fill-in-the-blank templates and graphical programming approach.
   3. System Definition/Control Sequence Documentation: All portions of system definition shall be self-documenting to provide hardcopy printouts of all configuration and application data. Control process and DDC control loop documentation shall be provided in logical, graphical flow diagram format to allow control sequences to be easily interpreted and modified at any time in the future.

2.07 PORTABLE LAPTOP PC OPERATOR TERMINAL

A. Furnish one Portable Laptop PC Operator's Terminal and software to be used for communication with any controller. The terminal shall be a Windows Vista Business edition based laptop personal computer that uses controller interface software to communicate with the controllers. Manufacturer shall be Dell, Inc. or approved equal.

B. When plugged into any controller on the BAS network, the portable terminal shall have the same functionality as a stationary terminal with full editing, programming, display, and command functions. The terminal shall allow access to the entire network.

C. The terminal shall have minimum 3.0 GHZ Intel Pentium Duo Core processor, 4.0 GB RAM internal memory, built-in 250 GB hard drive and 48X CDRW/DVD Combo drive. In addition, the terminal shall have an RS232 serial port, two USB ports and expansion slot for modem.

2.08 STAND-ALONE DDC PANEL-MOUNTED OPERATOR'S TERMINAL:

A. Each DDC panel (except VAV terminal unit controllers) shall include a local panel-mounted operator's terminal for local command entry, instantaneous and historical data display, setpoint adjustment and program additions and modifications.
   1. The DDC panel operator terminal shall provide access to all real or calculated points in the controller to which it is connected or any other controller in the network.
   2. Operator access at all DDC panel operator terminals shall be identical to each other, as well as identical to the PC operator workstations. Any password changes shall automatically be downloaded to all controllers on the network.
   3. The DDC panel operator terminal shall provide English language prompting to eliminate the need for the user to remember command formats or point names.
   4. A multi-function touchpad shall be provided for point and command selection, as well as parameter entry.
   5. Context-Sensitive Help.

6. Identification for all real or calculated points shall be consistent for all network devices. Use English language names to access points at the DDC panel operator's terminal.
7. In addition to instantaneous summaries, the DDC panel operator's terminal shall allow a user to view a point history file for system points.

2.09 ELECTRONIC AND ELECTRIC CONTROL COMPONENTS

A. All sensors, pressure transmitters, transducers, etc., shall be selected such that the pressure range midpoint shall coincide with the anticipated normal operating pressure.

B. Electric Thermostats: Thermostats to be manufacturer's best commercial grade thermostat with adjustable setpoint, dials calibrated in degrees F, and digital temperature indication. Select thermostats with suitable range for service intended. Temperature measurement accuracy shall be +/- 0.5 degrees F. Thermostats located in public areas such as corridors or elsewhere as indicated on drawings shall be provided with programming lockout to prevent unauthorized adjustment. Thermostats located where subject to physical damage and/or where identified on drawings shall be provided with tamper resistant cover. Warmer / Cooler setpoint adjustment will not be acceptable.

C. Electronic Sensors/Transmitters: Sensors/transmitters to be 1000 Ohm platinum RTD type with high resistance change vs. temperature or humidity change, accurate to +/- 1.0 degrees F for temperature and +/- 2.0% for humidity at applicable range, and provide 4 to 20 MA or 0 to 5 VDC output signal. Sensors/transmitters to be suitable for room, duct, or well mounting as required by application. Room type to have built-in setpoint potentiometer and digital room temperature or humidity indication. Select for temperature/humidity range of application. Provide appropriate mounting plate and hardware. Temperature sensors used as a part of Energy (BTU) Measurement System shall meet the applicable requirements of that section. Sensors shall have setpoint adjustment through BAS only. Sensors located where subject to physical damage and/or where identified on drawings shall be provided with protective cover. Sensor stability shall be less that 0.1 °F in 5 years. Provide these devices where identified on the contract documents or if not shown on design documents provide at all locations listed within this section. Humidity sensors are to be stand-alone sensors and at a minimum provided within each Trauma Room, Lab, CT, and Rad Rooms, Procedure Room, if not already shown on the contract documents.

D. Smoke Detectors: Install duct-mounted smoke detectors at locations indicated on drawings and in accordance with published smoke detector installation requirements. Smoke detectors to be furnished to Division 23 by Division 26.

E. Control Panels: Control panels to be constructed of unitized steel or aluminum cabinets. Provide cabinets with hinged, locking door opening to the front. Multiple panels mounted side-by-side to be hinged to the left or on opposite sides to open in the middle. Start-stop switches, hand-off-automatic switches, pilot lights, and temperature indicating devices to be flush-mounted in panel door. All other devices to be internally mounted within panel. Local panels exposed to weather to be weatherproof construction. Panel locations to be approved by Designer and be accessible for operation and maintenance. All devices specified to be mounted on control panel that require electrical connections to be prewired to a dual, numbered terminal strip located inside panel. All lines in panel shall have number I.D. bands. Gauges shall be installed on all pneumatic lines entering or leaving the panel. All devices inside the panel or mounted on panel face shall have an engraved laminated plastic nameplate. Wiring within panel to conform to National Electrical Code, and shall be neatly bundled and laced or enclosed in panduit trough.

F. Control Valves: Two-inch and smaller water service valves to be screw connected chrome plated characterized brass ball type with characterized port to allow equal percentage throttling. Valve pressure rating to be in accordance with piping and fitting specifications. (Minimum 125 psi operating pressure.) Valve actuators to be selected to close valves against pump shutoff head. Provide stainless steel stem with removable composition disc and self adjusting spring-loaded Teflon packing. Output signal of 4-20mA or 0-10 V shall be used to control the position of all modulating valves. Tri-state, pulse type, or similar non-proportional control valves/actuators are not acceptable.

G. Automatic Control Dampers: Ultra low-leak automatic control dampers to be Arrow Pin Lock opposed-blade dampers for modulating control and parallel blades for 2-position control or approved equal. Frames and blades to be minimum 16 gauge extruded aluminum or galvanized steel construction with 4" to 6" deep frame and 8" maximum width blades. Pivot rods to be 1/2" diameter, extruded aluminum or plated steel. Bearings to be corrosion resistant. Install blade linkage hardware in angle or channel frame section out of airstream. All hardware to be corrosion resistant. Seals to be replaceable extruded vinyl or silicone rubber blade seals and flexible metal compression type jamb seals. Dampers to have maximum 4 cfm per square foot leakage at 1" water gauge static pressure and 8 cfm per square foot leakage at 4" water gauge static pressure, verified by independent testing laboratory.

H. Electronic Actuators: Actuators shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch is not acceptable. For power-failure/safety applications, a mechanical, spring return mechanism shall be used. Non-mechanical forms of fail-safe are not acceptable. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by changing mounting orientation. Proportional actuators shall accept a 2 to 10 VDC or 4 to 20 mA and provide a 2 to 10 VDC position feedback signal. 24 VAC/DC actuators shall not require more than 15 VA for AC or 8 watts for DC applications. All non-spring return actuators shall have an external manual gear release to aid in installation and allow manual positioning when the actuator is not powered. All actuators shall have an external direction of rotation switch to aid in installation and provide proper control response. Actuators shall be provided with a factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box. Provide cover mounted control transformer for 120-VAC power supply. The actuators shall be U.L. listed.

I. Room Differential Pressure Alarm System: Room differential pressure devices shall be TSI PresSura or equal by Accutrol, Siemens, or Setra. Provide a unit outside of each isolation room. Refer to the architectural floor plans for exact number of rooms. Provide unit with audible and visual alarm, digital display of room pressure differential, through-the-wall pressure sensor and transformer. Provide BacNet interface for device monitoring through the BAS. System accuracy shall be +/- 10% of pressure reading ± 0.00001 in H2O with range of +/- 0.2000” w.c. Output signal shall be: 4-20mA. The device shall be provided with a door switch and field adjustable timer to minimize nuisance alarm indication due to door opening.

J. Hot Water Differential Pressure Transmitter: Static pressure measuring stations with +/- 0.25% FS accuracy, suitable for line installation at pressure to 250 psig. Provide 3-valve manifold brass body factory assembled and suitable for pipe or wall mounting. Setra Model 230 – 3V or approved equal. Output signal shall be 4-20mA. Select unidirectional or bidirectional type with transmitter span matched to application. Provide hard wire connection to pump controller rather than network connection.

K. Duct Static Pressure Devices: Static pressure measuring stations with +/- 2% accuracy equal to Paragon Controls PE-5000 or equal by Setra or Air Monitor Corp. shall be provided. Industrial quality, electronic solid state, 1/2 percent accuracy static pressure transmitters equal to Paragon Controls Model DPT-4001 shall be provided. Transmitter span shall be matched to application. Duct probe shall be 6063-T5 anodized aluminum. Output signal shall be 4-20mA.

L. Transformers: Provide all 24-volt control transformers necessary to convert 120-volt line voltage power to control voltage at control devices.

M. Relays, Hand-Off-Auto Switches, Pilot Lights: Provide all relays, hand-off-auto switches, and pilot lights necessary to accomplish automatic control of the mechanical systems. See electrical drawings for starters provided integral with hand-off-autos, pilot lights, and auxiliary contacts.

N. Pressure Switches: Pressure switches shall have contact action and pole configuration as required by application, U.L. listing, and adjustable setpoint.

O. Current Sensing Relays:
   1. Acceptable Manufacturer: Hawkeye Model 908, H308 (H540 for small fractional HP motor applications) or approved equivalent.

2. Current sensor shall be induce powered from the monitored load and shall have an adjustable operating range from 2.5 - 135 A, 0.75 – 50 A or 0.25 – 20 A selected for application. Visual indicators (LEDs) shall indicate output status and sensor power. Adjustable trip setpoint to +/- 1%. Current sensor output shall be N.O., solid state, 0.1A @ 30 VAC/DC.
3. The current sensor shall have a sensing range sensitivity selected that will enable BAS to distinguish between small motors operating with and without belts and small pump motors operating with and without water flow.

PART 3 EXECUTION

3.01 INSTALLATION

A. Components:
1. Provide sensors, transmitters, controllers, actuators, valves, dampers, and related items, necessary to accomplish control sequence shown on drawings. Install all such devices except as noted herein to the contrary.
2. Deliver control valves to the job site to be installed by Mechanical Tradesman under supervision of Control Tradesman.
3. Deliver automatic dampers to the job site to be installed by Mechanical Tradesman under supervision of Control Tradesman.
4. Mechanical Tradesmen to install flow switches, immersion wells, pressure tapping, and all associated shut-off cocks required for control systems.
5. The control equipment and connecting piping shall be installed in a neat and workmanlike manner by trained mechanics in the direct employ of the control manufacturer.
6. All exposed tubing and conduit shall be run parallel to or at right angles to the building structure, and shall be concealed in all finished spaces. Tubing and conduit may be run exposed in mechanical rooms or areas where other piping is exposed.
7. Prepare coordinated composite wiring diagram showing all interlock wiring associated with starters, control panels, and controls.
8. Drawings and Layouts: The controls contractor shall provide to the mechanical contractor complete schematic drawings for the entire control system for submittal to the Designer for approval before work shall begin. Brochures describing each item of control equipment or component shall be included.
9. Provide sequence of operation written so that building engineer can read and understand control scheme.
10. As-built drawings to be framed under plexiglass and placed in each respective equipment room area.

B. Electrical:
1. Division 23 (Mechanical Tradesman) shall furnish and install low-voltage control wiring, including conduit, conductors, and terminations for same. Division 23 shall also furnish and install control components associated with the low-voltage control systems and shall wire and connect components in accordance with approved wiring diagrams.
2. Division 26 (Electrical Tradesman) shall furnish and install power wiring including conduit, conductors, and terminations to motors, safety switches, starters, relays, valve and damper actuators, and other components requiring power as indicated on the electrical drawings, by the specifications, and in accordance with approved wiring diagrams. Division 26 shall also furnish and install starters as scheduled on the electrical drawings.
3. Division 23 to furnish and install all local area network wiring, including conduit, conductors, and terminations for same. The local area network (LAN) shall be configurable as either a bus or a star, or a combination of the two. The LAN shall use twisted pair, coax, or fiber optic cable, or any combination of the three to meet noise immunity and/or distance requirements. The network design shall provide a high speed data transfer rate for alarm and report generation of no less than 100 Mb (Mb/s).
4. Division 23 to furnish all input and output control wiring, including conduit, conductors, and terminations for same. All input and output control wiring shall be #18 twisted and shielded cable. No input or output point shall be more than 250 feet from its respective panel. All

shields to be grounded at the control panel. All shields at the sensors or transducers to be folded back and taped. All cable splices shall have joints soldered and taped including the shield. No mechanical connections will be acceptable. All connections within the panels must be made with connectors of appropriate size and design for the terminals being applied. All cables must be labeled and identified on corresponding termination drawings. A copy of the termination drawing shall be adequately protected and left in its respective panel.

5. Install all control wiring associated with DDC/BAS in minimum 1/2" size EMT. Provide all associated couplings, connectors, and fittings.
6. All wiring shall be in accordance with local regulations and the National Electrical Code.

C. Room Devices:
   1. Room devices shall be mounted so that the top of the device is 48" above the floor and aligned with the top of the light switch plates and 8" from the light switch if shown on the drawings adjacent to the light switch.
   2. Room device locations shall be coordinated with door swings, light switches, and other wall-mounted items.

D. Pressure/Temperature test ports shall be installed on the entering and leaving side of all heat transfer coils, heat exchangers (HVAC and domestic, both hot and cold fluid), control valves, flow meters, pumps, etc. Installation of P/T ports will facilitate the "Sensor Calibration Check" phase of the functional performance testing (FPT).

E. The contractor shall provide Tee type connections (and associated stop cocks or caps) in the pressure sensor tubing at all differential pressure sensors, including ductwork static pressure, high static pressure, airflow measuring devices, hot and cold water differential pressure, etc., that will allow field test measurements to be taken without interrupting the BAS reading. Providing this type connection will facilitate the sensor calibration check phase of functional performance testing and maintenance, by allowing simultaneous comparison of the BAS reading versus the actual field-measured parameter.

F. Calibrated balancing valves, flow elements and meters shall be installed in strict accordance with the manufacturer's recommendations for orientation, required straight length of upstream and downstream piping, etc., and in no case shall the pressure ports be pointed downward, in order to prevent the accumulation of trash and debris inside the ports. The ports shall be installed in such a manner that allows unobstructed access for the TAB agency to plug into the ports for purposes of measuring and verifying the differential pressure of the valve.

3.02 QUALITY CONTROL

A. Control system to be set up and checked out by factory-trained competent technician skilled in the setting and adjustment of temperature controls used in this project. This mechanic to be experienced in type systems associated with this control system.

B. At time of final observation, Control Contractor to demonstrate the entire sequence of operation for the systems to the Engineer. At this time, Engineer to observe function of entire control system, observe temperature control operations, damper positions, necessary to assure that temperature control system is operating as intended by mechanical design.

C. Final acceptance of system not to occur until sequence of operation check has taken place and certified by Engineer's representative.

D. The Control Tradesman to be responsible for returning to job during the opposite season to verify operation of control system. Engineer to be given notice of this return and to accompany Control Tradesman to observe the sequence of operation.

3.03 INSTRUCTION AND ADJUSTMENT

A. On completion of the job, the controls contractor shall have completely adjusted the entire control system. He shall arrange to instruct the Owner's representative on operation of the control system and supply him with three (3) copies of the control operating and instruction manuals.

B. The Controls Contractor shall obtain from the Owner's representative a signed receipt that he has received the instruction manuals and complete instruction on the operation of the system.

C. Contractor Adjustment: At the completion of the job, the controls contractor must submit to the Architect a letter stating that he has made final calibrations and adjustments to the system and that the Owner's operating personnel have been instructed in its use.

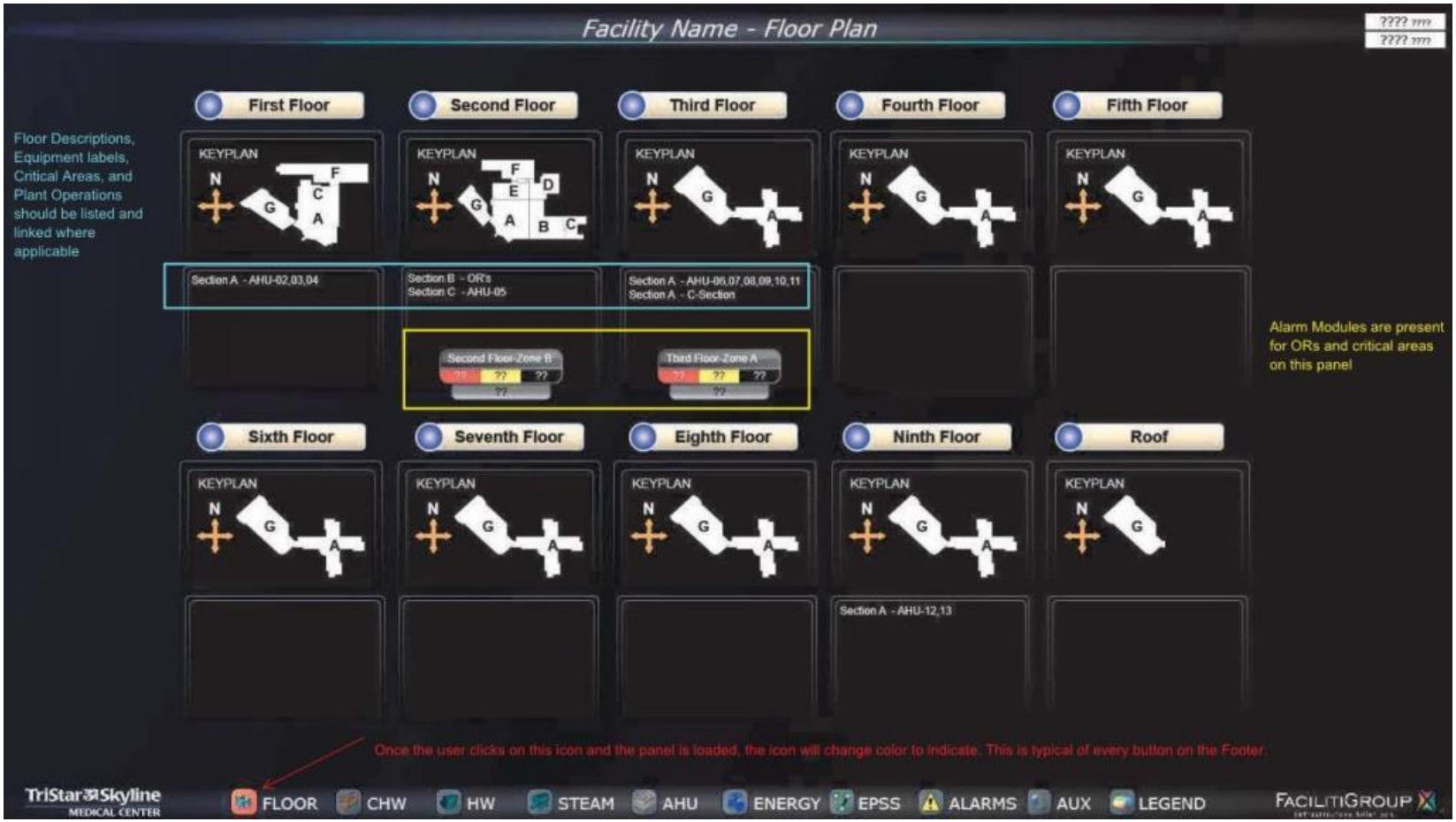
3.04 WARRANTY SERVICE

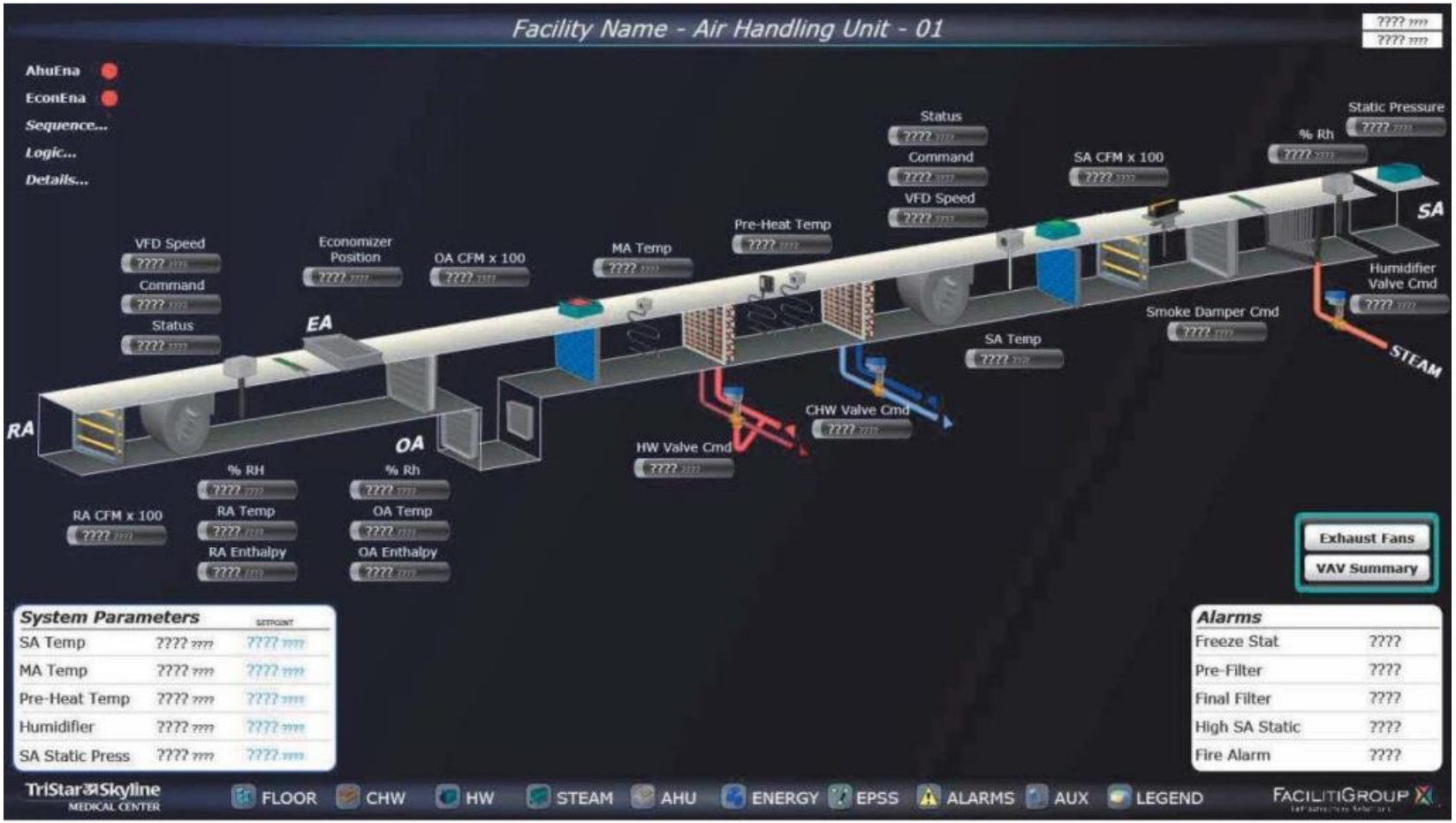
A. Warranty servicing shall be for a period not less than 24 months after final acceptance of the job by the owner and include the following provisions:
   1. Emergency maintenance service on regular working hour basis during warranty.
   2. Replacing defective parts and components as required.
   3. Servicing by factory trained and employed service representatives of system manufacturer.
   4. Maintaining of system programming.

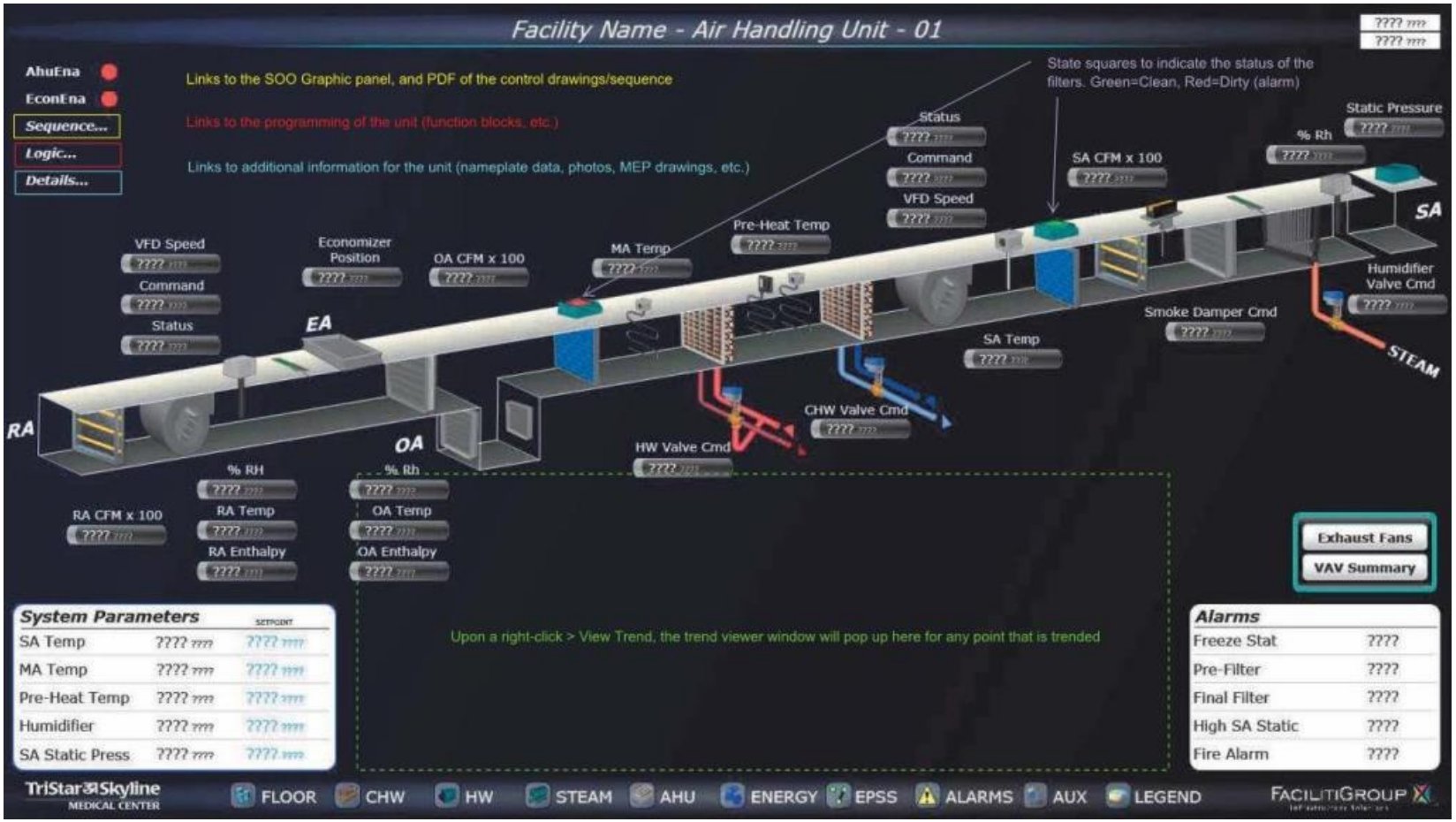
END OF SECTION 23 09 23

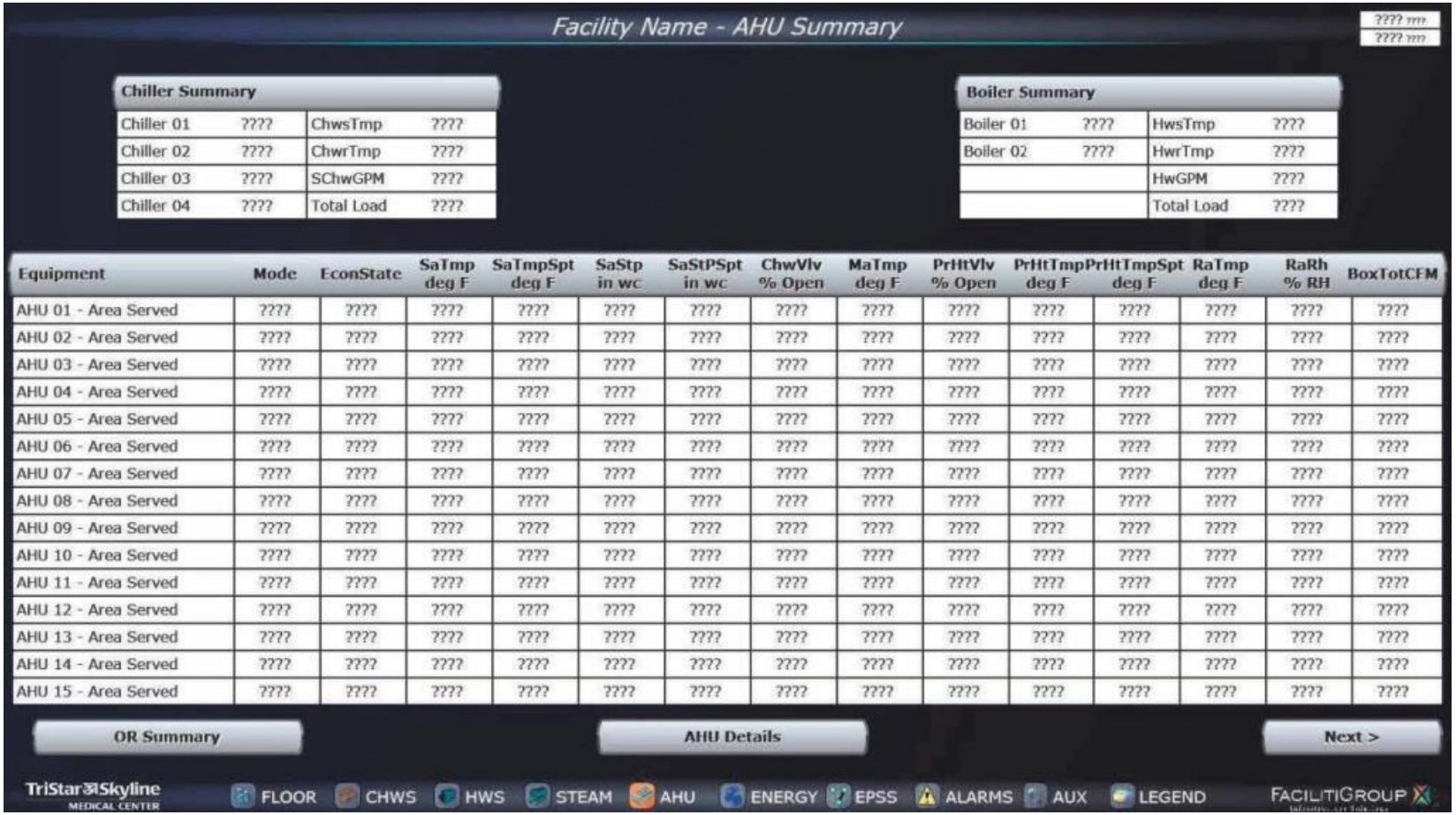
Outside Air Temperature
Outside Air Relative Humidity
Typical of ALL panels
Links to facility's Energy portal on HCAFI.com
FACILITIGROUP
Infrastructure Solutions
TriStar Skyline
MEDICAL CENTER
Links to Facility Public Website
Johnson Controls
Links to Contact Panel for JCI Rep, Energy Service Center, Utility providers
Links to individual equipment detail panel
Chilled Water System
CH-1
CH-2
Supply Temp
% RLA
kW / Ton
Condenser Water System
CT-1
CT-2
Speed
delta T
Tons
Chilled Water System
CH-3
CH-4
Supply Temp
% RLA
kW / Ton
Links to AHU Summary
Links to individual air handling units
Air Handlers
Sa Temp
Sa Static
AHU 01 - Area Served
AHU 02 - Area Served
AHU 03 - Area Served
AHU 04 - Area Served
AHU 05 - Area Served
AHU 06 - Area Served
AHU 07 - Area Served
AHU 08 - Area Served
AHU 09 - Area Served
AHU 10 - Area Served
AHU 11 - Area Served
AHU 12 - Area Served
AHU 13 - Area Served
AHU 14 - Area Served
AHU 15 - Area Served
AHU 16 - Area Served
AHU 17 - Area Served
AHU 18 - Area Served
Steam System
BLR-1
BLR-2
% Firing Range
Steam Flow
Efficiency
Hot Water System
HX-1
HX-2
HW Sup Temp
HW Ret Temp
Pump Status
Hot Water System
HWBLR-1
HWBLR-2
% Firing Range
Supply Temp
Efficiency
Links to individual System Panel
extra box to be deleted if not used
The facility logo on the footer will now become the HOME button and will link to the Dashboard. Typical of ALL panels
Summarizes all alarms for the system.
extra box to be deleted if not used
Links to the facility's EnergyScript portal on HCAFI.com.
Typical of ALL panels
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

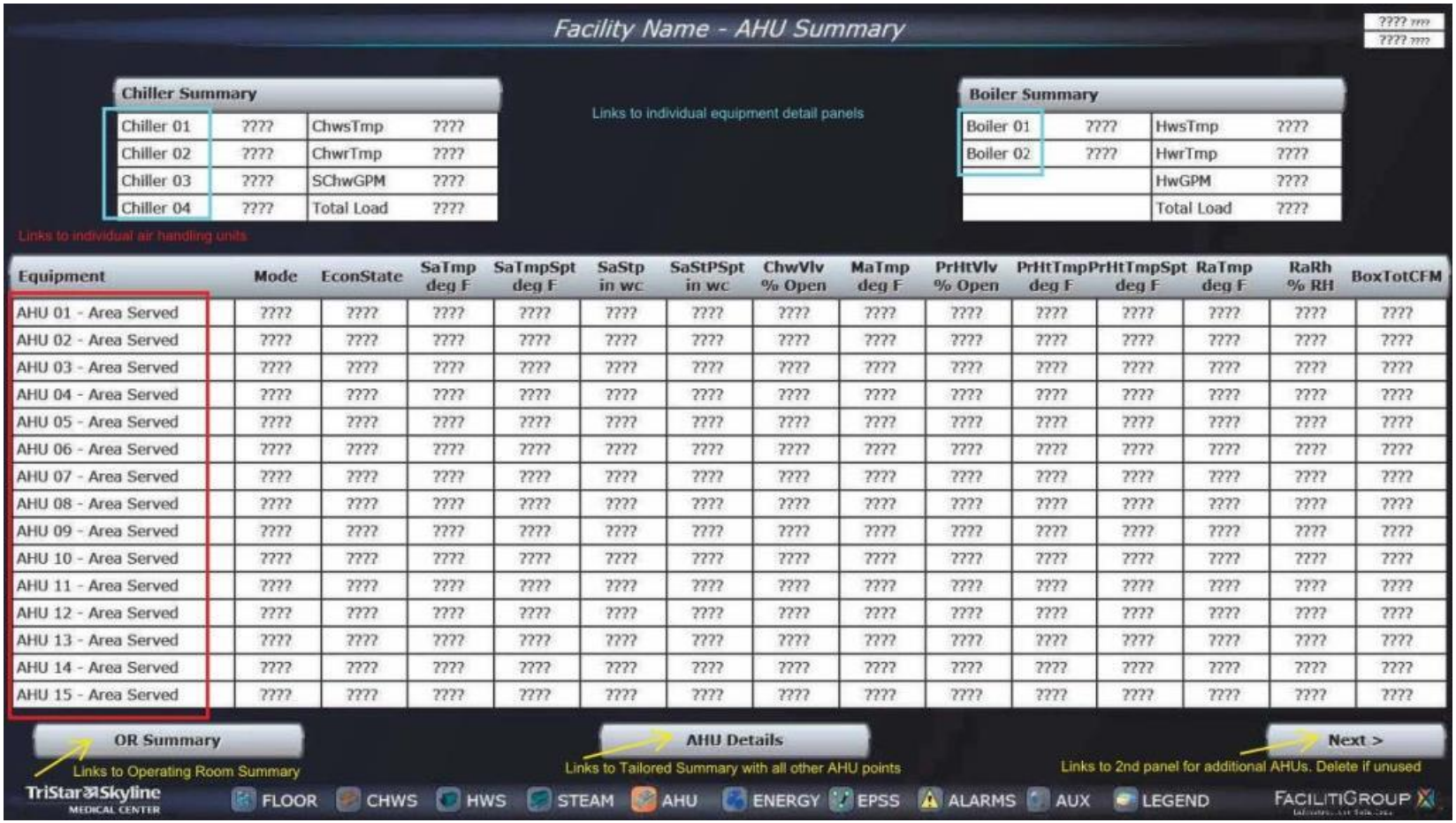
Facility Name - Floor Plan
???? ????
???? ????
First Floor
Second Floor
Third Floor
Fourth Floor
Fifth Floor
KEYPLAN
Section A - AHU-02,03,04
Section B - OR's
Section C - AHU-05
Second Floor-Zone B
Section A - AHU-06,07,08,09,10,11
Section A - C-Section
Third Floor-Zone A
Sixth Floor
Seventh Floor
Eighth Floor
Ninth Floor
Roof
Section A - AHU-12,13
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

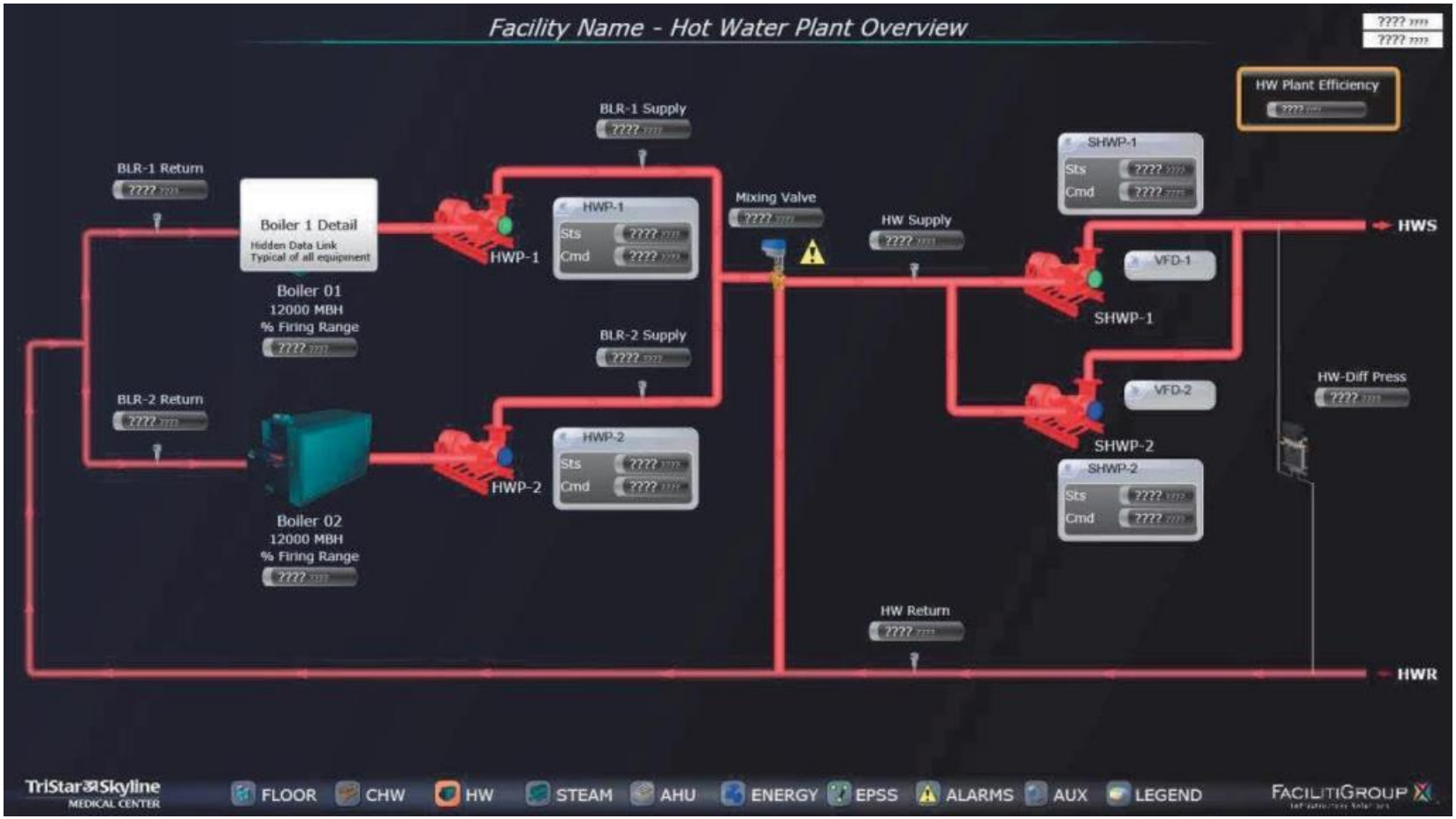

Facility Name - Floor Plan
???? ????
???? ????
First Floor
Second Floor
Third Floor
Fourth Floor
Fifth Floor
Floor Descriptions, Equipment labels, Critical Areas, and Plant Operations should be listed and linked where applicable
KEYPLAN
Section A - AHU-02,03,04
Section B - OR's
Section C - AHU-05
Section A - AHU-06,07,08,09,10,11
Section A - C-Section
Second Floor-Zone B
Third Floor-Zone A
Alarm Modules are present for ORs and critical areas on this panel
Sixth Floor
Seventh Floor
Eighth Floor
Ninth Floor
Roof
Section A - AHU-12,13
Once the user clicks on this icon and the panel is loaded, the icon will change color to indicate. This is typical of every button on the Footer
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

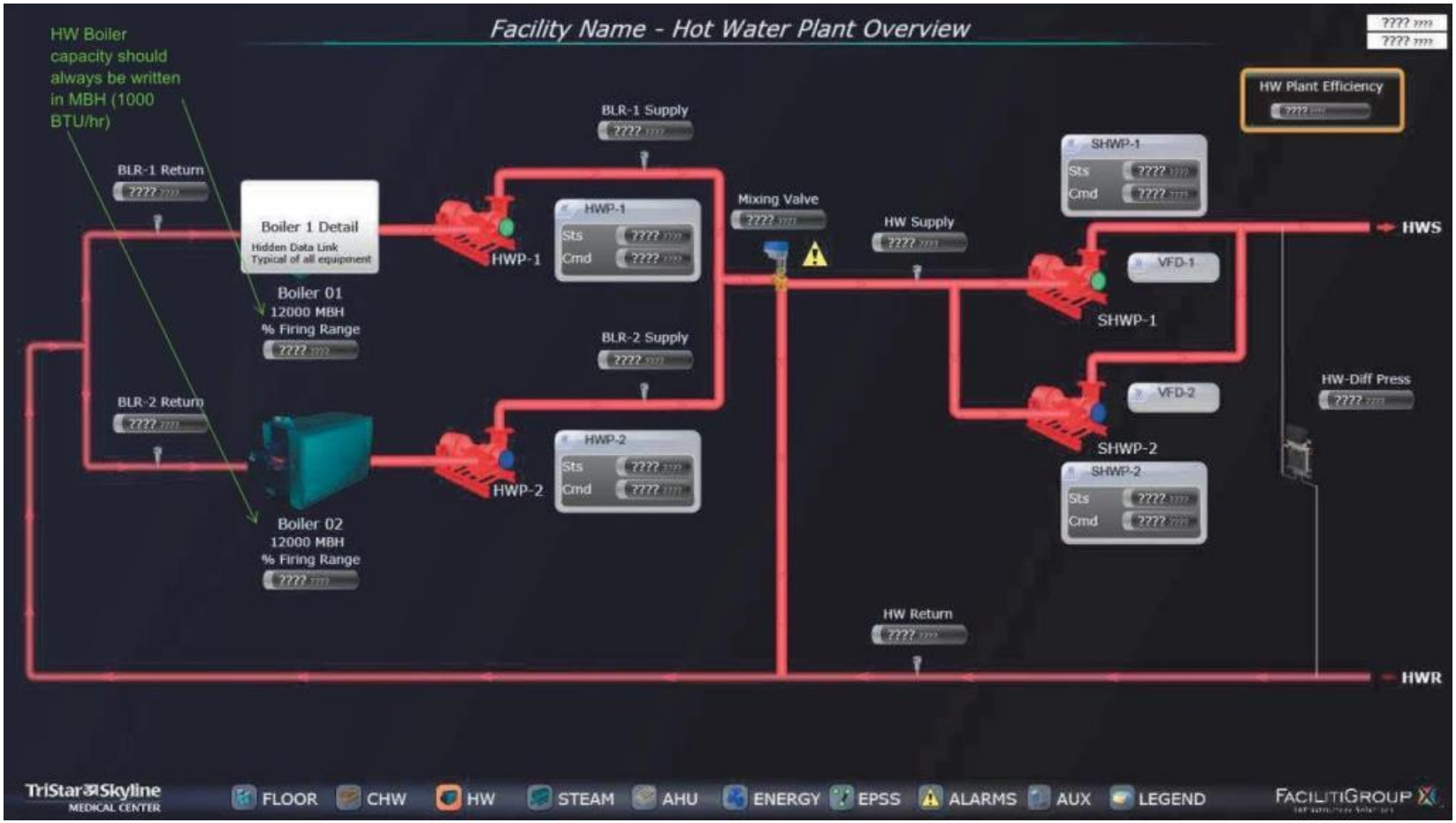

Facility Name - Air Handling Unit - 01
AhuEna
EconEna
Sequence...
Logic...
Details...
Status
Command
VFD Speed
SA CFM x 100
% Rh
Static Pressure
SA
Humidifier Valve Cmd
STEAM
Smoke Damper Cmd
SA Temp
Pre-Heat Temp
MA Temp
Economizer Position
OA CFM x 100
VFD Speed
Command
Status
EA
RA
OA
CHW Valve Cmd
HW Valve Cmd
% RH
RA Temp
RA Enthalpy
RA CFM x 100
% Rh
OA Temp
OA Enthalpy
Exhaust Fans
VAV Summary
System Parameters
SETPOINT
SA Temp
MA Temp
Pre-Heat Temp
Humidifier
SA Static Press
Alarms
Freeze Stat
Pre-Filter
Final Filter
High SA Static
Fire Alarm
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

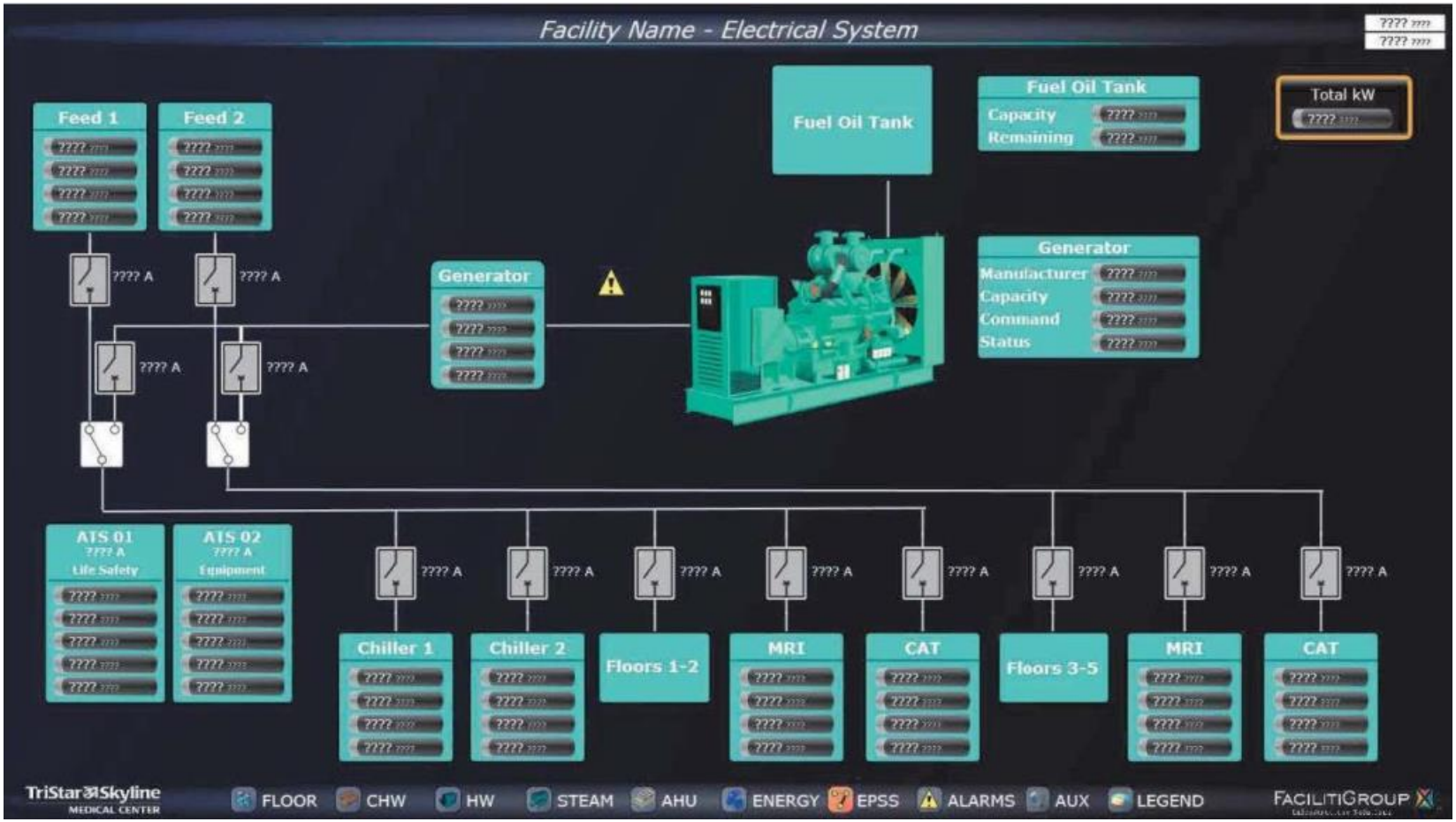

Facility Name - Air Handling Unit - 01
AhuEna
EconEna
Sequence...
Logic...
Details...
Links to the SOO Graphic panel, and PDF of the control drawings/sequence
Links to the programming of the unit (function blocks, etc.)
Links to additional information for the unit (nameplate data, photos, MEP drawings, etc.)
State squares to indicate the status of the filters. Green=Clean, Red=Dirty (alarm)
Status
Command
VFD Speed
SA CFM x 100
% Rh
Static Pressure
SA
VFD Speed
Command
Status
EA
Economizer Position
OA CFM x 100
MA Temp
Pre-Heat Temp
Humidifier Valve Cmd
Smoke Damper Cmd
SA Temp
STEAM
CHW Valve Cmd
HW Valve Cmd
RA
OA
% RH
% Rh
RA CFM x 100
RA Temp
OA Temp
RA Enthalpy
OA Enthalpy
Exhaust Fans
VAV Summary
System Parameters
SETPOINT
SA Temp
MA Temp
Pre-Heat Temp
Humidifier
SA Static Press
Upon a right-click > View Trend, the trend viewer window will pop up here for any point that is trended
Alarms
Freeze Stat
Pre-Filter
Final Filter
High SA Static
Fire Alarm
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

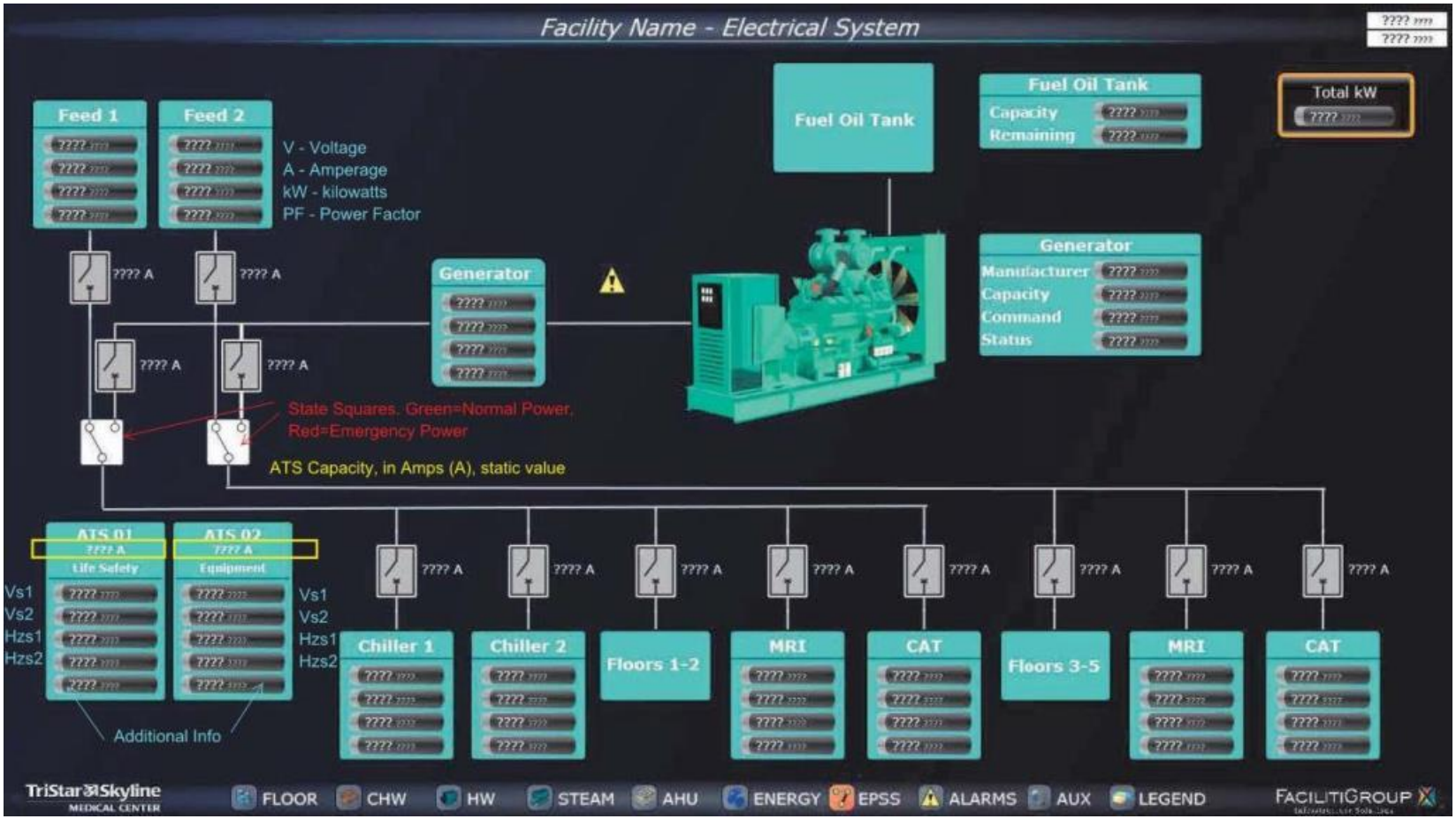

Facility Name - AHU Summary
???? ???
???? ???
Chiller Summary
Chiller 01 ???? ChwsTmp ????
Chiller 02 ???? ChwrTmp ????
Chiller 03 ???? SChwGPM ????
Chiller 04 ???? Total Load ????
Boiler Summary
Boiler 01 ???? HwsTmp ????
Boiler 02 ???? HwrTmp ????
HwGPM ????
Total Load ????
Equipment Mode EconState SaTmp deg F SaTmpSpt deg F SaStp in wc SaStPSpt in wc ChwVlv % Open MaTmp deg F PrHtVlv % Open PrHtTmp deg F PrHtTmpSpt deg F RaTmp deg F RaRh % RH BoxTotCFM
AHU 01 - Area Served
AHU 02 - Area Served
AHU 03 - Area Served
AHU 04 - Area Served
AHU 05 - Area Served
AHU 06 - Area Served
AHU 07 - Area Served
AHU 08 - Area Served
AHU 09 - Area Served
AHU 10 - Area Served
AHU 11 - Area Served
AHU 12 - Area Served
AHU 13 - Area Served
AHU 14 - Area Served
AHU 15 - Area Served
OR Summary
AHU Details
Next >
TriStar Skyline MEDICAL CENTER
FLOOR CHWS HWS STEAM AHU ENERGY EPSS ALARMS AUX LEGEND
FACILITIGROUP

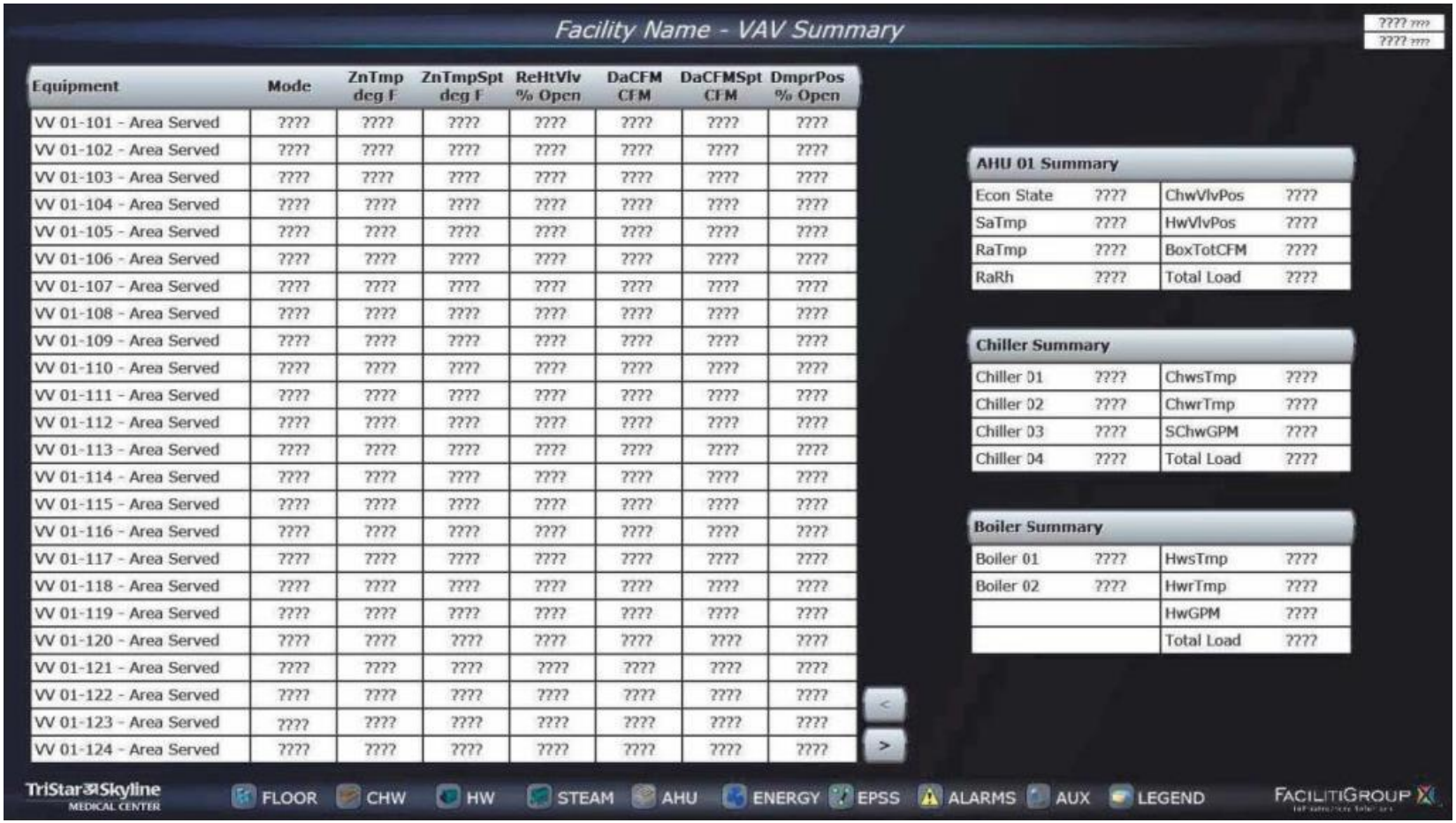

Facility Name - AHU Summary
???? ????
???? ????
Chiller Summary
Chiller 01 ???? ChwsTmp ????
Chiller 02 ???? ChwrTmp ????
Chiller 03 ???? SChwGPM ????
Chiller 04 ???? Total Load ????
Links to individual equipment detail panels
Boiler Summary
Boiler 01 ???? HwsTmp ????
Boiler 02 ???? HwrTmp ????
HwGPM ????
Total Load ????
Links to individual air handling units
Equipment Mode EconState SaTmp deg F SaTmpSpt deg F SaStp in wc SaStPSpt in wc ChwVlv % Open MaTmp deg F PrHtVlv % Open PrHtTmp deg F PrHtTmpSpt deg F RaTmp deg F RaRh % RH BoxTotCFM
AHU 01 - Area Served
AHU 02 - Area Served
AHU 03 - Area Served
AHU 04 - Area Served
AHU 05 - Area Served
AHU 06 - Area Served
AHU 07 - Area Served
AHU 08 - Area Served
AHU 09 - Area Served
AHU 10 - Area Served
AHU 11 - Area Served
AHU 12 - Area Served
AHU 13 - Area Served
AHU 14 - Area Served
AHU 15 - Area Served
OR Summary
Links to Operating Room Summary
AHU Details
Links to Tailored Summary with all other AHU points
Next >
Links to 2nd panel for additional AHUs. Delete if unused
TriStar Skyline MEDICAL CENTER
FLOOR CHWS HWS STEAM AHU ENERGY EPSS ALARMS AUX LEGEND
FACILITIGROUP

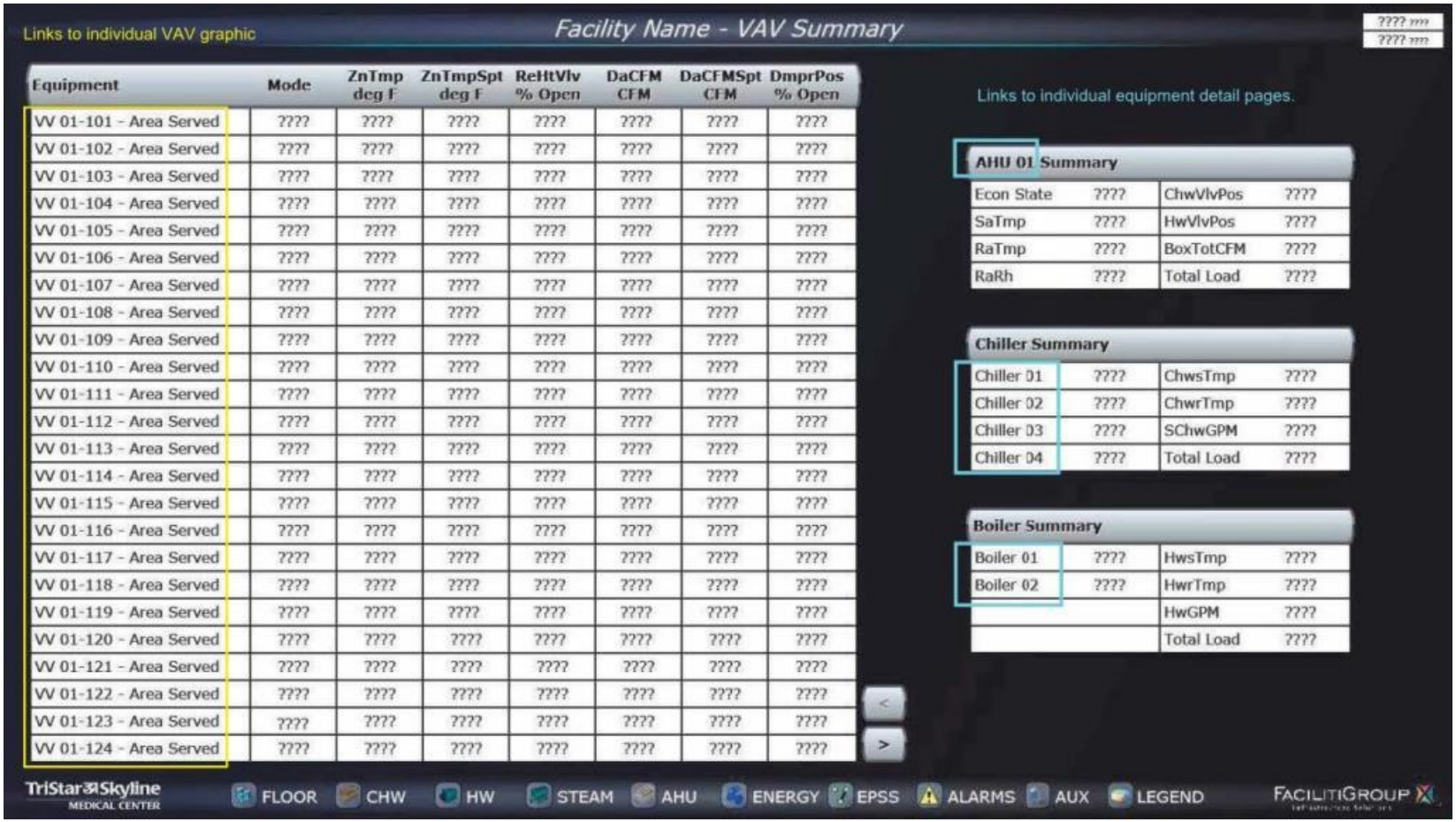

Facility Name - Hot Water Plant Overview
HW Plant Efficiency
BLR-1 Supply
BLR-1 Return
Boiler 1 Detail
Hidden Data Link
Typical of all equipment
Boiler 01
12000 MBH
% Firing Range
HWP-1
HWP-1
Sts
Cmd
Mixing Valve
HW Supply
SHWP-1
Sts
Cmd
HWS
VFD-1
SHWP-1
BLR-2 Supply
BLR-2 Return
HWP-2
HWP-2
Sts
Cmd
VFD-2
SHWP-2
SHWP-2
Sts
Cmd
HW-Diff Press
Boiler 02
12000 MBH
% Firing Range
HW Return
HWR
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Facility Name - Hot Water Plant Overview
HW Boiler capacity should always be written in MBH (1000 BTU/hr)
HW Plant Efficiency
BLR-1 Supply
BLR-1 Return
Boiler 1 Detail
Hidden Data Link
Typical of all equipment
Boiler 01
12000 MBH
% Firing Range
HWP-1
Sts
Cmd
Mixing Valve
HW Supply
SHWP-1
HWS
VFD-1
BLR-2 Supply
BLR-2 Return
HWP-2
VFD-2
SHWP-2
HW-Diff Press
Boiler 02
12000 MBH
% Firing Range
HW Return
HWR
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Facility Name - Electrical System
Feed 1
Feed 2
Fuel Oil Tank
Fuel Oil Tank
Capacity
Remaining
Total kW
Generator
Manufacturer
Capacity
Command
Status
Generator
ATS 01
Life Safety
ATS 02
Equipment
Chiller 1
Chiller 2
Floors 1-2
MRI
CAT
Floors 3-5
MRI
CAT
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Facility Name - Electrical System
Feed 1
Feed 2
V - Voltage
A - Amperage
kW - kilowatts
PF - Power Factor
Fuel Oil Tank
Fuel Oil Tank
Capacity
Remaining
Total kW
Generator
Manufacturer
Capacity
Command
Status
Generator
State Squares, Green=Normal Power,
Red=Emergency Power
ATS Capacity, in Amps (A), static value
ATS 01
Life Safety
ATS 02
Equipment
Vs1
Vs2
Hzs1
Hzs2
Additional Info
Chiller 1
Chiller 2
Floors 1-2
MRI
CAT
Floors 3-5
MRI
CAT
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Facility Name - VAV Summary
???? ????
???? ????
Equipment
Mode
ZnTmp deg F
ZnTmpSpt deg F
ReHtVlv % Open
DaCFM CFM
DaCFMSpt CFM
DmprPos % Open
VV 01-101 - Area Served
VV 01-102 - Area Served
VV 01-103 - Area Served
VV 01-104 - Area Served
VV 01-105 - Area Served
VV 01-106 - Area Served
VV 01-107 - Area Served
VV 01-108 - Area Served
VV 01-109 - Area Served
VV 01-110 - Area Served
VV 01-111 - Area Served
VV 01-112 - Area Served
VV 01-113 - Area Served
VV 01-114 - Area Served
VV 01-115 - Area Served
VV 01-116 - Area Served
VV 01-117 - Area Served
VV 01-118 - Area Served
VV 01-119 - Area Served
VV 01-120 - Area Served
VV 01-121 - Area Served
VV 01-122 - Area Served
VV 01-123 - Area Served
VV 01-124 - Area Served
AHU 01 Summary
Econ State
SaTmp
RaTmp
RaRh
ChwVlvPos
HwVlvPos
BoxTotCFM
Total Load
Chiller Summary
Chiller 01
Chiller 02
Chiller 03
Chiller 04
ChwsTmp
ChwrTmp
SChwGPM
Total Load
Boiler Summary
Boiler 01
Boiler 02
HwsTmp
HwrTmp
HwGPM
Total Load
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Links to individual VAV graphic
Facility Name - VAV Summary
???? ????
???? ????
Equipment
Mode
ZnTmp deg F
ZnTmpSpt deg F
ReHtVlv % Open
DaCFM CFM
DaCFMSpt CFM
DmprPos % Open
VV 01-101 - Area Served
VV 01-102 - Area Served
VV 01-103 - Area Served
VV 01-104 - Area Served
VV 01-105 - Area Served
VV 01-106 - Area Served
VV 01-107 - Area Served
VV 01-108 - Area Served
VV 01-109 - Area Served
VV 01-110 - Area Served
VV 01-111 - Area Served
VV 01-112 - Area Served
VV 01-113 - Area Served
VV 01-114 - Area Served
VV 01-115 - Area Served
VV 01-116 - Area Served
VV 01-117 - Area Served
VV 01-118 - Area Served
VV 01-119 - Area Served
VV 01-120 - Area Served
VV 01-121 - Area Served
VV 01-122 - Area Served
VV 01-123 - Area Served
VV 01-124 - Area Served
????
Links to individual equipment detail pages.
AHU 01 Summary
Econ State
SaTmp
RaTmp
RaRh
ChwVlvPos
HwVlvPos
BoxTotCFM
Total Load
Chiller Summary
Chiller 01
Chiller 02
Chiller 03
Chiller 04
ChwsTmp
ChwrTmp
SChwGPM
Total Load
Boiler Summary
Boiler 01
Boiler 02
HwsTmp
HwrTmp
HwGPM
Total Load
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

SECTION 23 21 13

HYDRONIC PIPING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Submit pipe, valves, and fittings and have approved before starting installation. Pipe, valves, and fittings to be new, and marked clearly with manufacturers' name, weight, and classification or working pressure.

B. Piping to run approximately as shown on drawings or as structural and architectural conditions permit.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, provide products by the following:

1. Ferguson Enterprises
   Contact: Bettina Dawson
   Office: (615) 316-1920
   Cell: (931) 239-0466
   Email: HCA@Ferguson.com

2.02 STEEL PIPES

A. Butt welded, electric resistance welded, or seamless black steel pipe, ANSI B 36.10, ASTM A-53, Grade "B" or "A", Schedule 40 for piping 10" and smaller,0.375 wall thickness for piping 12" thru 24" diameter, for the following services:

1. Chilled water supply and return piping 2-1/2" and larger.
2. Hydronic heat pump supply and return piping 2-1/2" and larger.
3. Condenser water supply and return piping.
4. Heating hot water supply and return piping 2-1/2" and larger.
5. Combination heating/cooling water supply and return piping 2-1/2" and larger.
6. Fuel oil piping.
7. Compressed air piping.
8. Mill wrap all uninsulated underground steel pipe with Republic X-Tru-Coat or equal.

2.03 STEEL PIPE FITTINGS NOT APPLICABLE

2.04 COPPER PIPES

A. Type "L" hard-drawn seamless copper tubing, ASTM B-88:

1. HVAC hot water piping 2-1/8" O.D. and smaller. Piping dimensions on drawings for piping 2-1/8" and smaller are outside diameter. (O.D.).

B. Type "K" hard-drawn seamless copper tubing: NOT APPLICABLE

C. Type "DWV" hard-drawn seamless copper tubing: Contractor's option for above-ground moisture condensate drain piping.

D. Copper Pipe Fittings: NOT APPLICABLE

1. Provide sweat fittings, ASTM B-62, dimensions conforming to ANSI B16.22, wrought copper, with sweep patterns for copper tubing.
2. Dielectric connection: Provide Epco Sales, dielectric couplers at junction of steel pipe and equipment with copper piping systems. Use of steel or cast iron fittings in copper piping systems prohibited.
3. Fittings for drainage piping to be drainage pattern type.

E. Unions to be brass ground joint, 250-pound working pressure.

F. Nipples used in conjunction with copper pipe to be brass.

2.05 PP-RCT PIPE NOT APPLICABLE

2.06 VALVES

A. Valves are specified by Nibco model numbers to establish quality levels unless otherwise noted. Milwaukee or Apollo are considered equal manufacturers. Provide clamp lock hand lever operators on valves less than 8 inches. Provide hand wheel and closed housing worm gear on valves 8 inches and larger unless indicated otherwise below. Provide chain operators for all equipment room and powerhouse valves 4 inch and larger which are located over 6 feet 6 inches above the finish floor.

B. Gate Valves:
   1. Gate valves for copper piping systems to be Class 125, bronze body, solder ends, Nibco Model S111. Valve to have either solid or split wedge disc, inside screw, rising stem, and screwed bonnet.

C. Globe Valves: NOT APPLICABLE
   1. Globe valves 2-1/2" and larger to be Class 125, cast iron body, bronze mounted, flanged ends, Nibco Model F718-B. Valves to have renewable seat and disc, outside stem and yoke with rising stem, and bolted bonnet.
   2. Globe valves 2" and smaller to be Class 150, bronze body, screwed ends, Nibco Model T235Y. Valve to be plug type with renewable seat and disc, rising stem, and union bonnet.

D. Ball Valves:
   1. Ball valves for copper water piping systems 2-1/8" O.D. and smaller to be equal to Apollo "3" Figure 82-200, solder ends, and for 2-5/8" thru 3-1/8" O.D. to be equal to Apollo Figure 70-100, threaded ends. Valves to have bronze body, chromium plated bronze ball, teflon seats, stuffing box ring and seals, and quarter turn on-off. Provide memory stops for valves used for balancing service. Valves to be rated for 400-psi WOG at 200 degrees F. Install threaded end valves with brass adapters.

E. Butterfly Valves: NOT APPLICABLE

F. Check Valves:
   1. Check valves for copper water piping systems to be swing type, Class 125, bronze body, screwed ends, Nibco Model T/S413.

2.07 STRAINERS

A. Provide cleanable "Y" type strainers in pump suction lines. Strainers to have iron body with screwed bronze or bolted iron cap. Strainer baskets to be brass. Water strainers to be Monel 20 mesh screen. Strainers to be line size complete with blow-down hose bibbs. When Suction Diffusers are specified for end suction pumps, strainers are not required. Strainers to be as follows:
   1. Screwed 125# - Crane 988-1/2.
   2. Flanged 125# - Crane 989-1/2.
   3. Solder joint 250# - Muessco 353-1/2.

2.08 HANGERS

A. Copper piping 1/2" O.D. thru 4" O.D., with no longitudinal movement to be Grinnell Figure 260, MSS SP-69 Type 1, adjustable clevis hanger with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

B. Insulated copper piping 1/2" O.D. thru 2-1/8" O.D. with longitudinal movement to be Grinnell Figure 171, MSS SP-69 TYPE 41, pipe roll complete with Figure 167, MSS SP-69 TYPE 40, galvanized steel insulation protection shield sized for maximum 10' span on 4 psi compressive strength insulation.

C. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

D. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

E. Provide concrete inserts, Grinnell Figure 282, MSS SP-69 TYPE 18, universal concrete insert, for attaching hangers to building structure. Inserts to be adequately sized and correctly positioned to support piping, valves, etc., when full of water and system is in operation.

F. Provide C-clamps with locknut, Grinnell Figure 86, MSS SP-69 TYPE 23, where piping is to be hung from steel beams. Welding hanger rods to steel members is not permitted. Provide malleable beam clamps, Grinnell Figure 218, MSS SP-69 TYPE 30, with extension piece, Grinnell Figure 157, where piping is hung from bar joist.

G. Support all piping by heavy steel, adjustable hangers, or brackets suitably fastened to structural portion of building. Place hangers in accordance with following tables:]

COPPER TUBING SUPPORTS	
SIZE (IN.)	DISTANCE BETWEEN SUPPORTS (FT.)
5/8	6
7/8 - 1-1/8	8
1-3/8 - 2-1/8	10
2-5/8 - 5-1/8	12
6-1/8 - 8-1/8	14

H. Perforated metal, strap iron, or band iron hangers are not permitted. Offsets in hangers are not allowed. Pipe risers to be supported at regular intervals in pipe shafts within the limits of good practice.

I. See Insulation Section for requirements at pipe hangers.

J. Support horizontal piping across roof in accordance with Specification Section 23 05 49.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install piping not to interfere with opening of doors or other moving parts. Do not install piping near or directly over any portion of electrical equipment.

B. Provide chromium-plated escutcheon plates for exposed uninsulated pipes projecting through floors or walls in finished spaces. Mechanical rooms and janitor closets are not considered "finished" spaces.

C. Hang piping so equipment, flanges, and connections do not bear weight of piping.

D. Adequately support vertical lines at their bases or by a suitable hanger placed in horizontal line near riser or by a base fitting set on pedestal.

E. Pipes not to be hung or supported by pumps. No torque to be applied to pumps by connecting pipes. After final pipe adjustments and initial operation of the pumps, this Contractor to recheck alignment of pumps and realign as required.

F. Run piping in straight lines; riser lines to be plumb with such offsets only as indicated or necessary. No sagging of lines permitted.

G. Unless otherwise shown on drawings, lines to be installed to drain to sumps or sewer.

H. Ream pipe after cutting to full bore. Remove foreign matter from inside of pipe before installing. Keep installed piping free from dirt and scale and protect open ends from foreign matter. Use temporary plugs or other approved methods of open end closure.

I. Threads to be right-hand, pipe standard, clean cut, full depth, and tapered. Joints to be made tight without caulking. Approved pipe joint lubricant to be used, applied in thin layer to the male thread only.

J. Install copper fittings with suitable flux and 95/5 solder. Type K copper pipe to be joined by means of suitable flux and silver or phos-copper.

K. Piping to have sufficient number of flanges or unions for convenient installation and removal of piping and equipment.

L. Remake or replace defective, leaking, or otherwise unsatisfactory joints or material. Peening, caulking, or doping of piping is not permitted.

M. Install piping to prevent stresses and strains to piping and hangers from expansion or contraction. Provision for proper loops, offsets, or expansion joints to be responsibility of Contractor. Make provision for servicing and removal of equipment without dismantling piping.

N. Where indicated on the drawings that the pipe will be exposed to direct UV light for more than 30 days, it shall be provided with a Factory applied, UV-resistant coating. Alternate UV protection methods are not acceptable.
   1. Pipe fittings shall be Nupi Niron® Clima Cool-Pro®.

O. Life Cycle and Environmental Product Declaration
   1. Manufacturer shall be required to produce LEED v4.0+ LCA (Life Cycle Assessment) and EPD (Environmental Product Declaration) that is recognized by the USGBC. Manufacturer shall be able to provide a minimum of 10 data packages from previous jobsites showing compliance with this requirement.

P. Thermal and Vapor Barrier
   1. Where standard pipe insulation is indicated on the drawings or in these specifications, the contractor shall provide a thermal (radiant, conductive, and convective) and vapor barrier insulation. The insulation products shall be provided in the appropriate thickness or as indicated on the drawings or elsewhere in these specifications. The standard pipe insulation shall be UV resistant, CFC- free, non-porous, non-fibrous, and resist mold growth.

Q. Valve Applications
   1. Install gate valves close to the main on each branch and riser serving 2 or more equipment connections and where indicated.
   2. Install gate or ball valves on the inlet to each equipment item and elsewhere as indicated.
   3. Install drain valve at the base of each riser, at low points of horizontal runs, and where required to drain hydronic piping system.
   4. Install swing check valve on the discharge side of each pump and elsewhere as indicated.
   5. Install ball valves in each hot-water circulating loop and the discharge side of each pump.

3.02 FIRE-RATED PARTITIONS

A. Provide permanent firestop system at all piping penetrations of fire-rated walls and floors. Review details on drawing as well as this specification for permissible firestop systems. The firestop system shall have been tested and approved in accordance with ASTM E119 and U.L. 1479 (ASTM E814) and classified for up to 2 hours fire rating. Firestop system shall be type detailed on drawings or intumescent type capable of expanding up to 8 times its original volume. Firestop system to be 3M, Hilti, Nelson, Johns Manville, or Specified Technologies. Firestop system shall be installed in strict accordance with published U.L. approved installation instructions. Piping to pass through the fire-rated partition insulated or non-insulated as specified and detailed. Submit U.L. approved installation drawing for each type of penetration prior to construction.

3.03 NON-RATED PARTITIONS

A. Piping to pass through the walls insulated or non-insulated as specified. Wall should be finished to fit neatly around the piping. Firestopping is not required at non-rated partitions.

3.04 PIPE SLEEVES

A. Pipe sleeves shall be provided at non-rated partitions and floor penetrations. Pipe sleeves to be Schedule 40 or 18 gage steel. Sleeves to extend 1-1/2" in excess of partition depth on each side. Sleeves penetrating floors in wet areas, including all mechanical rooms, shall extend a minimum of 1 inch above the floor.
   1. Piping requiring sleeves:
      a. Heating hot water
      b. Chilled water
      c. Copper pipes thru masonry walls

3.05 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.06 VALVE ACCESS

A. Locate all shutoff and control valves for easy access and operation. Where valves must necessarily be located in enclosed spaces, they shall be provided with access panels of sufficient size for operation. Furnish these access panels to proper trades for installation.

3.07 AIR VENTING

A. Provide manual air vents at high points of vertical risers and at each water coil to eliminate air from HVAC water systems.

3.08 WATER DRAINING

A. Provide 3/4" hose end gate valves at low points and bottom of each riser to drain HVAC water systems.

END OF SECTION 23 21 13

SECTION 23 21 16

HYDRONIC PIPING SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Expansion tank.

B. Tank air control fitting.

C. Tangential air separator.

D. Suction diffuser.

E. P.T. test plugs.

F. Pressure gauges.

G. Digital thermometers.

H. Thermometer test wells.

I. Flow balancing valve.

J. Flow measuring meter.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Bell and Gossett ITT, Dieterich Standard, Flow Design, Gerand, Mueller, Peterson Engineering, Taco, Thrush, John Wood Industrial Products, Weiss Instruments, Inc.

2.02 EQUIPMENT

A. Compression Tank:
   1. Tanks to be constructed of carbon steel in accordance with ASME Boiler and Pressure vessel code.
   2. Tank to be constructed and ASME stamped for 125 psi working pressure at 375 degrees F.
   3. Unit shall be stamped with ASME "U" symbol.
   4. Provide tanks with mounting saddles.
   5. Compression tank to be manufactured by Bell & Gossett, Taco, Wood Industrial, or approved equal.

B. Tank Air Control Fittings:
   1. Furnish an air control tank fitting containing an air separating trap and water control baffle to provide unrestricted airflow to the compression tank and air-free water flow from the tank.
   2. Fittings to be equipped with manual vent tube.
   3. Construct fitting for 125 psi working pressure at 240 degrees F.
   4. Fitting to be Bell & Gossett ITT Airtrol tank fitting, or approved equal.

C. Tangential Air Separator:
   1. Provide an external air separation unit consisting of a steel tank, strainer, and collector tube.
   2. Unit to have screwed flanged tangential inlet and outlet connections.
   3. Design internal perforated stainless air collector tube to direct released air into compression tank.
   4. Removable stainless steel system strainer to have 3/16 inch diameter perforations and free area of not less than five times cross-sectional area of connecting pipe.
   5. Construct unit in accordance with ASME Boiler and Pressure Vessel Code and stamp for 125 psig working pressure at 350 degrees F.
   6. Unit shall be stamped with ASME "U" symbol.
   7. Provide blowdown connection on bottom of unit to facilitate routine cleaning of unit.
   8. Unit to prevent accumulation of air in hydraulic heating and/or cooling system and prevent noises caused by entrained air in piping.
   9. Separator to be Bell & Gossett ITT Rolairtrol, Spirotherm Spirovents, or approved equal.

D. Suction Diffuser:

1. Provide at each end-suction pump a Suction Diffuser with integral strainer.
2. Unit to consist of cast iron, angle type body with steel inlet vanes and combination diffuser-strainer-orifice cylinder with 3/16 inch diameter openings for pump protection.
3. Equip orifice cylinder with a disposable, fine mesh strainer which shall be removed after system start-up.
4. Design orifice cylinder to withstand pressure differential equal to pump shutoff head and have a free area equal to five times cross-sectional area of pump suction opening.
5. Vane length to be not less than 2-1/2 times the pump connection diameter.
6. Suction diffuser shall be provided with bottom blowdown connection, inlet gauge port, and adjustable support foot to carry weight of suction piping.
7. Suction diffuser to be constructed for 125 psi working pressure.
8. Suction diffusers to be manufactured by Bell & Gossett ITT, Taco, Mueller, or approved equal.

E. P.T. Test Plugs:
1. Provide 1/4 inch solid brass pressure/temperature test plugs at each BAS temperature sensor and at the entering and leaving connections of coils, chillers, hot water boilers, and heat exchangers.
2. Nordel self-closing valve to be rated for 275 degrees F. service.
3. Plugs to be manufactured by Flow Design, Peterson Engineering, SISCO, or approved equal.

F. Pressure/Temperature Test Kit:
1. Provide Owner complete portable pressure and temperature test kit.
2. Kit to be complete with pressure test gauge, necessary connector hoses, temperature test thermometer with adapter, shutoff and vent valves and carrying case.
3. Readout kit to be manufactured by Bell & Gossett ITT or approved equal.

G. Pressure Gauges:
1. Gauges in mechanical rooms to be 3-1/2” dial equal to Trerice Model No. 800LFB with glycerin liquid fill, nylon, steel, or aluminum case, acrylic plastic window, brass movement, phosphor bronze bourdon tube, and brass socket. Accuracy to be guaranteed within one percent.
2. Gauges in the powerhouse/central energy plant to be 4-1/2” dial equal to Trerice Model No. 450LFSS with glycerin liquid fill, reinforced polypropylene case, acrylic window, stainless steel movement, stainless steel tube and socket. Accuracy to be guaranteed within one-half of one percent.
3. Select scale range of gauges to indicate design pressure near midpoint of scale.
4. Provide each gauge with 1/4 inch size, brass construction needle valve equal to Trerice Model No. 735-2.
5. Provide each gauge with impulse dampener equal to Trerice Model No. 870.

H. Digital Thermometers:
1. Provide solar digital vari-angle Weiss Instruments, Inc., Model DVU-35 (no substitutions) with adjustable angle (rear, front, and side) thermometers across indoor chiller coolers and condensers, entering and leaving heat exchanger, hot water boilers and AHU coils where equipment is protected from weather.
2. Provide solar digital vari-angle Weiss Instruments, Inc. Model 5DVU35-300 (no substitutions) with adjustable angle thermometer for applications where device is exposed to weather.
3. Each thermometer to be self-powered and within 1% accuracy. Stem assembly to be industrial glass.

I. Thermometer Wells:
1. Provide Trerice or equal stainless steel thermometer wells for water temperature sensors and at other locations shown on drawings.
2. Test wells to be stainless steel with 2-1/2 inch extension neck and screw plug cap with chain and shall be filled with light clear oil.

J. Flow Balancing Valve:

1. Balancing/shut-off valve to be ball type with bronze/brass body, chromium plated bronze ball, Teflon seats, blowout proof stem with Teflon packing and nut, and full size quarter turn handle with grip and memory stop.
2. The flow measuring element shall be a low loss/high signal Venturi type of one to ten rangeability equipped with dual Schrader type pressure test ports and caps for connection to a portable differential pressure meter.
3. Meter connections to have built-in check valves.
4. Valves to provide for leak tight shutoff service at full rated working pressure.
5. Sizes 1/2" through 2" to be threaded ends with brass adapters; sizes 2-1/2" and larger to be flanged.
6. Valves and Venturis to be rated for 125 psig working pressure at 250 degrees F.
7. Combination flow measuring, balancing, and shutoff valves to be Bell & Gossett Circuit Setter Plus or approved equal Ball valve up to 3” or Globe valve 4” to 12” type.

K. Flow Measuring Meter:
1. Provide portable flow measuring meter capable of indicating pressure differential across previously specified flow balancing valves and flow measuring stations.
2. Unit to be complete with hoses, shutoff and vent valves, and carrying case.
3. Flow measuring meter to be made by manufacturer of associated flow balancing/measuring devices.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hydronic specialties in strict accordance with manufacturers’ published installation instructions.

B. Provide 1/2" manual air vents at top of pipe risers and other locations where air can be trapped or collected.

C. Provide 3/4" hose end gate valve drains at bottom of pipe risers and other locations to drain water systems.

D. Pipe relief valve outlets from hydronic systems to nearest floor drain.

E. Support pump inlet and strainer fittings with floor mounted pipe and flange supports.

F. Locate thermometers and pressure gauges no higher than 7 feet above finished floor elevation.

G. PT test plugs shall be located at each hydronic BAS temperature sensor and at the entering and leaving connections of coils, chillers, hot water boilers and heat exchangers.

END OF SECTION 23 21 16

SECTION 23 21 23
HYDRONIC PUMPS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pump to be non-overloading, single-stage, bronze fitted, centrifugal type pump driven by single-speed, squirrel-cage motors.

B. Pump manufacturer shall furnish and be responsible for the selection, compatibility, and performance of each unit consisting of pump, motor, coupling, and base plate.

C. Pumps to be Bell & Gossett, Armstrong, Taco, Peerless, Aurora, Paco, Weinman, Grundfos or Tigerflow.

D. NOTE: Motor horsepower indicated on schedule to allow non-overloading operation of pump. Pumps requiring larger motors will not be acceptable.

E. Pumps shall not be selected requiring impeller sizes within 10 percent of maximum impeller size for that pump size and/or have an efficiency of 80 percent or less.

PART 2 PRODUCTS

2.01 IN-LINE PUMPS

A. Volute to be cast iron, designed for 175 psi working pressure, include suction and discharge nozzles of equal size, gauge tappings, and drain fittings.

B. Impeller to be bronze enclosed type, hydraulically and dynamically balanced, keyed to shaft and secured by suitable locking cap screw.

C. Shaft to be steel. Replaceable shaft sleeve to be aluminum bronze. Shaft sleeve to completely cover wetted area under mechanical seal.

D. Standard mechanical seal to be provided to seal off liquid cavity.

E. Pump to be designed so pump internals can be serviced without disturbing connecting pipe.

2.02 MOTOR

A. See separate Section 23 05 13.

2.03 COUPLING AND BASE PLATE FOR BASE MOUNTED PUMPS

A. Manufacturer to furnish and mount pump and motor on common steel base plate with drip rim.

B. Manufacturer to furnish and mount flexible coupling. Fasten metal coupling guard to pump base plate.

C. NAMEPLATE: Provide pump and motor with stainless steel or aluminum nameplate securely fastened to casings. Nameplates to provide all data necessary for equipment identification and replacement.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide base-mounted pumps with soleplates, bedplates, or base plates carefully leveled, grouted, and bolted in place on concrete pads or foundations. Grout to be expanding type containing catalyzed metallic aggregate. After grout has set, cut flush with bedplate and seal to prevent fraying deterioration at edges.

B. Install pipe supports on each side of in-line pumps to prevent undue strain on piping system.

C. Make hot alignment check on couplings between motors and pumps. Operate equipment until components have reached operating temperature before hot check is made. Reposition equipment as required and repeat hot alignment check until parallel and angular alignments in both plan and elevation are within limits set by equipment manufacturer.

D. Provide Suction Diffusers on each pump where show on the documents.

E. Both entering and leaving flanges on pumps and suction diffusers are to be drilled and tapped for gauge connections.

F. Concentric reducers are not permitted at pump inlets. To avoid air pockets, use eccentric reducers with flat side on top where transitions are required.

END OF SECTION 23 21 23

SECTION 23 23 00
REFRIGERANT PIPING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Refrigeration piping, valves and fittings to connect split system heat pump air conditioning systems including computer room air conditioning systems.

1.02 SAFETY CODE

A. Comply with the requirements of ANSI B9.1, Code for Refrigerant Systems.

PART 2 PRODUCTS

2.01 MATERIALS

A. Piping: Type "L" ACR hard copper, ASTM B88.

B. Fittings: Wrought copper.

C. Solder: Silver solder, or phos-copper solder having a melting point of 1125 degrees F. or higher.

2.02 EQUIPMENT

A. Service Valves: Henry valves or equal. Provide packed type receiver, purge, and gauge valves with valve stem seal cap ports.
   1. Valves up to 5/8" O.D.: Henry Figure 516 or equal, diaphragm type.
   2. Valves larger than 5/8" O.D.: Henry Figure 203 or equal.

B. Solenoid Valves: Manufactured by Sporlan Co., or equal, suitable for the type of refrigerant used, and of a type permitting manual lifting of stem for emergency operation. Size valves for pressure drop of 3 pounds at design flow.

C. Refrigerant Filter Dehydrator: Sporlan Co. Reversible Heat Pump or equal sealed core type of size recommended by manufacturer for maximum design tonnage. For systems 20 nominal tons and larger, provide replaceable core filter driers.

D. Moisture Indicator: Sporlan Co. See-All type SA-125 or equal.

E. Pipe Supports:
   1. Pipes subject to vibration: Isolation type brackets.
   2. Pipes not subject to vibration: Grinnel No. CT-95 or equal.
   3. Riser clamps: Grinnel CT-121 or equal.

F. Escutcheons: Chrome plated escutcheons sized for pipe.

G. Sleeves: Provide sleeves as specified in Section 23 21 13 and 23 2213.

H. Insulation: Insulate piping as specified in Section 23 07 10.

PART 3 EXECUTION

3.01 INSTALLATION

A. Make solder joints with carbon dioxide or nitrogen passing through joints being soldered. Ensure a clean, tight system. Pull a clean rag through each piece of tubing after cutting or reaming.

B. Install pipe and hangers in accordance with hanger manufacturers' printed instructions.

C. Provide escutcheons at all visible wall penetrations in finished areas.

3.02 LEAK TESTING

A. Test for leaks by use of carbon dioxide or nitrogen and a liquid soapsuds solution. Correct leaks found.

B. Evacuate system to 20" vacuum and charge with refrigerant until a pressure of 15 psig is reached. Then test for leaks using a Halide leak detector. Correct leaks found.

C. Pressurize system, with carbon dioxide or nitrogen, to 300 psig on the high side, and 200 psig on the low side, and test for leaks. Correct leaks found.

3.03 SYSTEM DEHYDRATION

A. Dehydrate system by "Double Dehydration" method.

B. Use a suitable vacuum pump. Evacuate system to a vacuum of 0.2" Hg absolute and operate pump for eight hours when that pressure is reached.

C. After eight hours, admit dry nitrogen directly to the system, and then evacuate system to a vacuum of 0.2" Hg absolute and operate pump for four hours.

3.04 CHARGING SYSTEM

A. When system dehydration is complete and all leaks are corrected, charge system with refrigerant.

END OF SECTION 23 23 00

SECTION 23 25 13

WATER TREATMENT FOR CLOSED HYDRONIC SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a complete water treatment system for the hot water systems as specified herein. Provide system start-up and adjustment.

B. Provide one years supply of water treatment chemicals and systems pre-cleaning chemicals.

C. Submit complete water treatment systems for approval.

D. All hot water piping and related equipment shall be thoroughly flushed out with pre-cleaning chemicals designed to remove deposition such as pipe dope, oils, loose rust, mill scale and other extraneous materials. Recommended dosages of pre-cleaner chemical products shall be furnished by water treatment supplier and added and circulated throughout the water systems. The water systems shall then be drained, refilled and flushed thoroughly until no foreign matter is observed and total alkalinity of the rinse water is equal to that of the make-up water.

PART 2 PRODUCTS

2.01 CLOSED HOT WATER TREATMENT SYSTEMS

A. Provide a one-shot chemical feeder of 5-gallon capacity and minimum 125 PSI working pressure for each closed water system. Feeder to be complete with funnel with fill valve, and inlet, outlet and drain connections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and place complete water treatment systems in proper operating condition in accordance with drawings, specifications, and manufacturer's published installation instructions. Provide communication link between water treatment microprocessor and Building Automation System PC.

B. Permanent facility pumps should not be used for circulating the cleaning water. However if it is impractical to use temporary pumps, the permanent facility pump may be used provided that the pump is unconditionally warranted for two years, parts and labor, after the date of substantial completion by the mechanical contractor.

C. Water treatment equipment manufacturers' representative to supervise systems pre-cleaning, water treatment systems installation and start-up, and train owners' representatives a minimum of 8 hours concerning proper feeding and control techniques. Provide two copies of water treatment systems operating and maintenance manuals to Designer.

D. Cleanness of the system shall be determined by water sampling performed by the water management chemical engineer and witnessed and approved in writing by the General Contractor's quality control representative.

E. System Startup Chemicals: Mechanical contractor shall purchase startup chemicals from HCA's designated supplier, and utilize the supplier's representative to operationally treat the systems until such time as this responsibility is formally accepted by HCA. Weekly testing of the efficacy of the chemical treatment of the cooling towers and boilers shall be conducted and the results immediately copied to the hospital's DFM.

END OF SECTION 23 25 13

SECTION 23 29 23

VARIABLE FREQUENCY MOTOR CONTROLLER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish complete variable frequency motor controllers (VSMC) as specified herein for the fans and pumps designated. All standard and optional features shall be included within the VSMC enclosure unless otherwise specified.

B. Provide VSMCs for as scheduled on the drawings in accordance with this section. All VSMCs provided to be of same manufacturer.

1.02 QUALITY ASSURANCE

A. To ensure quality and minimize infantile failures at the job site, the VSMC shall be burned in at an ambient of 40 degrees Celsius minimum for at least 120 hours. The VSMC shall be operating a dynamometer and the load and speed shall be cycled during the test. All optional and special features shall be functionally tested at the factory for proper operation.

1.03 WARRANTY

A. The VSMC shall be warranted by the manufacturer for a period of 36 months from date of start-up. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized on-site service.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. VSMC to be as manufactured by ABB, Danfoss-Graham, York/Toshiba, or approved equal.

B. The VSMC shall convert 3-phase, 60-Hz utility power to adjustable voltage and frequency, 3-phase, AC power for stepless motor speed control from 5% to 100% of the motor's Hz speed. Input voltage shall be as indicated on the equipment schedules on drawings.

C. Convertor Section: Full wave diode bridge rectifier.

D. Invertor Section: Transistorized sine coded pulse width modulated (PWM) type for stepless motor speed control.

E. Silicon-controlled rectifiers (SCRS) or GTOs shall not be used in the circuitry.

F. The VSMC maximum output current rating shall be 110 percent of the motor nameplate full load current.

G. The VSMC and options shall be tested to ANSI/UL Standard 508. The complete drive including all options shall be listed by a nationally recognized testing agency such as U.L. or ETL.

H. The VSMC and options shall comply with the applicable requirements of the latest standards of ANSI, IEEE, and the National Electrical Code. The VSMCs full load amp rating shall meet or exceed NEC Table 430-150.

I. The VSMC shall not emit either conducted or radiated RFI in excess of the limitations set forth in the FCC Rules and Regulations, Part 15, Subpart J, for class A computing devices. The VFD shall have an FCC compliance label. Provide RFI filters if required.

J. The increase in audible motor noise with the VSMC operating shall not exceed 3 decibels.

2.02 BASIC FEATURES

A. The VSMC shall include the following basic features:
   1. The VSMC shall be housed in a NEMA 1 wall-mounted enclosure.
   2. The following operator controls shall be located on the front of the enclosure:
      a. Hand/Off/Auto selector switch to start and stop the motor. In the auto position, the drive will start/stop from a remote contact closure.
      b. Auto/Manual selector switch. In the auto position, motor speed is determined by the follower signal. In the manual position, motor speed is determined by the manual speed potentiometer.

c. Manual speed potentiometer.
d. Power on pilot light to indicate that the AFC is being supplied by the power line.
e. Fault pilot light to indicate that the AFC has tripped on a fault condition.
f. Digital meter to indicate percent speed and percent load.

3. Two sets of form C, dry contacts to indicate when the VSMC is in the run mode.
4. One set of form C, dry contacts to indicate when the VSMC is in the fault mode.
5. When input power returns to normal following a fault trip for under-voltage, over-voltage, or phase loss, the VSMC shall automatically restart. The VSMC shall not automatically restart following fault trips due to overload or over-current.
6. The VSMC shall include a door interlocked, padlockable, input power disconnect switch.
7. Speed Control: The output frequency may be adjusted in proportion to any one of the following:
   a. 0-10 VDC Analog Signal.
   b. 0-5 VDC Analog Signal.
   c. 4-20 MA DC Analog Signal.
   d. 3-15 psig Pneumatic Signal.
8. Coordinate with controls supplier for exact input signal and type to provide proper input follower (i.e., grounded or floating).
9. Provide open protocol BACnet MS-TP, LONtalk, Johnson N2, etc. interface card to connect to Building Automation System. Coordinate with existing controls system provider for preferred interface language.

2.03 PROTECTIVE FEATURES

A. The VSMC shall include the following protective features:
   1. Current limiting semiconductor fuses for the power input.
   2. Separate overload relay for each motor controlled.
   3. Protection against input power under-voltage, over-voltage, and phase loss.
   4. Protection against output current overload and over-current.
   5. Protection against over-temperature within the VSMC enclosure.
   6. Protection against over-voltage on the DC bus.
   7. In the event of a power loss, shutdown without component failure. Upon return of power, automatically return drive to normal operation, if the start is in the "ON" condition, being able to restart into a rotating motor regaining positive speed control without shutdown or component failure.
   8. In the event of a phase-to-phase short circuit, shutdown safely without component failure.
   9. In the event that an input or output power contactor is opened or closed while the drive is activated, no damage to the VSMC shall result.
   10. Any disconnect switches between the VSMC and the motor shall include an auxiliary contact interlocked to the VSMC fault trip circuit. In the event that a disconnect switch is opened while the drive is running, the drive shall shut down.
   11. DC bus discharge circuit for protection of service personnel.
   12. Insensitive to incoming power phase sequence.

2.04 ADJUSTMENTS

A. The VSMC shall include the following adjustments available via potentiometers inside the enclosure:
   1. Maximum speed, adjustable 50-100% base speed.
   2. Minimum speed, adjustable 0-50% base speed.
   3. Acceleration time, adjustable 2-60 seconds.
   4. Deceleration time, adjustable 2-60 seconds with override circuit to prevent nuisance trips if deceleration time is set too short.
   5. Current limit, adjustable 0-110%.

2.05 SERVICE CONDITIONS

A. The VSMC shall be designed to operate within the following service conditions:
   1. Ambient temperature, 0-40 degrees C.
   2. 0-95% relative humidity, non-condensing.

3. Elevation to 3300 feet without derating.
4. AC line voltage variation, -5% to 10% of nominal.

2.06 SPECIAL FEATURES

A. The following special features shall be included in the VSMC enclosure. The unit shall maintain its U.L. or ETL listing.
   1. A motor starter shall be included in the bypass circuitry for constant speed motor control when the VSMC is taken out of service. Manual bypass shall provide all the circuitry necessary to transfer the motor from the VSMC to the power line, or from the line to the controller while the motor is at zero speed. The bypass circuitry shall be mounted in a separate section of the VSMC enclosure. Two motor contactors, electrically interlocked, shall be utilized. One contactor is to be between the controller and the motor. The other contactor is to be between the bypass power line and the motor providing across-the-line starting for motors 50 hp and less, and part-winding or “soft start” starting for motors greater that 50 hp. Motor overload protection is to be provided in both the controller mode and the bypass mode. The bypass section door shall include a "drive/line" switch, "on/off-reset" switch, and a "load transferred to line" pilot light.
   2. The VSMC shall include a main fused disconnect switch or circuit breaker to provide a means of disconnecting all power to both the bypass circuitry and the controller. The disconnect switch or circuit breaker shall be door interlocked and padlockable. The fuses or circuit breaker shall be sized to provide short circuit protection for the motor when in the bypass mode per the NEC.
   3. A second disconnect switch, circuit breaker, or contactors shall be provided to disconnect input power to the controller but not the bypass circuitry. This disconnect will allow troubleshooting and testing of the VSMC, both energized and de-energized while operating in the bypass mode.
   4. Plug-in test meter shall provide a quick means for monitoring the different signals within the VSMC for start-up and troubleshooting. Where the meter is capable of operating with different horsepower VSMCs, only one meter needs to be supplied.
   5. A critical frequency avoidance circuit shall be provided to avoid operation at speeds which cause excessive vibration in the driven equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. The manufacturer of the VSMC equipment shall provide a competent, factory trained service technician to supervise the installation, start-up and testing of the VSMC.

B. Install VSMCs in locations shown on the drawings in strict accordance with the manufacturer's published installation instructions.

C. Contractor shall provide such materials and assistance as required by the manufacturer's representative.

D. Division 26 shall provide necessary electrical connections.

E. Contractor shall provide coordination of the necessary controls not provided by the VSMC manufacturer.

3.02 START-UP, TESTING, DEMONSTRATION

A. The manufacturer's factory-trained service technician, assisted by contractor, shall verify correct installation, start-up equipment, and test it as a unit and a part of the system it serves. Verify by adjustments, tests, etc., that the equipment is functioning as specified. Provide three copies of test data to the Owner. As a minimum, check the following items:
   1. Motor voltage and frequency.
   2. Control input and automatic start/stop.
   3. Calibration and adjustment for minimum and maximum speed setpoints and acceleration and deceleration rates.
   4. Wire terminations.

B. VSMC manufacturer shall provide a minimum of 4 hours instruction to Owner to demonstrate the operation of the system. Provide three copies of operation and maintenance manual to Owner at completion of instructions.

C. A copy of the variable frequency drives certified startup sheets for all AHUs shall be provided to the construction manager / Cx team for record purposes within one week of start up.

END OF SECTION 23 29 23

SECTION 23 31 10

SHEET METAL DUCTWORK - LOW PRESSURE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Low pressure ductwork refers to systems operating at 2.00" w.g. total static pressure with velocities up to 2000 FPM. It is the intent of this specification to provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction loss with the least possible leakage loss. Friction loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Access to all accessories requiring maintenance, service and inspection shall be maintained. Radius elbows are preferred for all turns to minimize friction, noise and vibration; and, especially, for sections having large volume or higher velocities and sections which may have turbulences.

B. The contractor shall provide and/or construct all materials, ductwork, joints, transitions, splitters, dampers, access doors, etc., as set forth in these specifications necessary to install the Low Pressure Sheet Metal Ductwork required by the Mechanical Drawings.

C. Low pressure ductwork shall be constructed to meet the following pressure class:
   1. Supply ductwork downstream of terminal units: 1.0" pressure class.
   2. Supply and return duct connections to fan coil units (ESP ≤1.0"): 1.0" pressure class.
   3. Supply and return duct connections to single zone air systems (ESP >1.0", ≤2.0"): 2.0" pressure class.
   4. Exhaust and return ductwork (Fan ESP ≤2.0"): 2.0" pressure class.
   5. Supply ductwork and plenums downstream of supply fans up to terminal boxes: 4.0” pressure class.

1.02 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet Metal Tradesman is to have access on the construction site to the Latest Edition of SMACNA "HVAC Duct Construction Standards”, (Metal and Flexible). The Manual is referred to in specifications for required construction methods and details. Contractor shall comply with provisions of the SMACNA Manual and more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for all air ducts, but also quality workmanship which includes layout preplanning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for all ducts include:
   1. Dimensional stability (shape deformation and strength).
   2. Containment of the air being conveyed (leakage control).
   3. Vibration (fatigue and appearance).
   4. Noise (generation, transmission or attenuation).
   5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions).
   6. Support (alignment and position retention).
   7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials which meet applicable requirements of SMACNA manual and local and state codes, whichever is the most stringent.

D. Support ductwork in accordance with applicable requirements of SMACNA manual, local and state codes, and details on plans, whichever is the most stringent.

E. Emboss fittings with material gauge, manufacturer, and type material.

F. Materials used as sealers, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of not over 50.

G. Joint sealer shall meet the requirements of UL181A or UL181B as applicable.

H. Duct sealant classification: Seal all transverse joints, longitudinal joints and duct wall penetrations in accordance with SMACNA Class A. The sealant used to seal the longitudinal joints of low pressure ductwork must be visible or the joints shall require resealing in the field.

1.03 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to designer for approval ONLY when it deviates from products specified in Part 2 herein.

B. Shop Drawings: Contractor to submit to owner for approval complete sheet metal shop drawings of all ductwork, including equipment rooms, shafts, and especially congested areas and areas with possible conflicts. No installation shall proceed without owner stamped approval of shop drawings. Submittal to reflect space requirements coordinated with other trades such as Electrical, Plumbing, Mechanical and Structural. Prior to submission to owner, shop drawings to have stamped approval of all major trades which occupy ceiling space (HVAC, plumbing, piping, sprinkler, and electrical), to substantiate adequate coordination as to space, accessibility and to ensure no conflict exists between contractors.

C. The General Contractor shall be responsible for coordination between trades and shall stamp and sign the duct drawings to substantiate that the coordination has been accomplished. Non-critical piping and conduit shall give way to ducts.

D. Provide grease duct and kitchen hood shop drawings for review of code officials.

PART 2 PRODUCTS

2.01 MATERIAL

A. Sheet Metal, Angles, Bar Slips, Hangers, and Straps: Galvanized steel.

B. Screws: Cadmium plated.

C. Joint Sealer: Hardcast Iron Grip 601 or equal, Single Stage Sealant Process.

2.02 FABRICATION

A. Provide a rectangular or round duct where required on drawings of prime quality galvanized steel sheets, thickness and reinforcement as required by latest edition of SMACNA, or local and state codes, whichever is more stringent. When fabricating low pressure ductwork, largest duct dimension governs the entire duct and complete joint. **Ductwork to be no lighter than 24 gauge**. Contractor may substitute heavier gauge at no additional cost.

B. Duct dimensions shown on drawings indicate inside clear dimensions.

C. In addition to the requirements above, add supplemental bracing as necessary to prevent sagging, drumming, and vibration.

D. Round prefabricated slip joint duct may be used on exhaust and return duct 12" and smaller and for runout duct to boxes, diffusers, registers, and grilles.
   1. Secure duct sections and fittings with sheet metal screws.
   2. Make connections of round duct to rectangular duct using "spin-in" collars with manual volume damper.
   3. Transverse and longitudinal slip joints shall be sealed with approved sealer.

E. Provide transverse joints of "s" and drive construction at least every eight feet on duct whose larger side is less than 18". Seal all transverse joints with joint sealant material.

F. Provide transverse joints, or equivalent supplemental angle reinforcing on 4 foot centers on duct whose larger side is greater than 18". At the contractor's option, duct mate or equal joint system may be substituted for "s" and drive construction. Seal all transverse joints with joint sealant material.

G. Longitudinal seams shall be Pittsburg Lock or grooved seams closed tightly and evenly. Button punch snap lock longitudinal seam construction shall not be allowed. Seal longitudinal joints which prove to leak with joint sealant material.

H. Cross break ductwork over 10" dimension, either side.

I. Do not exceed 20 degree angle of slope for increase-in-area transitions.

J. Do not exceed 20 degree angle of slope for decrease-in-area transitions.

K. Do not exceed 30 degrees on the entering side or 45 degrees on the leaving side for angle of transitions at connections to equipment without the use of approved vanes. 20 degree angle is preferred and should be used space permitting.

L. Provide Ells fabricated to one of the following specifications in order of preference (SMACNA Figures 4-2 through 4-4 and Figure 4-9 and Chart 4-1):
   1. Unvaned elbow with the throat radius equal to 3/4 of the width of the duct and with a full heel radius.
   2. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Vanes shall be securely fastened to runners. All vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
   3. Square elbows with single thickness turning vanes. Maximum unsupported length of vanes shall be 36". Vanes shall be securely fastened to runners. All vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
   4. Radius elbows are the preferred fitting. Square elbows are to be used only when available space prevents the use of radius elbows.

M. Provide offsets as necessary in accordance with SMACNA Figure 4-7.

N. Make branch connections and tees in one of the following manners:
   1. Converging radius elbow with MVD. (SMACNA Figure 4-5).
   2. 45-degree entry with MVD. (SMACNA Figure 4-6).
   3. Round spin-in fitting with MVD.

O. Space duct joints to avoid cutting them for branch take offs and outlet collars.

PART 3 EXECUTION

3.01 INSTALLATION, APPLICATION, ERECTION

A. Support ductwork on each side of the duct with suitable sheared strips of galvanized metal or 1" x 1/8" galvanized steel band iron hangers.

B. Attach hangers to the ductwork using sheet metal screws.

C. Secure hangers to concrete structure with approved anchor shields and to steel structure by means of C-clamps.

D. Space hangers approximately eight feet along the duct except as noted below.

E. For ducts 60" and larger and heavy sections, such as welded duct and sound absorbers, space hangers at approximately four foot intervals.

F. Obstructions shall not be located within ducts.

G. Do not exceed 45 degrees for easement transition angle.

H. All ductwork, including supply, return and exhaust shall have circumferential joints, longitudinal joints, and duct wall penetrations externally sealed in accordance to SMACNA Class A. The sealant used to seal the longitudinal joints of low pressure ductwork must be visible or the joints shall require resealing in the field.

I. Insulation: Where drawings and insulating specifications indicate that ducts are to be insulated make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar equivalent in depth to

insulation thickness and of suitable size to which insulation may be finished to be mounted on duct.

J. Counterflashing: Counterflash all ducts where they pierce the roof.

K. Pitot Ports: Pitot ports for measuring airflow to be located in each main duct at the downstream end of the straightest run of the main and before the first branch take-off. Pitot ports to be formed by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum 8" centers and at least three to a duct, evenly spaced. Holes to be plugged with plastic plugs. Provide access to these for future rebalancing.

3.02 CLEANING

A. Clean ductwork thoroughly to assure all foreign matter, dirt, etc. is removed.

3.03 LEAKAGE TESTING OF INSTALLED SYSTEMS

A. Test Low Pressure Ductwork as follows:
   1. Follow procedure published by United Sheet Metal Division of United McGill Corporation entitled “System Pressure Testing for Leaks” using prescribed test kit containing test blower, two U-tube manometers, and calibrated orifice tube.
   2. Leak test at least 50% of the low pressure supply (from the terminal de-vice to the air devices or supply ductwork from a low pressure AHU), and 50% of the return and exhaust ductwork to ensure duct tightness and air handler system performance. Leak test the supply duct from the AHU to the terminal boxes.
   3. Leak test all duct that is enclosed in a chase or above a drywall ceiling.
   4. Installed low pressure duct system to be pressurized to maximum amount for the appropriate pressure class. Air leakage at test pressure to be measured by a calibrated orifice type flow meter. Ductwork shall be tested in accordance with the 2012 Second Edition of SMACNA HVAC Air Duct Leakage Test Manual. Low pressure duct shall be considered a Seal Class “A” with a leakage class of 8 for rectangular duct and 4 for round duct. Allowable leakage rate shall be in accordance with the Figure 5-1L.
   5. Leakage concentrated at one point may result in objectionable noise even if system passes leakage rate criteria; correct to satisfaction of Designer.
   6. Orifice flow measurement device to be individually calibrated against a primary standard and calibrated curve permanently attached to orifice tube assembly.
   7. Leak testing shall be observed by the General Contractor’s on-site quality control representative. The contractor shall have on site at all times the duct leak test training video distributed by the Owner. Maintain on site a set of prints to identify, in different colors, the duct sections isolated for each test, as well as the date of the leak test and final leakage rate recorded for each duct section.
   8. For low pressure ductwork where both longitudinal and transverse seams are fully sealed, leakage test described herein may be omitted.
   9. If system is tested in sections, leakage rates may be totaled to give performance of the whole system.

END OF SECTION 23 31 10

SECTION 23 31 11
SHEET METAL DUCTWORK - MEDIUM PRESSURE

PART 1 GENERAL

1.01 WORK INCLUDED

A. The contractor shall provide and/or construct all materials, ductwork, joints, transformations, fittings, access doors, etc., as set forth in these specifications necessary to install the medium pressure sheet metal ductwork required by the drawings.

B. Medium pressure - sheet metal ductwork with air velocity greater than 2000 feet per minute and static pressure 4" or less, but greater than 2".

C. It is the intent of this specification to provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction loss with the least possible leakage loss. Friction loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reduction in the number of offsets and elbows by pre-planning the duct system installation and coordination with other trades to prevent interferences. Access to all accessories requiring maintenance, service, and inspection shall be maintained. Radius elbows are preferred for all turns to minimize friction, noise and vibration; and, especially, for sections having large volume or higher velocities, and sections which may have turbulences.

D. Medium pressure ductwork is required from the outlet of AHU to each variable volume terminal box and shall be constructed to meet a 4" pressure class minimum or higher as required to meet air handling unit design external static pressure.

1.02 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet metal tradesman to have access, on the construction site, to "HVAC Duct Construction Standards, Metal and Flexible, Latest Edition. The Manual is referred to in the specifications for required construction methods and details. The Contractor shall comply with applicable provisions of the SMACNA Manual and the more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for all air ducts; but also, quality workmanship, which includes layout preplanning so that offsets, rises, falls, elbows, fittings, etc., are minimized or eliminated. General performance requirements for all ducts include:
   1. Dimensional stability (shape deformation and strength).
   2. Containment of the air being conveyed (leakage control). (See Part 3 of this specification for leakage testing.)
   3. Vibration (fatigue and appearance).
   4. Noise (generation, transmission or attenuation).
   5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive atmospheres, biological contamination, flow interruption or reversal, underground or other encasement conditions, combustion, or other in-service conditions).
   6. Support (alignment and position retention).
   7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials which meet requirements of SMACNA manual and local and state codes, whichever is the most stringent. Ductwork to be no lighter than 24 ga.

D. Support duct in accordance with SMACNA manual, local and state codes, and details on plans, whichever is the most stringent.

E. Emboss fittings and duct sections with material gauge, manufacturer, and type material.

F. Materials used as sealers, liners, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

G. Joint sealer shall meet the requirements of UL181A or UL181B as applicable.

H. Duct sealant classification: Seal all transverse joints, longitudinal joints and duct wall penetrations in accordance with SMACNA Class A.

1.03 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to owner for approval.

B. Shop Drawings: The Contractor is to submit to Owner for approval complete sheet metal shop drawings of all ductwork, including equipment rooms, shafts, and especially, congested areas and areas with possible conflicts. No installation shall proceed without owner stamped approval of shop drawings. Submittal to reflect space requirements coordinated with other trades such as Electrical, Plumbing, Mechanical, and Structural. Prior to submission to Owner, shop drawings to have stamped approval of major trades which occupy ceiling space (HVAC, plumbing, piping, sprinkler, and electrical), to substantiate adequate coordination as to space and accessibility and to ensure no conflict exists between contractors.

C. The General Contractor shall be responsible for coordination between trades and shall stamp and sign the duct drawings to substantiate that the coordination has been accomplished. Noncritical piping, low pressure ducts, and conduit shall give way to medium pressure ducts.

PART 2 PRODUCTS

2.01 MATERIAL

A. Sheet Metal, Angles, Bar Slips, Hangers and Straps: Galvanized steel.

B. Screws: Cadmium plated.

C. Joint Sealer: Hardcast Iron Grip 601 or Equal Single-Stage Sealant Process.

2.02 GENERAL FABRICATION REQUIREMENTS

A. Medium-pressure duct and fittings to be manufactured by a company who has had as its principal business the manufacture of spiral duct and welded fittings for at least five years.

B. Medium-pressure fittings to be manufactured by same manufacturer of ductwork to assure tight fit of all ductwork and components.

C. Supplier of medium-pressure ductwork to provide to Designer certified copies of test data made by independent United States laboratory covering all duct and fittings as manufactured by supplier.

D. Duct test data to cover leakage rate, bursting strength, collapsing strength, seam strength, and friction loss. Friction loss test data to cover both duct and assembled coupling joints. Fitting test data to cover friction loss tests of all fittings shown on drawings.

E. Installation manuals to be included by the Contractor with submittals. Manuals to provide detailed instructions on assembly, joint sealing, erection, reinforcement of flat-oval duct, and system pressure testing for leaks.

2.03 SPECIFIC FABRICATION REQUIREMENTS

A. Round Duct and Fittings:
   1. Round duct to be manufactured using galvanized steel meeting ASTM A-525. Construction shall be in accordance with SMACNA manual and manufacturer's standards.
   2. Round duct is to have appropriate seams made to eliminate leakage based on pressures for which the system has been designed. Longitudinal seam duct to have fusion welded butt seam.
   3. Fittings and couplings shall have the minimum gauges specified by SMACNA Manual. Fittings to have continuous welds along all seams.
   4. Divided flow fittings (90 degree and 45 degree branches, wyes, crosses, etc.) to be manufactured as a separate fitting, not as a tap collar or saddle tap welded into spiral duct sections. Entrances to be free of weld buildup, burrs, or irregularities.
   5. Elbows in diameters 3" thru 8" to be stamped elbows. Other elbows to be gored construction with all seams continuously welded. Elbows to be fabricated to center line radius of 1.5 times the cross-sectional diameter. Two-piece mitered elbows shall not be used unless specifically shown on plans.

6. Spun bellmouth connections to be used at each round take-off from medium pressure plenum.
7. Galvanized areas damaged by welding to be coated with corrosion resistant aluminum paint.

2.04 COUPLINGS FOR ROUND MEDIUM-PRESSURE DUCT

A. Diameters up to 60":
   1. Duct-to-Duct joints to be sleeve couplings, reinforced by rolled beads.
   2. Duct-to-fitting joints to be slip-fit of projecting collar fitting into duct.
   3. Insertion length of sleeve coupling and fitting collar to be 2" minimum.

B. Diameters 61" and up:
   1. Duct-to-Duct and duct-to-fitting connections to be made by angle ring flanges. Flange on pipe to be a 2" x 2" x 3/16" angle attached to duct with continuous weld.
   2. Fittings to have loose ring "Van Stone" flange.
   3. Provide 5/8" flange to act as gasketing surface for sealing with the angle ring. Angle ring to be rolled, welded ring 2" x 2" x 3/16".
   4. Bolt hole spacing for angle rings to be on 6" centers.
   5. If longitudinal seam duct greater than 60" diameter is supplied in lengths greater than 5', one angle ring must be welded to duct on 5' centers. Welding can be an intermittent weld of 1" in 12".

C. Flat-Oval Duct and Fittings:
   1. Provide flat-oval duct and fittings where indicated on drawings by symbol accompanying minor and major axis dimensions.
   2. Provide spiral-seam, flat-oval duct manufactured from galvanized steel in the following U.S. Standard gauges:

FLAT OVAL DUCT CONSTRUCTION, SPIRAL SEAM	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 24	24
25 - 48	22
49 - 70	20
70 and up	18

   3. Provide reinforcement and bracing in accordance with SMACNA manual and published details of spiral flat-oval duct manufacturer for size and pressure conditions applicable.
   4. Matching flat-oval fittings to be manufactured from galvanized steel with continuous weld seams in the following U.S. Standard gauges:

FLAT OVAL FITTING CONSTRUCTION	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 36	20
37 - 60	18
61 and up	16

   5. Construct flat-oval duct for sizes not available in spiral construction to the following minimum gauges:

FLAT OVAL DUCT CONSTRUCTION, LONGITUDINAL SEAM	
MAXIMUM WIDTH (IN.)	**GAUGE**
0 - 36	20
37 - 60	18
61 and up	16

   6. Flat-oval duct not of spiral construction to be adequately braced on 4' centers by reinforced couplings or angle ring flanges to limit amplitude of wall vibration to plus or minus 0.008" and maximum wall deflection to 0.52" at 6" static pressure. Provide angle flanges when maximum width exceeds 41" or when maximum height exceeds 26".
   7. Spun bellmouth connection shall be used at each flat oval duct connection to medium pressure plenum.

D. Rectangular Ductwork:
   1. Reinforce rectangular duct with angles or internal tie rods. Joints to be double "S" slip up to 60" in width and companion angle flanged joint above 60" in width. Sheet metal gauges for medium pressure duct shall be as required by SMACNA 2005 manual.
   2. Fabricate elbows using one of the following methods:
      a. Radius elbows are the preferred fitting. Square elbows are to be used only when available space prevents the use of radius elbows.
      b. Six inch throat radius with full radius, single thickness vanes and full heel radius. Maximum unsupported length of vanes shall be 36". Vanes shall be secure and stable in installed operating position. Construct vane edges to project tangents parallel to duct sides.
      c. Unvaned elbow with the throat radius equal to 3/4 of the width of the duct and a full heel radius.
      d. Square elbows with H-E-P: High Efficiency Profile turning vanes as manufactured by Aero/Dyne Company. Turning vanes shall be double thickness airfoil design with smoothly-rounded entry nose and extended trailing edge. Turning vane assemblies shall be fabricated with side rails and installed on design centers across the full diagonal dimension of the elbow. Vanes are to be installed in strict accordance with manufacturers' recommendations.
   3. Contractor may request round or oval duct be substituted for any rectangular duct shown. Size substitutions to be based on equivalent airflow resistance.

PART 3 EXECUTION

3.01 INSTALLATION

A. Support round ducts from building structure with galvanized steel hangers as recommended in SMACNA manual. Secure hangers to masonry portion of building by means of inserts or other acceptable anchors. Secure hangers to steel structure members by means of C-clamps. Vertical risers and other duct runs where methods of support specified above are not applicable, to be supported by angle brackets as shown in SMACNA manual.

B. Support rectangular and flat oval ducts by 1" x 1/8" galvanized band iron or 3/8" galvanized rod hangers attached to reinforcing angles and spaced same as reinforcing angles. Secure hangers to concrete beam or slab by inserts, anchor shield and bolt, toggle bolt, or expansion bolt.

C. Attach hangers to ductwork using sheet metal screws.

D. Space hangers approximately 8' along the duct for ducts under 60". For ducts 60" and larger and heavier sections, such as welded duct, space hangers at approximately 4' intervals.

E. Hangers and bracing used with ductwork to be galvanized.

F. Obstructions shall not be located within ducts.

G. Provide smooth insulation finish around dampers, access doors, and similar operating devices. Provide metal collar equivalent in depth to insulation thickness.

H. Provide pitot ports for measuring airflows in each main supply duct downstream of straightest run of main and before first branch takeoff. Form pitot ports by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum of 8" centers. Provide minimum of 3 per duct evenly spaced. Plug holes with plastic plugs. Provide access to pitot ports for future re-balancing.

I. Seal duct joints as follows:
   1. Apply sealer to male end of couplings and fittings. After joint is slipped together, place sheet metal screws 3" on center, 1/2" from joint bead. Apply sealer to the outside of the joint extending 1" on each side of the joint bead and covering screw heads.
   2. Duct sealer to be specifically formulated for the sealing of high-pressure duct systems. Submit sealer specifications for approval. Flame spread rating of sealer to be less than 25, smoke development rating of sealer to be less than 50. Apply joint material in strict accordance with manufacturers' published installation instructions.

3. Flanged joints to be sealed with neoprene rubber gaskets.
4. The sealant on longitudinal seams of field fabricated duct and fittings shall be visible on the exterior of the duct or the joints shall require resealing in the field.

3.02 LEAKAGE TESTING OF INSTALLED SYSTEMS

A. Test medium pressure ductwork as follows:
   1. Follow procedure published by United Sheet Metal Division of United McGill Corporation entitled "System Pressure Testing for Leaks" using prescribed test kit containing test blower, two U-tube manometer, and calibrated orifice tube.
   2. Medium pressure duct to be pressure tested from the AHU to the terminal boxes.
   3. Installed medium-pressure duct system to be pressurized to 50% over design operating pressure to 6" w.g. maximum. Air leakage at test pressure to be measured by a calibrated orifice type flow meter. Ductwork shall be tested in accordance with the SMACNA HVAC Air Duct Leakage Test Manual. Medium pressure duct shall be sealed to a Seal Class “A” with a leakage class of 4 for rectangular duct and 2 for round or flat oval ductwork. Allowable leakage rate shall be determined in accordance with the SMANA Figure 5-1L.
   4. Leakage concentrated at one point may result in objectionable noise even if system passes leakage rate criteria; correct to satisfaction of Designer.
   5. Orifice flow measurement device to be individually calibrated against a primary standard and calibrated curve permanently attached to orifice tube assembly.
   6. Leak testing shall be observed by the General Contractor’s on-site quality control representative. The contractor shall have on site at all times the duct leak test training video distributed by the Owner. Maintain on site a set of prints to identify, in different colors, the duct sections isolated for each test, as well as the date of the leak test and final leakage rate recorded for each duct section.

END OF SECTION 23 31 11

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Specialties to be submitted and approved before starting installation.

B. Items to be installed approximately as shown on drawings taking into account differences in mechanical equipment submitted and that shown on contract documents. Each item to be installed so that it is readily accessible for maintenance, repair, and/or setting and balancing.

C. Refer to drawings for diffuser, register, and grille sizes and number of airflow directions.

PART 2 PRODUCTS

2.01 FIRE DAMPERS

A. Fire dampers to be U.L. listed in accordance with UL-555. Fire dampers to be held in an open position with a 165 degree F fusible link and arranged to lock in position on closure.

B. Fire dampers for rectangular duct to be type "B" and for round duct to be Type "C". Fire dampers located behind sidewall registers and grilles and others specifically indicated on drawings to be Type "A". Fire dampers to be multi-leaf type with spring closing for horizontal mounting and weighted-gravity closing for vertical mounting. Dampers to be steel construction with rust resistant finish and provided with a factory-installed mounting sleeve suitable for structure. Mount per manufacturer's published U.L. approved installation instructions.

C. See Architectural drawings for hour-rating of walls and/or floors. Dampers to be compatible with hour ratings.

2.02 COMBINATION SMOKE/FIRE DAMPERS

A. Combination smoke/fire dampers to be U.L. listed both as 1-1/2 hour fire damper under UL-555 and as smoke damper under UL-555S as Minimum Leakage Category II and Elevated Temperature Category B (350 degrees F).

B. Dampers to be steel construction with rust resistant finish and provided with 165 degree F electronic resettable fuse link (EFL) and factory-installed mounting sleeve suitable for structure. Mount damper per manufacturer's published U.L. approved installation instructions.

C. Damper operator to be electric type compatible with electrical characteristics used for smoke detection and/or fire alarm system.

D. Dampers to be Ruskin Model FSD36 with crimped type blades for low-pressure duct systems and Ruskin Model FSD60 with airfoil blades for medium- and high-pressure duct systems.

2.03 DAMPERS

A. Automatic Control Dampers: All automatic control dampers to be furnished by Control Subcontractor and installed by this Contractor (except unit mounted dampers).
   1. Automatic control dampers to be low-leak, galvanized steel or aluminum construction parallel blade type, Ruskin Model CD50, or approved equal.
   2. Dampers to be complete with minimum 4" deep, 16-gauge hat-shaped channel frame, minimum 16 gauge blades on maximum 6" centers, 1/2" diameter shafts, and corrosion resistant bearings.
   3. Dampers to have extruded vinyl blade seals and stainless steel or aluminum flexible metal compression type jamb seals to limit leakage to a maximum of 1/2% (maximum of 5.4 cfm/sq. ft. leakage for 48" x 48" size damper) when tested in accordance with AMCA Standard 500.
   4. Motor actuator to be oil immersed gear train, 120-volt line voltage type with spring return to closed position on power interruption. Provide Honeywell Model M445/845, Barber-Colman MA-5210/5330 or approved equal complete with damper linkages.

B. Manual Volume Dampers (MVD): Manual volume dampers to be hand-operated type dampers constructed of galvanized steel, minimum 22-gauge for duct widths 18" and less, minimum 16-

gauge for duct widths greater than 18". Dampers for ducts to 12" height and 12" diameter to be single blade carried on a 3/8" round steel rod mounted inside of duct without frame and fitted with locking type quadrant and brass end bearing plate accurately drilled and secured to duct. Dampers for ducts greater than 12" height to be multi-blade type, 12" maximum blade width up to 30" blade length and 10" maximum blade width over 30" blade length. Blades to be mounted on frame with brass sleeve bearings interconnected for operation from one locking type hand quadrant. Round pivot rods to have section faced flat to receive locking setscrew in locking quadrant. Refer to SMACNA manual Figures 2-14 and 2-15.

1. For manual damper locations above a rigid or non-accessible ceiling or where damper access is limited, a remote damper operator shall be used. Damper operator to be self-locking worm gear designed for 3/8” damper shaft. Shaft extension to be 3/8” square rod with coupler. Remote operator to be provided with wrench operated shaft adjustment, position indication and lock nut. Where straight shaft extension cannot be used due to accessibility, a flexible cable operator with compatible damper operator and regulator may be utilized. Damper operator, shaft and regulator shall be designed for minimum 35 in-lb torque. Remote operator in non-sterile areas to be ceiling mounted with removable cover plate or mounted above access door. Sterile area installations such as surgery rooms or elsewhere as indicated on drawings shall use bracket mount installation above access door. Where multiple operators are routed to single or multiple access locations, provide markings to identify the associated air device for future use. The damper operator, shaft extension and ceiling termination/regulator shall be manufactured by Young Regulator, Inc. or approved equal.
2. Ductwork manual volume damper (MVD) handles in externally wrapped ductwork shall be supplied with a stand-off bracket and locking quadrant to ensure that the handle can be adjusted without disturbing the insulation vapor barrier.

C. Backdraft Dampers (BDD): Backdraft dampers to be Ruskin Model BD2-A2 or approved equal low-leak counterbalanced backdraft dampers. Dampers to be heavy-duty type suitable for air velocities to 2500 fpm with all extruded aluminum construction, minimum 0.81" thick frame, and minimum .050" thick blades on maximum 4" centers. Provide blades with vinyl edge seals. Provide dampers with aluminum linkage and corrosion resistant type bearings. Provide dampers with adjustable counterbalances on blades to assist closing.

2.04 SQUARE CEILING DIFFUSERS

A. Provide Titus TDC or approved equal round or square neck, louvered face ceiling diffusers at all locations designated by schedule on drawings. Diffusers to be all aluminum construction. Frame to be flush mount for diffusers in "hard" ceilings and lay-in T-bar mount for diffusers in lay-in ceilings. Finish to be baked-on, off-white enamel.

2.05 LAMINAR FLOW DIFFUSERS

A. Provide Titus TLF-AA or equal by Price, Anemostat, or Precision Air Products laminar flow, aluminum, perforated face ceiling diffuser at all locations designated by schedule on drawings. Diffuser to have round neck, deflector ring, 3/32” diameter holes on 1/4” centers in a 60 degree staggered pattern, retainer cable and suitable for either surface-mounted or laid-in T-bar ceiling system. Finish to be baked-on, off-white enamel.

2.06 SIDEWALL AND LOW-WALL RETURN REGISTERS

A. Provide Titus 33-RS heavy duty registers at all locations designated on drawings. Registers to be minimum 16-gauge steel construction complete with minimum 38 degree deflection fixed blades spaced 1/2". Finish to be baked-on, off-white enamel. Blades to be parallel to floor.

2.07 CEILING RETURN & EXHAUST REGISTERS

A. Provide Titus Model 50-F or approved equal at locations designated by schedule on drawings. Registers to be complete with 1/2" cube egg-crate aluminum grid. Finish to be baked-on, off-white enamel. Border to be flush mounted frame style.

2.08 AIR LOUVERS

A. [Air louvers shall be Florida Building Code Approved and Miami-Dade Qualified, wind driven rain, extruded aluminum blades equal to Greenheck model EHV-901D, Construction Specialties model DC-9614 or approved equal. The exposed exterior wall face of the louver shall be horizontal blade type. The louvers shall be tested and have passed the following: AMCA POOL Air Performance and Wind Driven Rain, AMCA 540 Test Method for Louvers Impacted by Wind Borne Debris (Missile Level D and Missile Level E), AMCA 550 Test Method for High Velocity Wind Driven Rain Resistant Louvers, TAS 201 (Large and Small Missile Impact), TAS 202 (Uniform Static Air Pressure), TAS 203 (Cyclic Wind Loading). Louvers to have minimum 0.050" thick aluminum frame and blades. Louver depth to be 9". Blade construction to be horizontal rain resistant style. Finish shall be Kynar color selected by Architect. Louver shall be rated at: the beginning point of water penetration (0.01 oz. of water (penetration) per sq. ft. of louver free area is above 974 fpm, minimum 54% free area (48"x48" test sample), 0.25" S.P. resistance at 850 fpm. Provided 1/2" mesh expanded aluminum screen with removable frame mounted on inside inside face of louver. Provide minimum 10 year finish warranty.]

2.09 FLEXIBLE CONNECTORS

A. Install UL listed flexible duct connectors between duct and fan/equipment connections. Flexible duct connectors to be made of 28-ounce, heavy glass fabric double coated with neoprene.

2.10 FLEXIBLE DUCT

A. Flexmaster Type 1M Acoustical Attenuating or Approved equal. Submit acoustical performance of any alternate product for prior approval.
   1. Characteristics of flexible duct:
      a. Approved as UL-181 Class 1 air duct.
      b. Flame spread rating less than 25 and smoke developed rating less than 50.
      c. Rated for 6" w.g. positive pressure, 4" w.g. negative pressure, and 5000 fpm air velocity.
      d. Tear and puncture resistant reinforced CPE inner liner mechanically locked together with a corrosive resistant galvanized steel helix.
      e. Insulated with minimum 1/2" thick fiberglass insulation with vapor barrier jacket.

B. Seal off the insulation jacket at its ends and at joints with mastic, Hardcast, or similar material. Replace flexible duct if jacket is punctured.

C. Flexible duct is NOT to be used for runouts where it must pass through walls or through smoke or fire partitions. Flexible duct is not to be used in exposed application. Flexible duct lengths shall not exceed 6 feet at each connection.

D. No bends shall be made in flexible duct with the center line radius less than one and one-half duct diameter and only one bend may occur per 6 foot length of duct material.

2.11 DUCT ACCESS DOORS

A. Duct access doors to be provided for access to all coils, fire, fire/smoke, and smoke dampers, automatic and backdraft dampers, duct smoke detectors, static pressure and air volume sensing devices, and other equipment installed in ducts and at other points indicated on drawings.

B. Access door construction and airtightness must be suitable for the duct pressure class used (low, medium, or high).

C. Access doors to be double-panel, galvanized steel construction with minimum 1" rigid insulation between panels. Access doors in exhaust duct and unlined return duct may be uninsulated single panel, galvanized steel construction. Doors to mount in rigid frame constructed of formed galvanized steel. Angle iron bracing to be used as required to provide rigid assembly. Doors to hinge on one side with door latch on opposite side.

D. Access doors in ductwork shall fully comply with Figure 7-2, 7-3 and 7-2M of SMACNA manual. Casing access doors shall fully comply with Figure 9-15 and 9-16 of SMACNA manual. Minimum size shall be 12" x 12" per NFPA 80.

E. Doors to close against gasket seal.

F. Ductwork and/or equipment access doors shall be required at all motorized dampers, fire/smoke dampers, smoke detectors, airflow monitoring stations, duct-mounted temperature/pressure sensors and/or transmitters, vaned elbows, duct-mounted heat transfer coils, sound attenuators and any other mechanical and/or control device requiring inspection, maintenance or test access. In addition, 24" x 24" access doors should be utilized wherever possible to facilitate adequate access for maintenance and/or testing.

G. Access doors for fire dampers, fire/smoke dampers, and smoke dampers shall be permanently identified on the exterior by a label having letters not less than 0.5 inches in height reading: “Fire Damper” “Fire/Smoke Damper” or “Smoke Damper” as required by 2012 International Mechanical Code.

2.12 DUCT MOUNTED SMOKE DETECTOR

A. Duct mounted smoke detectors shall be furnished by Division 26. Coordinate power and control wiring. Installation of smoke detector shall by Division 23.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation to be in accordance with manufacturers’ published installation instructions as well as applicable sections of SMACNA manual.

B. Provide all screws, bolts, nuts, and inserts required for attaching sheet metal specialty items to ducts, walls, floors and ceilings.

END OF SECTION 23 33 00

SECTION 23 33 20
ACOUSTICAL BARRIER WRAP

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide barrier wrap equal to Kinetics Model KNM-100AL materials at locations indicated on the drawings or as otherwise directed.

PART 2 PRODUCTS

2.01 BARRIER WRAP

A. Barrier wrap to be a single composite material consisting of a mass loaded limp, flexible, vinyl sheet noise barrier bonded to reinforced aluminum foil on exterior and 1” quilted fiberglass decoupling layer on interior.

B. The barrier wrap to be nominal 1 lb/sq ft density and to have a minimum 28 STC rating as a free hanging barrier when tested according to ASTM E-90-90.

OCTAVE BAND TRANSMISSION LOSS (dB)					
125	250	500	1K	2K	4K
13	16	24	33	43	49

C. The barrier wrap to have maximum flame spread rating of 10 and smoke developed index of 40 when tested in accordance with ASTM E-84.

D. The composite material to have the following minimum insertion loss when adhered to 20 gauge sheet metal duct when tested according to ASTM E-222-90.

OCTAVE BAND INSERTION LOSS (dB)					
125	250	500	1K	2K	4K
6	7	18	24	27	28

PART 3 EXECUTION

3.01 INSTALLATION

A. Wrap barrier around sheet metal completely covering the area indicated. Quilted fiberglass is to be placed against the sheet metal to decouple the outer limp barrier material from the metal. Securely fasten wrap with proper adhesive, kinetics acrylic based tape and/or bands.

B. All joints are to be sealed with a 6" minimum overlap of limp barrier material similar to that used in the composite to form a continuous air tight barrier around the duct. This to be adhered with 100% coverage of adhesive.

C. Seal all joints where the barrier wrap abuts the building construction with non-setting acoustical sealant such as DAP Acoustical Sealant or approved equal.

END OF SECTION 23 33 20

SECTION 23 34 00
CENTRIFUGAL FANS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes requirements for all centrifugal fans. Refer to drawings and schedules for style of fan and accessories to be provided.

B. Provide fan type, capacity, direction of rotation, discharge direction, and arrangement as shown on drawings.

C. Fans shall be Florida Building Code approved and Miami Dade qualified, with a current NOA approval. All manufacturer NOA Installation details to be included in equipment submittal.

1.02 PERFORMANCE

A. Certify fan performance in accordance with AMCA Certified Air and Sound Rating Criteria Standard 210, 300, and 301.

B. Fans shall be UL or ETL listed.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ACME, Greenheck, Barry Blower, Twin City, Cook, or approved equal.

2.02 CENTRIFUGAL EXHAUST FANS

A. Non-overloading, backward inclined, aluminum centrifugal fan wheel.

B. Variable pitch V-belt drive or direct drive as scheduled.

C. Roof or wall mounting as scheduled.

D. Removable heavy gauge aluminum fan housing enclosing motor outside airstream.

E. Permanently lubricated, ball bearing fan motor.

F. Isolate fan motor, wheel, and drive from base with rubber vibration isolators.

G. Electrical junction box.

H. Gravity backdraft damper.

I. Birdscreen around fan discharge.

J. Upblast housing when scheduled on drawings.

K. Solid state variable speed controller when scheduled on drawings.

L. Sparkproof construction with explosionproof motor when scheduled on drawings.

M. See fan schedule on drawings for other required accessories.

2.03 BELTED VENT SETS

A. Belted vent sets shall be a completely packaged unit including fan assembly, motor, adjustable belt drive, and adjustable motor base.

B. Wheels and Housings: Wheel diameters and discharge areas shall be sized in accordance with AMCA Standards.

C. Housing Construction: Heavy gage continuously welded steel. Housings shall be suitably braced to prevent vibration and pulsation. Housings shall be field rotatable to different discharge positions. Inlets shall be fully streamlined. Provide inlet and discharge flanges.

D. Painting: Factory applied, corrosion-resistant paint.

E. Shaft: Solid hot rolled steel, ground accurately for a smooth bearing fit.

F. Provide heavy duty, anti-friction, self-aligning ball or roller type bearings. Position bearing supports to directly oppose drive belt tensions and transmit loads to the fan base. Bearings to have a minimum L10 life of 40,000 hours.

G. Mount motor on an adjustable slide rail base.

H. Provide steel fan base.

I. Motor horsepowers and outlet velocities shall not exceed that scheduled on drawings.

J. Fans shall be statically and dynamically balanced at the factory.

K. Provide fans with OSHA approved expanded metal beltguards with tach hole for checking fan shaft speed.

L. Provide fans which all use same type grease.

M. Provide fan housing drain.

N. Provide housing access door.

O. Fans for outdoor mounting to be completely weatherproofed, with a fan motor and drive weather cover, and complete epoxy coating.

P. Exhaust fans serving airborne infection isolation (AII), decontam room, emergency department waiting rooms, shall discharge a minimum of 10'-0" above the finished roof. Refer to details on the drawings.

2.04 SQUARE CENTRIFUGAL IN-LINE FANS

A. Non-overloading, backward inclined, aluminum centrifugal fan wheel.

B. Variable pitch V-belt drive or direct drive as scheduled.

C. Heavy gauge aluminum or galvanized steel housing with duct connection at fan inlet and outlet and removable access panels to access all interior components without removing ductwork or wiring.

D. Permanently lubricated, ball bearing fan motor.

E. Electrical junction box.

F. Gravity backdraft damper.

G. Belt guard/motor cover.

H. Internally insulated housing when scheduled on drawings.

I. Solid state variable speed controller when scheduled on drawings.

J. Spring vibration isolators.

K. See fan schedule on drawings for other required accessories.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fans in locations shown on drawings in accordance with manufacturers' published installation instructions.

B. Connect fans to ductwork by means of flexible connections.

C. Fan and curb shall be installed per manufacturer's installation instructions to meet attachments for high wind and hurricane installation.

3.02 TEST AND ACCEPTANCE

A. Start-up and checkout fan for proper motor phasing, alignment, and vibration free operation. Correct improperly aligned fans. Change unmatched belts.

B. Demonstrate system operation to Owner's maintenance personnel and instruct them in operational and maintenance requirements.

C. Verify that, where applicable, fans are interlocked with other fans as required by control drawings.

END OF SECTION 23 34 00

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Variable volume air terminal units to be pressure independent, single duct, DDC control type with hot water reheat coil pre-assembled unit with factory installed piping and controls (with individual transformer) and shall be pre-commissioned.

B. Air terminal unit airflow and sound performance ratings to be certified in accordance with AHRI Standard 880. Unit maximum NC level shall not exceed NC 26 at 3.0" of static pressure at the inlet.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, provide products by the following:

1. Johnson Controls, Inc.
   VAV Box Model VRU
   Contact: Kevin P. Tolbert
   email: kevin.p.tolbert@jci.com
   478-952-8740

2.02 EQUIPMENT REQUIREMENTS

A. Provide terminal units with minimum 22-gauge welded galvanized steel housing, slip and drive duct connection, hanger holes or brackets, and 1/2 inch thick internal fiber-free, closed-cell. Insulation shall comply with Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. Insulation to be UL listed and meet NFPA-90A and UL-181 requirements.

B. For terminals units with a 6" inlet or greater, airflow to be monitored by an integral, multiple point, averaging airflow sensing ring or cross to maintain constant airflow within 5 percent of rated cfm down to 25 percent of nominal cfm, independent of changes in system static pressure. Sampling points to be evenly spaced across the air terminal box inlet for better readings. Factory set, field adjustable settings for terminal unit maximum and minimum airflows to be provided in accordance with schedule on drawings. Integral flow taps and calibration chart to be provided for each terminal unit.

C. On terminal units with inlets less than 6", a single point flow measuring device is acceptable.

D. Internal resistance of terminal unit shall not exceed that scheduled on drawings when handling maximum scheduled air volumes.

E. Terminal unit leakage rate to be maximum 2 percent of nominal catalog rated cfm at 3.00" w.g. inlet static pressure when tested according to ASHRAE 130.

F. Maximum room N.C. due to discharge or radiated sound shall not exceed NC-35 when terminals are either in throttled or full open position with inlet static pressure ranging from 0.5 to 2" w.g. Correction of noise excesses not to constitute additional charges.

G. Terminal units to be complete with factory installed, direct digital control actuator for connection to DDC controls provided by controls contractor.

H. Provide factory mounted hot water reheat coils for terminal units scheduled on drawings in accordance with Section 23 82 13 Heating Coils. Minimum tube thickness of 0.016".

I. Provide a discharge air temperature on each terminal unit. Temperature measurement to be 1000 Ohm RTD, 2-wire sensing element with +/- 0.3°F accuracy and a stability of less than 0.1°F in five years.

J. Where box supplier has an offering for a constant volume box or a variable volume box controlled to a constant volume, provide the latter to obtain the most data points and for flexibility.

K. An 8 inch diameter or 7.75 inch by 7.75 inch gasketed hinged access door shall be provided on the terminal unit. Door frame may be bolted, sealed or flanged to the casing. The door shall be double wall construction, gasketed and insulated. The Door shall be held in place with a cam lock latch allowing quick access without the use of tools.

L. Shipping: All components to be adequately protected during shipping, pipes to be plugged to keep debris from getting into the pipe and fittings, pipe ends to be prevented from damage during shipping.

M. Warranty: 1-year parts and labor warranty for all the parts of the pre-assembled air terminal box unit, with the exception of the controls contractor's scope of work.

2.03 PRE-PIPED VAV TERMINAL ASSEMBLY REQUIREMENTS

A. Terminal box assembly shall consist of factory fabricated terminal unit, integral controls, coil, piping of the sizes, capacities and configurations shown on the drawings with catalogued part numbers. All controls and hydronics piping shall be accessible from the same side of the unit. All hydronics piping packages shall be piped in the opposite direction of the control panel, downstream of the VAV terminal unit. Controls Contractor shall be responsible for proper selection/sizing of the VAV based on scheduled performance parameters and the supplying of the VAV.

B. The entire VAV assembly (terminal unit, coil, hydronics piping packages, controls hardware, electrical components and wiring) shall be seismically certified per IBC 2010 code with a 2.5 allowance factor and carry the OSHPD (OSP) certification.

C. If required for single-side access, single duct terminal units with hot water coils shall be shipped with a factory supplied 16 inch duct extension attached downstream of the coil. The construction of the duct extension shall be equal to the quality of materials and workmanship to that of the terminal unit. All connections to be sealed with silver foil tape rated at 6" of total pressure. The insulation shall match the insulation of the VAV box.

D. A control panel manufactured with a minimum 20 gauge sheet metal shall be supplied. The enclosure cover design shall allow for the following motions with a single universal design: a 180 degree hinged motion, a sliding motion from left to right and right to left including full removal of the enclosure cover without tools. The controls cover shall reside in a set position without the use of mechanical fasteners or screws. "Quick Release" sheet metal tabs/guide stops shall be supplied to allow the cover from slipping off when in the fully open position. The "Quick Release" tabs/guide stops shall be designed in such a way to allow the complete removal of the cover. A handle shall be supplied on the controls cover for opening and closing the controls cover. The control enclosure shall have factory installed knock outs for mounting all the electrical and controls components required. All electrical and electronic components including both line voltage and low voltage shall be mounted in the metal controls enclosure per applicable codes. The control panel shall include stand-offs to allow mounting of the controls and electrical items without penetrating the VAV terminal box casing.

E. A single point power connection shall be provided to the VAV unit. Low voltage wire from the ATC control valve actuator to the DDC controller shall be wired in 3/8 inch flexible conduit in accordance with UL-1995 and the National Electric Code. An electrical junction box with a disconnect switch, 24 volt transformer with low voltage wiring shall be provided and mounted on the VAV by the VAV manufacturer. All relays required shall be installed and wired in the electrical enclosure.

F. Hot water coils shall be factory installed with a maximum of ten (10) aluminum fins per inch and rated in accordance with ARI 410.The coil circuiting shall be a multi circuited header with corrosion free brass manual air vent piped in at the highest and lowest point of the piping header to ensure efficient drainage and air removal from the coil. A metal coil-u-bend cover shall to be factory installed on the coil u-bends to protect the coil u-bends during shipment and installation. Upstream and downstream coil casing connections to terminal unit and duct extension to be sealed with silver foil tape rated at 6" TSP. Tube thickness shall be a minimum of 0.016″

G. VAV boxes serving operating rooms and C-section rooms shall have a minimum of two-rows for rapid room warm-up. Two-row coils are preferred in all applications to reduce fan power requirements and sound transmission.

H. Two (2) 90 degree copper pipes formed on a tube bender shall be sweated directly to the header of the coil with a minimum distance of 6 inches from the coil inlet and to the coil outlet regardless of the coil size. Sweated copper elbows and fittings are not acceptable to achieve the same result.

I. A minimum of two adjustable Universal Handle Brackets with built in handles shall be supplied for every VAV furnished. Handles shall be constructed with a minimum of 14 gauge metal shall be painted to avoid corrosion and stress fractures of hydronics. Handle opening shall be able to accept a minimum of the following lifting devices through the handle portion of the bracket without damaging the product: human hand, forklift, Unistrut, pipe or other lifting devices. The handle shall have a 180 degree – "rolled up edge" to prevent injury to the human hand: raw edges or non-rolled edges shall not be accepted.

J. The shipping handle brackets shall use 4 military grade rubber grommets for elimination of galvanic corrosion and isolation between copper piping and support handles. The rubber grommets shall be made of Buna-N and be resistant to petroleum-based oils and fuels, water and alcohols.

K. The piping assembly and coil shall be field reversible. The hydronics piping structure and 2 handle shipping brackets shall be attached to the coil inlet and outlet connections as one assembly integral to the VAV. All piping assemblies for the VAVs supplied shall be identical and interchangeable for inlet sizes of four (4) inch through 24 inch. The supply and return aspect ratios of the inlet and outlet piping shall be 6 inch on center of the coils. The piping aspect ratio is identical for all VAVs supplied regardless of VAV box/coil size.

L. The following minimum factory installed piping components shall be supplied; a valve package consisting of a stainless steel ball valve with a #20 stainless steel screen to act as a strainer, a union, P/T (pressure temperature) port, drain or blow-down with integrated stainless ball valve and removable brass end cap to seal the drain connection. Union with P/T port. All P/T ports require an extension of a minimum of 1.5 inches. Stainless steel isolation valve, union, and P/T readout ports. Pressure gauge to confirm 100% leak free product delivery. Type "L" ¾ inch copper pipe.

M. Memory stops shall not be provided with VAV boxes, but shall be available from the manufacturer for field retrofit without the need to replace the entire valve, should the need arise.

N. A ½ inch control valve with stainless steel ball and stem shall be provided and factory installed in the piping trim at the factory. A 24 volt electric non-spring return modulating valve actuator shall be provided. The actuator wires shall be terminated to the VMA controller. Both the actuator and control valve shall be tested before leaving the factory.

O. Four aircraft cables shall be factory installed on the VAV with the job specific platform fastening mechanism at the end of the aircraft cables. Cables shall be a minimum of 10 feet long. Cables shall be rated for a minimum of 100 lbs each with a 5:1 safe working load allowance.

P. A transformer with primary and secondary transformer fusing with a toggle disconnect switch shall be provided and installed at the factory. All secondary wiring from the toggle switch and transformer to the VMA vav controller shall be factory installed and tested before shipment.

Q. A platinum 1k ohm DAT (Discharge Air Temperature) Sensor shall be provided. The DAT sensor shall have a stainless steel mounting flange with two hex-head self-drilling mounting screws and come equipped with a 10 ft plenum rated cable with ¼" female insulated quick-connect terminator leads. Cable must meet UL 1995 requirements for installation within an air plenum. The DAT sensor shall be factory installed in the duct extension at the farthest point downstream of the coil. The DAT sensor shall be factory checked for proper resistance range and factory-wired to the VMA- 1630 controller.

R. A VAV box controller shall be provided and factory installed. All wiring from the DAT, transformer and control valve shall be connected and tested at the factory. The pneumatic tubes from the air flow sensor shall be connected to the controller transducer at the factory

2.04 QUALITY ASSURANCE

A. The hydronics piping structure and coil shall be charged with nitrogen or other appropriate dry gas at the factory before shipment at greater than sea level pressure at the assembly area; seal the gas in the piping structure: Test the sealed piping structure and coil for a minimum of 12 hours to determine whether the gas stays within the hydronics Piping Structure and coil through the use of a pressure gauge. If the gas leaks from the hydronics piping structure per the pressure gauge identify the leak, fix it and re-test upon verification of the piping structure having zero leakage of the gas prior to shipment.

B. Transport the sealed and pressurized piping structure with coil from the factory to the construction site; determining a pressure of the gas at the construction site. If hydronics structure and coil arrives without holding pressure, then Contractor to trouble shoot and fix leak.

C. Inside of terminal unit and duct extension to be cleaned and wiped down. Inlet and discharge shall be wrapped with a protective cover. All VAVs shall be individually tagged, strapped down, palletized, enclosed in cardboard boxes and shrink wrapped with a pallet stretch machine. Labels with bar codes shall be adhered to the to each unit with the following information: Tag numbers, Model no, Serial no., Date of manufacture, Manufacturer, Inlet size, MFG, ID # and Job Name. Electrical wiring schematic shall be adhered to the outside of each control enclosure. Additional tagging to be placed on the outside of the cardboard box shrink wrapping. Shipping boxes shall list all relative shipping information including reference ID no., telephone number and name of person/entity receiving the product(s), and tags of individual VAV units on the pallets

D. Inlet of terminal unit and outlet of duct extension to be sealed with a plastic wrap to keep air borne particles out of the inlet and outlet of the VAV. In addition, the entire assembly shall be wrapped and secured to the shipping pallet.

E. Factory Commissioning of Controls and Software
   1. Load appropriate VAV program into the DDC controller and program all the performance parameters commensurate for each zone/VAV unit per schedule supplied by the controls contractor
   2. Properly address each controller with the correct address in order for the BAS system to identify each DDC controller.
   3. Power up the VAV and run the program through full cycle operation. Stroke the damper actuator to full open and then to closed position. Stroke the temperature control valve to full open and full closed.
   4. Set and Ship all actuators in the open position

F. Digital Data Retrieval System – VAV manufacturer shall provide the following as part of the Operational and maintenance manuals in digital form:
   1. Digital images of each individual VAV shipped including the hydronic piping packages, controls hardware, electrical, coil and terminal unit taken before shipment.
   2. Controller software and individual VAV performance files specific for each VAV by tag number.
   3. Approved Submittals
   4. Operational and maintenance instructions
   5. Drawings
   6. Part numbers

PART 3 EXECUTION

3.01 INSTALLATION

A. Install terminal units in strict accordance with manufacturers' published installation instructions.

B. Terminal units to be supported directly from unit to structure with appropriate supports.

C. Refer to section 01 91 13 for terminal box commissioning requirements and methodologies.

D. The HCA standard is that heating coils on VAV boxes are not provided with individual balancing valves. Balancing valves are instead to be provided at every floor, wing, and at every branch serving a minimum of 3 VAV boxes. Confirm balancing of individual terminal box is not included in the base scope of work of the Test and Balancing agent.

E. Provide shutoff valves as required for maintenance and replacement without a large-scale shutdown of equipment.

END OF SECTION 23 36 00

SECTION 23 40 00

HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install filters as scheduled on drawings with appropriate draft gauge(s).

1.02 QUALITY ASSURANCE

A. All filters to meet NFPA 90A requirements for flammability.

B. Filters with a 90% efficiency and less shall be tested in accordance with ASHRAE Standard 52.

C. Filters with a 95% efficiency and higher shall be rated under the D.O.P. test requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. American Air Filter, Flanders, CamFilFarr, TriDim, Koch, and 3M.

2.02 MANOMETER

A. Provide a Dwyer magnehelic gauge across each filter bank.

B. Mark gauge to indicate design clean and dirty loading conditions.

2.03 MEDIUM-EFFICIENCY DISPOSABLE FILTERS

A. Provide medium efficiency, disposable, pleated media filters at locations shown on drawings.

B. Each filter shall consist of a non-woven cotton media, media support grid, and enclosing frame.

C. Filter shall be listed by UL as Class II.

D. Provide MERV 11 (60% efficiency) per ASHRAE Test Standard 52.

E. 2-Inch Thick Media: Effective filter media area shall not be less than 4.6 square feet of media per square foot of face area.

2.04 HIGH-EFFICIENCY CARTRIDGE FILTERS

A. Provide MERV 14 (90% efficiency) per ASHRAE Standard 52 to locations shown on drawings.

B. 12-Inch Thick high-efficiency cartridge type filter.

C. Filters to have average velocity through media of not more than 25 fpm.

D. Filters to be selected in accordance with schedule for face velocity in order to produce efficiency and not exceed initial and final resistance as indicated on drawings.

2.05 HOLDING FRAMES

A. Frames to be constructed of 16-gauge galvanized steel.

B. Designed to provide a positive seal against leakage of unfiltered air.

C. Pre-drilled for convenient assembly into banks.

D. Integral spring type latches for holding filter against sponge rubber gaskets.

E. Install frames to provide service from the dirty air side.

F. The Cx authority shall inspect the filter arrangement for tight fit and absolute minimal bypass leakage around frame assembly and it shall be the responsibility of the contractor to correct any deficiencies prior to acceptance by the Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide filters and housings of size and capacities scheduled on drawings.

B. Mount filters and housings at locations shown on drawings.

C. Provide one complete change of filter media for each air handling unit, delivered to job site and turned over to Owner at final inspection.

D. Install filters in accordance with manufacturers' published installation instructions.

E. Install draft gauge(s) outside of air stream for each bank of filters.

F. Protect heating coils, cooling coils, and ductwork with filter media during construction.

G. Upon completion of ductwork and fan system, thoroughly clean systems and install specified filter media prior to placing system in operation.

H. The installing contractor shall be responsible for providing a new set of clean filters during initial system startup and at the start of TAB fieldwork for all air handling units. In addition, temporary filter media shall be removed and final unit filters shall be installed prior to final unit setup by the TAB agency (i.e., prior to final unit traverse).

END OF SECTION 23 40 00

SECTION 23 51 00
BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install factory-fabricated, UL listed, double wall, type "B" gas vent piping and fittings for combustion air duct.

B. Furnish and install factory-fabricated, UL listed, double wall, positive pressure vent piping and fittings for forced/induced draft heating systems for condensing exhaust flues.

C. Furnish and install windproof vent caps at all flue outlets.

1.02 QUALITY ASSURANCE

A. Double Wall Type "B" Gas Vent Systems shall comply with the following standards:
   1. UL 441.
   2. UL 795.
   3. NFPA 54.
   4. NFPA 221.

B. Double Wall Positive Pressure Systems shall comply with the following standards:
   1. UL 103.
   2. NFPA 37.
   3. NFPA 54.
   4. NFPA 211.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Selkirk Metalbestos.

B. American Metal Products Co (AMPCO).

C. Metal-Fab Inc.

D. Stacks Inc.

E. AERCO International.

F. Cleaver Brooks.

G. Fulton Boiler Works, Inc.

H. Lochinvar Corporation.

I. Superior.

J. Approved equal.

2.02 EQUIPMENT

A. Type "B" Gas Vent:
   1. Provide AGA and UL listed double wall, gas vent pipe and fittings for gas-fired appliances at locations shown on drawings.
   2. Maximum 400 degrees F operating temperature.
   3. Inner Shell:
      a. 0.014 inch thick aluminum for pipes up to 18 inch diameter.
      b. 0.018 inch thick aluminum for pipes 20 inch through 30 inch diameter.
   4. Outer Shell:
      a. 28 gauge galvanized steel for pipes up to 18 inch diameter.
      b. 26 gauge galvanized steel for pipes 20 inch through 30 inch diameter.
   5. Shell Separation: 0.5 inch air space.
   6. Minimum rated clearance to combustible construction: 1 inch.
   7. Insulating Characteristics: 0.5 BTU/hr-sq. ft.-degrees F.
   8. Couplings: Snap Lock.
   9. AMPCO Model R or approved equal.

B. Double Wall Positive Pressure System:
   1. Provide UL tested and listed double wall pipe and fittings suitable for forced/induced draft boilers, diesel exhaust, industrial ovens and process ducting at locations shown on drawings.
   2. Suitable for use with natural gas, #2 fuel oil, LP, and wood.
   3. Maximum 1000 degrees F continuous operating temperature, or 1400 degrees F intermittent.
   4. Inner Shell:
      a. 20 gauge 304 stainless steel for wood, LP, natural gas and #2 fuel oil.
      b. 20 gauge 316 stainless steel for all other fossil fuels.
   5. Outer Shell: 24 gauge aluminum coated steel.
   6. Shell Separation: 1 inch air space.
   7. Minimum rated clearance to combustibles: 10 inches.
   8. Couplings: Flanged containment band.
   9. AMPCO Model VSI-2, Metalbestos Model PS, or approved equal.

C. Triple Wall Positive Pressure System:
   1. Provide UL tested and listed double wall pipe and fittings suitable for forced/induced draft boilers, diesel exhaust, industrial ovens and process ducting at locations shown on drawings.
   2. Suitable for use with heating equipment burning gas, liquid, or solid fuels as described in NFPA 211, Chapter 2.
   3. Maximum 1000 degrees F continuous operating temperature, or 1400 degrees F intermittent.
   4. Inner Shell:
      a. 20 gauge 304 stainless steel for wood, LP, natural gas and #2 fuel oil.
      b. 20 gauge 316 stainless steel for all other fossil fuels.
   5. Center & Outer Shells:
      a. 24 gauge aluminum coated steel for 6 inch to 24 inch diameters.
      b. 20 gauge aluminum coated steel for 26 inch to 36 inch diameters.
   6. Shell Separation:
      a. Inner ring: 1 inch air space.
      b. Outer ring: 0.5 inch air space.
   7. Minimum rated clearance to combustibles: 4 inches.
   8. Couplings: Flanged containment band.
   9. AMPCO Model VSI-3 or approved equal.

D. Vent Caps:
   1. Provide windproof flue vent caps for all gravity vent systems.
   2. Caps to be designed with an integral baffling system to maintain a negative draft in the system irregardless of wind velocity or direction.
   3. Galvanized steel construction with birdscreen outlet covers.
   4. Vent caps to be manufactured by Breidert Company or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all vent piping and fittings in strict accordance with manufacturers' published installation instructions.

B. Type "B" Gas Vent Systems:
   1. Terminate vent piping at least 5 feet above draft diverter.
   2. Attach vent piping to draft hood with sheet metal screws.
   3. Securely strap vent piping in position and maintain at least 1 inch air space clearance to combustibles.
   4. Install an approved roof thimble at each roof penetration, sized to provide minimum 1" clearance from flue pipe.
   5. Terminate gas vent piping at least 3 feet above the roof and 2 feet higher than any portion of the roof located within 10 feet horizontally.

6. Vent piping terminating more than 5 feet above the roof shall be guyed or braced.
7. Terminate all gas vent piping with a Breidert windproof cap unless noted otherwise.

C. Double Wall Positive Pressure Systems:
1. Provide necessary angle iron frames and support plates to support weight of vertical stacks.
2. Seal inner pipe joints by use of Containment Bands and RTV silicon sealant for flue gas temperatures up to 600 degrees F.
3. Above 600 degrees F, joints to be sealed with high temperature joint cement.
4. Terminate vent piping for medium heat appliances (Boilers operating over 50 psig) not less than 10 feet higher than any portion of the building within 25 feet.
5. Provide an approved roof support and penetration assembly for each stack penetration of the building roof structure.

D. All parts exposed to the outdoors shall be protected with one base coat and one finish coat of paint, equal to Series 4200 - 4300 heat resistant paint manufactured by Rust-O-Leum Corp.

END OF SECTION 23 51 00

SECTION 23 52 16
BOILER, CONDENSING HIGH EFFICIENCY

PART 1 GENERAL

1.01 INCLUDED WORK

A. Furnish labor, materials, tools, equipment, and services for boilers as specified herein, sized and located in accordance with mechanical drawings.

1.02 RELATED WORK

A. Section 23 09 23: Direct Digital Control / Building Automation System (DDC/BAS)

B. Section 23 21 13: Hydronic Piping

C. Section 23 21 16: Hydronic Piping Specialties

D. Section 23 51 00: Breechings, Chimneys, and Stacks

1.03 QUALITY ASSURANCE

A. Design, construct, and factory test boiler in accordance with ASME Code for Boilers and Pressure Vessels, Section 1, Power Boilers, and state and local boiler codes.

B. Boiler shall receive authorized boiler inspection and bear ASME Stamp, and be UL 795 listed.

C. Fire test boiler at factory with the specified fuel(s) to check operation and function of controls. Provide source and field quality control test reports to owner.

D. Gas train assembly shall meet the requirements of Industrial Risk Insurers (IRI) or Factory Mutual (FM).

E. Boiler shall be provided with a minimum 10 year warranty (or manufacturer standard whichever is greater) against failure due to condensate corrosion, thermal stress, mechanical defects or workmanship.

1.04 SUBMITTALS

A. Submit product data for Designer's approval as required by Section 23 05 00.

1.05 DOCUMENTS

A. Provide the following documents to be delivered upon completion of work:
   1. Certificates/Permits
      a. ASME Certificate
      b. National Board of Pressure Vessels Inspectors Certificate
      c. Guarantee
      d. Construction and Operating Permits (where required by state or local regulations) from Air Pollution Control Authorities.
      e. Certificate of Acceptance or Boiler Operating Permit from State Boiler Inspector.
   2. Operation and Maintenance Data:
      a. Boiler Emergency Manual
      b. Boiler Operation Manual
      c. Boiler Maintenance Manual

1.06 PERMITS

A. Contractor shall obtain construction and operating permits from local Air Pollution Control Authorities and boiler and/or insurance inspectors.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are:
   1. Aerco.
   2. Lochinvar.
   3. Cleaver Brooks
   4. Approved Equal.

B. Boilers submitted as alternate to that scheduled on the drawings must be of a size to fit in the space allowed. Boilers are to be provided with a minimum of 3'-0" clear to all sides unless boiler is UL listed to be mounted as a single module with additional units.

C. Boilers submitted must contain the following information: performance data, dimensions and clearances for service, operating characteristics, furnished specialties and accessories, efficiency curves @ 100%, 50% and 7% firing rates and water temperatures ranging from 60F to 160F, pressure drop curve from boiler minimum flow to max flow, and vent requirements.

D. [If boiler submitted is an alternate manufacturer or model from the basis of design, contractor and manufacturer are responsible for submitting a coordinated package with all modifications required for the alternate model to work within the as designed system. This will include piping modifications, pump modifications, vent modifications, control modifications, and electrical circuiting requirements. Specific attention is to be given to flow rates of the boiler and any requirements for constant volume boiler flow with variable volume secondary or building flow.]

2.02 BOILERS – GENERAL CONSTRUCTION

A. Condensing high efficiency heating water boiler, complete with all controls and accessories ready to operate on natural gas as primary fuel, and propane as back up fuel.

B. Capacity and working pressure: As scheduled on drawings. Boiler shall be factory fabricated, factory-assembled and factory-tested, fully condensing boiler with heat exchanger sealed pressure-tight, built on a steel base, including insulated jacket, flue-gas vent, combustion air intake connection, water supply, return, and condensate drain connections and controls.

C. The boiler shall be manufactured in accordance with ASME Boiler and Pressure Vessels Code. The pressure vessel shall have flanged 150 pound ANSI rated water connections sized for the appropriate flow of the boiler. Pressure vessel shall be constructed of carbon steel or stainless steel.

D. The heat exchanger shall be stamped with the appropriate ASME working pressure not less than 160 psi and manufactured of stainless steel. Pressure vessel/heat exchanger shall be of welded construction. Access to the heat exchanger shall available for inspection and removal.

E. Burner and Modulating air/fuel valve shall be capable of turn down scheduled on the drawings without the loss of combustion efficiency or staging of gas valves. A VFD controlled blower shall be used to ensure the optimum mixing of air and fuel.

F. Exhaust manifold shall be corrosion resistant cast aluminum or 316 Stainless Steel. Manifold to have gravity drain for condensate.

G. Blower to include VFD control and operate during the burner firing sequence and pre-purge the combustion chamber. Blower motors shall not operate in the service factor of the motor.

H. Ignition shall be via regulated staged spark ignition with 100 percent main valve shut off and electric flame supervision.

I. The boiler shall be completed with a metal jacket consisting of a rust resistant alloy steel casing with a two coats hard enamel finish. Jacket shall be readily removable by section.

J. Provide electrical voltage as scheduled on the drawings. Provide factory installed and wired all require controllers, switches, devices and wiring with single point power connection. All wired in conformance with applicable provisions of the National Electric Code.

K. Ceramic fibers that may be potentially carcinogenic to humans is unacceptable as a combustion liner.

2.03 BOILER CONTROLS AND SAFTEY CIRCUITS

A. Control panel shall be UL listed and include LED display. Controls shall annunciate boiler and sensor status and include extensive self diagnostic capabilities the incorporate separate status and fault messages. Combustion safeguard/flame monitoring system shall use spark ignition and a rectification type flame sensor. Controller is to automatically restart after a loss of power in the same mode as before interruption.

B. Controls shall incorporate the following self governing modes where it receives and external control signal to eliminate nuisance faults due to over temperature, improper external signal or loss of external signal. 1) Set point High Limit 2) Set point Low Limit 3)Failsafe Mode

C. Boiler control system shall include the following:
   1. System Start Temp
   2. Pump Delay timer
   3. Auxiliary start delay timer
   4. Auxiliary temperature sensor
   5. Analog output feature to enable simple monitoring of temperature set point, outlet temperature or fire rate
   6. Remote interlock circuit
   7. Delayed interlock circuit
   8. Fault Relay for remote fault alarm
   9. Supply temperature reset based on outdoor ambient temperature

D. Boiler shall include and electric, single seated combination safety shut off valve/regulator with proof of closure switch in its gas train. Each boiler shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1

E. Boiler shall include a oxygen monitoring system that will measure the oxygen content of the exhaust gasses in real-time. Output of monitor shall be available through display.

F. The control system for the combination natural gas and propane firing system shall be IRI or FM approved.

G. Safety provisions in the control circuit shall cause the burner to shut off and prohibit restart until normal condition in the event of the following:
   1. High Discharge Temp
   2. High Internal pressure
   3. Low Water Flow
   4. High Water Flow
   5. Forced draft fan failure or loss of pressure
   6. Ingition pilot flame failure
   7. Main flame failure
   8. Low fuel pressure

H. In the event of a pilot or main flame failure, the burner shall automatically shut off and can not begin operation until it is manually reset.

I. Modulating fire control shall provide low fire start and step modulation up to needed capacity firing rate.

2.04 BOILER BURNER

A. Combination type burner shall be an integral part of the boiler, and shall be approved for operation with natural gas and propane.

B. The burner shall be capable of scheduled turn down modulating capacity control without loss of combustion efficiency or staging of gas valves.

C. The burner shall be a metal-fiber mesh cover a stainless steel body with spark ignition and flame rectification. All burner material exposed to combustion to be stainless steel.

D. Modulating burner air and fuel valve to be controlled by a single linkage. Linkage shall not require field adjustment.

E. Ignition shall be a via regulated staged spark ignition with 100 % main valve shut off and electronic flame supervision.

F. Burner to be capable of limiting excess oxygen in flue gas to less then 7%.

2.05 BOILER VENTING

A. The exhaust vent must be UL Listed for use with Category II, III and IV appliances and compatible with operating temperatures up to 230 F. positive pressure, condensing flue gas service. Refer to section 23 51 23 Prefabricated Vent System.

B. Provide exhaust vent flue size as shown on the drawings.

C. Combustion-Air Intake: Boilers shall be capable of drawing combustion air from the outdoors via a sealed combustion duct work constructed of PVC or metal between the boiler and building exterior.

D. Follow all requirements for maximum length and slope of manufacturer's venting guide for installation

2.06 GAS PIPING

A. Provide all necessary gas piping properly valved between main and connection to burner and pilot.

B. Gas pilot train shall include a three-way two-position plug cock to facilitate the use of propane as a standby pilot fuel. See drawings for propane tank size, location, and piping.

C. Size in accordance with national, state, and local ordinances and codes, and NFPA recommendations.

D. Gas cocks: Lubricated plug cocks with operating handles.

E. Gas burner piping assembly, including pilot, shall meet requirements of IRI or FM.

2.07 ASSEMBLY AND TESTING

A. Boiler, control panel and all components to be factory assembled and tested.

B. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas and demonstrate submitted combustion efficiency. Perform hydrostatic test.

C. Test and Inspect factory assembled boilers, before shipping according to ASME Boiler and Pressure Vessel Code. Provide testing documentation and results to owner as part of owner engineering manuals.

PART 3 EXECUTION

3.01 INSTALLATION

A. Boilers are to be installed per submitted and approved shop drawings. Refer to specification section 23 01 00 for requirements.

B. Install boilers in accordance with NFPA, ASME, local codes, and manufacturer's instructions, and Factory Mutual requirements. All boilers are to be installed with a minimum 3'-0" clear in all dimensions.

C. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Coordinate concrete, reinforcement and formwork requirements with division 3.

D. Boilers and accessories shall be installed and piped per manufacturer's recommendations and under his supervision. Drain valves on boiler shell and condensate neutralization receivers shall be piped to the nearest drain, full size of the connection. Relief valves and vents shall be piped to outside the building using either the connection size. Relief lines turning up through the roof shall be provided with gooseneck fittings to prevent water entry. Pipe gas vent connections on gas controls to outside of the building.

E. Boilers shall receive factory start-up supervision tests to check construction, operation, and function of controls and to ensure proper preparation for use. (See the following paragraphs.)

3.02 DUTIES OF SERVICE REPRESENTATIVE

A. Boiler and burner manufacturers' factory trained service representative(s) to perform services described below:
   1. Instruct designated maintenance personnel in operation and maintenance of equipment.

2. Test operation of safety valves.
3. Adjust firing equipment. Representative shall have the test equipment, tools, and instruments necessary to accomplish this work.
4. Conduct boiler performance demonstration, demonstrate firing on both fuel sources.

B. Provide option for separate (additional) boiler operating training, if required.

3.03 START-UP

A. Leak Test: Perform hydrostatic test.

B. Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.

C. Test and adjust controls and safety's. Replace damaged and malfunctioning controls and equipment. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.

D. Set field-adjustable switches and circuit-breaker trip ranges as required.

3.04 OPERATING DEMONSTRATION

A. Demonstrate to Owner the operation of the system over entire range, using both primary fuel and back up fuels.

B. Demonstrate to Owner the operation and maintenance of total system as a unit - boiler, circulating pumps and condensate neutralization system. Demonstration is to be videotaped for owner records.

END OF SECTION 23 52 16

SECTION 23 75 13
PACKAGED DX OUTDOOR ROOFTOP UNIT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide rooftop units as shown on schedule and where located on drawings. Units to be manufactured by AAON. For pricing contact:

Hobbs Associates
Contact: David Miller
Email: dmiller@hobbassociates.com
2707 Landers Avenue
Nashville, TN 37211
Cell: 615-630-8860

1.02 QUALITY ASSURANCE

A. Unit cooling capacity shall be in accordance with and tested to AHRI Standard 210/240 or 360.

B. Units up to 20 tons capacity shall carry the AHRI compliance label.

C. Units shall be safety certified in accordance with UL Standard UL465 and ANSI Standard Z21.47.

D. Unit shall be safety certified by an accredited testing laboratory. Unit nameplate shall carry the label of the certification agency.

E. Unit shall be shipped completely assembled by the manufacturer including all standard items and accessory items.

F. Unit shall be 100 percent run tested by the manufacturer with a copy of the run test report shipped with the unit.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Unit Construction:
1. Unit shall be completely factory assembled, piped, wired and shipped in one piece.
2. Unit shall be specifically designed for outdoor application with a fully weatherproof cabinet.
3. Unit shall be designed for mounting on a roof curb.
4. Cabinet shall be constructed entirely of G90 galvanized steel with the exterior constructed of 18 gauge or heavier material.
5. The unit roof shall be cross broken and/or sloped to assure drainage.
6. Access to compressor(s), controls, filters, fan(s), heating section, and other items needing periodic checking or maintenance shall be through hinged access doors with a quarter turn latch (door fastening screws are not acceptable).
7. Air side service access doors shall be fully gasketed with rain break overhangs. Air side access doors shall have an internal metal liner to protect the door insulation.
8. Unit exterior shall be painted with 2-part polyurethane paint over a wash primer and a paint grip type galvanized steel.
9. The interior side of all exterior panels shall be entirely insulated with 1" thick, one pound density, neoprene coated, fiberglass insulation.
10. Unit shall be provided with interior insulation liners to provide double wall construction.
11. All openings through the base pan of the unit shall have upturned flanges of at least 1/2" in height around the opening through the base pan.
12. Unit shall have decals and tags to indicate unit lifting rigging, service areas, and caution areas.

13. Wiring diagrams shall be both "point-to-point" and "ladder" diagrams. Wiring diagrams shall also be laminated in plastic and permanently fixed to the control compartment door.
14. Wiring shall be color coded and marked with identification on each end.

B. Fans:
1. Fan(s) shall be entirely self-contained on a slide deck for service and removal from the cabinet.
2. All motors 1 horsepower and larger shall have belt-driven fans. Belt-driven fan(s) shall have backward inclined airfoil blades. Adjustable v-belt drive shall be provided with a minimum rating of 140 percent of the motor nameplate brake horsepower when the adjustable pulley is at the minimum RPM.
3. Fans, drives, and motors shall be dynamically balanced.
4. Provide high-efficiency fan motors and variable frequency drive. Mount VFD inside electrical section.

C. Condensing Section:
1. The condensing section shall be equipped with direct-drive, vertical discharge condenser fan(s).
2. The condenser coil shall be sloped at least 30 degrees from horizontal to protect the coil from damage. If condenser coil is not sloped for protection, louvered coil guards shall be provided.
3. Condenser coil(s) shall be copper tubes with aluminum fins mechanically bonded to the tubes.
4. Condenser coil(s) to be sized for a minimum of 10 degrees sub-cooling.

D. Evaporator Coil:
1. Evaporator coil shall be minimum 6 rows.
2. Evaporator coil(s) shall be copper tubes with aluminum fins mechanically bonded to the tubes.
3. Evaporator coil(s) shall have galvanized steel end casings.
4. Evaporator coil(s) shall have equalizing type vertical tube distributors with a top suction connection.
5. Evaporator coil(s) for multi-compressor units shall be circuited with one circuit and expansion valve per compressor.
6. Unit shall be provided with stainless steel drain pan.

E. Refrigeration System:
1. Compressor(s) shall be of the hermetic scroll type with internal thermal overload protection.
2. All units over 7-ton capacity shall be multiple stage and shall have a minimum of two stages of capacity control.
3. Compressor(s) shall be mounted in an isolated compartment to permit operation of the unit without affecting airflow when the compressor compartment is open.
4. Compressor(s) shall be isolated from the base pan and supply air to avoid any transmission of noise from the compressor into the building area.
5. System shall be equipped with thermostatic expansion valve type refrigerant flow control.
6. System shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.
7. Unit shall be equipped with Schrader type service fittings on both the high side and low pressure sides of the system.
8. Unit shall be equipped with refrigerant liquid line filter driers.
9. Unit shall be fully factory charged with refrigerant R-410.
10. 5-year compressor warranty shall be provided.
11. Unit shall be provided with 35 degree F low ambient control.
12. Unit shall be provided with hot gas bypass on each refrigerant circuit.
13. All circuits shall be equipped with liquid line sight glass.
14. Unit shall be provided with 5-minute anti-short cycle time delay relay for each compressor unless thermostat or microprocessor control provides this feature.

15. Multi-compressor unit shall be provided with 20-second time delay relay to prevent both compressors from starting simultaneously unless thermostat or microprocessor control provides this feature.

F. Outside Air:
   1. Outside air shall be a modulating dry bulb activated economizer with multi-stage integrated economizer and compressor operation controlled for maximum benefit. The economizer shall consist of a motor-operated outside air damper and return air damper constructed of extruded aluminum blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 cfm of leakage per square foot of damper area when subjected to 2" w.g. air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outside air damper during periods of unit shutdown or power failure.
   2. Modulating damper power exhaust with all controls provided as part of the economizer.
   3. Provide controls to maintain constant volume of minimum outside air regardless of supply air volume.

G. Filters:
   1. Unit shall be provided with 2" thick, 65 percent high-efficiency pleated, throwaway supply air filters.
   2. Provide clogged filter switch.
   3. Provide filter gauge.

H. Electrical:
   1. All disconnects to be by Division 26, coordinate with electrical contractor for unti connections.

I. Controls:
   1. Provide unit mounted variable air volume programmable microprocessor controller to control discharge air temperature and supply duct static pressure. Provide with discharge air temperature sensor, return air temperature sensor, outside air temperature sensor, zone temperature sensor and supply air duct static probe.
   2. Provide BACNET gateway for DDC controller integration into Energy Management System. Refer to control drawings for all points to be mapped to front end controls systems.

J. Roof Curb: Roof curbs shall be constructed of galvanized steel. Roof curbs shall be minimum 14" high above the roof. Curbs shall be fully gasketed between the curb top and unit bottom. Curbs shall provide full perimeter support, cross structure support and air and water tight seal for the unit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install unit in accordance with manufacturers' published installation instructions.

B. Manufacturers' representative service technician to provide start-up supervision for each unit.

C. Duct connections to units to allow for straight and smooth airflow. Connections to unit to be made with flexible duct connections. Sleeve duct penetrations through roof. Provide three 2" layers of neoprene coated fiberglass duct liner to completely fill inside of roof curb.

D. Drain lines to be trapped and run full size from drain pan connection to discharge into nearest roof drain as indicated on plans.

END OF SECTION 23 75 13

SECTION 23 81 29

VRF VARIABLE REFRIGERANT FLOW SYSTEM

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Simultaneous Heating and Cooling Heat Pump: The VRF (Variable Refrigerant Flow) system shall be a simultaneous cooling and heating heat pump. The simultaneous heating and cooling VRF system shall consist of an outdoor unit, high efficiency heat recovery units designed for minimum piping and maximum design flexibility, indoor units, and controls by the equipment manufacturer. Every indoor unit shall be independently capable of operating in either heating or cooling mode regardless of the mode of other indoor units. The system shall be capable of changing mode of individual indoor units (cooling to heating or heating to cooling) within a maximum time of 5 minutes to ensure indoor temperature can be properly maintained.

1.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Basis of Design: Mitsubishi.
   2. Daikin, Mitsubishi, LG, or Sanyo other manufacturers may be approved as part of the alternate/substitution process.

B. All manufacturers other than the basis of design are required to coordinate any changes from the basis of design with all associated trades. Any additional costs associated with the alternate equipment including but not limited to electrical wiring costs, piping costs, and engineering design costs shall be covered by the equipment manufacturer. No additional costs shall be incurred by the owner or designer.

1.03 QUALITY ASSURANCE

A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

E. The VRF system shall be installed by a licensed mechanical contractor trained by the VRF equipment manufacturer or certified manufacturer's agent.

F. Commissioning shall be performed by the manufacturer or certified manufacturer's agent.

1.04 STORAGE AND HANDLING

A. All VRF equipment shall be stored protected from weather, extreme temperature, etc. as suggested by the manufacturer. All VRF equipment shall be moved, lifted, etc. as suggested by the manufacturer.

1.05 WARRANTY

A. VRF equipment shall be warranted by the manufacturer's limited warranty for a period of one year from date of substantial completion. Manufacturers shall provide an extended warranty including 1 additional year parts and 5 additional year's compressor.

PART 2 PRODUCTS

2.01 SIMULTANEOUS HEATING AND COOLING OUTDOOR UNIT

A. General: The outdoor unit shall be used specifically with manufacturer approved piping components and air handling units. The outdoor units shall be equipped with multiple circuit boards that interface to the VRF controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

1. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. All refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) or heat recovery box shall be insulated.
4. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
7. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
8. The outdoor unit shall be capable of operating in heating mode down to -4 degrees Fahrenheit ambient temperature or cooling mode down to 23 degrees Fahrenheit ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
9. The outdoor unit shall be capable of operating in cooling mode down to -10°F with optional manufacturer supplied low ambient kit.
10. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
11. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
12. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
13. The outdoor unit shall not cease operation in any mode based solely on outdoor ambient temperature.
14. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
15. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.
16. Unit Cabinet: The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Unit cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models.

B. Fan:
1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have vertical discharge airflow.

C. Refrigerant
1. R410A refrigerant shall be used for all systems.

2. Contractor shall provide sufficient refrigerant to properly charge system.

D. Coil:
   1. Each outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
   2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
   3. The coil shall be protected with an integral metal guard.
   4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
   5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

E. Compressor:
   1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors shall not be allowed.
   2. A crankcase heater(s) shall be factory mounted on the compressor(s).
   3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
   4. The compressor will be equipped with an internal thermal overload.
   5. The compressor shall be mounted to avoid the transmission of vibration.
   6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

F. Electrical:
   1. The outdoor unit electrical power shall be 208/230 or 460 volts, 3-phase, 60 hertz.
   2. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz) or 414-506V (460V/60Hz).
   3. The outdoor unit shall be controlled by integral microprocessors.
   4. Provide all manufacturer required control wiring between each unit outdoor unit and system controller. Control wiring shall be 2 conductor twisted pair shielded cable.

G. Multiple Condensing unit Sections
   1. The outdoor unit shall be completely factory assembled, piped and wired. Dual and triple frame outdoor units will be field piped with factory designed and supplied Y-branch kits to manifold them together into a single refrigerant circuit.
   2. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimal spacing.
   3. Multiple modules shall have duty cycling function to ensure sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours of runtime.

2.02 Branch CIRCUIT (BC) controllers / HEAT RECOVERY Boxes / SOLENOID VALVE KITS

A. General: Unit manufacturer shall provide branch circuit controller / heat recovery box / or solenoid valve kit as required by system to allow for simultaneous heating or cooling operation of any indoor fan coil unit.

B. The BC (Branch Circuit) Controllers shall be specifically used with manufacturer provided fan coil units. These units shall be equipped with a circuit board that interfaces to the VRF controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.
   1. BC Unit Cabinet:
      a. The casing shall be fabricated of galvanized steel.
      b. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.

c. The unit shall house two tube-in-tube heat exchangers.
2. Refrigerant: R410A refrigerant shall be required.
3. Refrigerant valves:
   a. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
   b. Each branch shall have multiple two-position valves to control refrigerant flow.
   c. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
   d. Linear electronic expansion valves shall be used to control the variable refrigerant flow.
4. See drawings for required quantity of zones for each system. All system alternate manufacturers shall provide identical quantity of cooling and heating zones per BC controller as shown on drawings. If alternate manufacturer unable to provide identical quantity then manufacturer shall provide additional BC controllers, wiring, and piping to provide same number of zones shown on the drawings at no additional cost.
5. Integral Drain Pan: An integral condensate pan and drain shall be provided.
6. Electrical:
   a. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
   b. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
7. The BC Controller shall be controlled by integral microprocessors.
8. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.03 WALL-MOUNTED INDOOR UNIT

A. General: Unit shall be a wall-mounted indoor unit section and shall have a modulating linear expansion device and a flat front. Unit shall support individual control using manufacturer provided DDC controller.

B. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
   1. All casings, regardless of model size, shall have the same white finish
   2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
   3. There shall be a separate back plate which secures the unit firmly to the wall.

D. Fan:
   1. The indoor fan shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
   3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
   4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

E. Filter: Return air shall be filtered by means of an easily removable, washable filter.

F. Coil:
   1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   2. The tubing shall have inner grooves for high efficiency heat exchange.

3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. Both refrigerant lines to indoor unit shall be insulated.

G. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)

H. Controls:
1. This unit shall use controls provided by manufacturer to perform functions necessary to operate the system.
2. The unit shall be able to control external backup heat.
3. The unit shall have a factory built in receiver for wireless remote control.

I. Condensate Pump: Unit manufacturer shall provide condensate pump to lift condensate a minimum of 80". Condensate pump shall be integral to unit or wired through low voltage circuit of unit. Contractor shall provide all wiring and installation for pumps not integral to unit.

2.04 HIGH STATIC CEILING-CONCEALED DUCTED INDOOR UNIT

A. General: High Static unit shall be a ceiling concealed ducted indoor fan coil that mounts above the ceiling with a fixed rear return and a horizontal discharge supply, and shall have a modulating linear expansion device. Unit shall feature external static pressure settings up 0.80 in. WG. Units shall have the ability to control supplemental heat via connector CN24 and a 12 VDC output.

B. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
1. The cabinet shall be ceiling-concealed, ducted.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:
1. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter: Provide optional rear return filter box with long-life filter indoor units. Provide return filter grille where shown on drawings. Provide clean set of filters and one spare set of filters at substantial completion.

F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate shall be gravity drained from the fan coil.
7. Both refrigerant lines to the indoor unit shall be insulated.

G. Condensate Pump: Unit manufacture shall provide condensate lift mechanism to lift condensate a minimum of 21".

H. Electrical:
   1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz. or 208/230 volts, 3-phase, 60 hertz as scheduled on drawings.
   2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

I. Controls: This unit shall use controls provided unit manufacturer to perform functions necessary to operate the system.

2.05 CONTROLS

A. General:
   1. The unit shall have controls provided with the unit by the manufacturer to perform input functions necessary to operate the system.
   2. Computerized PID control shall be used to maintain room temperature within 1 F of setpoint.
   3. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature.
   4. The fan coil circuit board shall be wired to enable auxiliary heating when coil thermistor temperature drops below 104 degrees F in heating mode.

2.06 CONTROLLERS

A. Physical Characteristics: General: control system devices shall be a neutral color plastic material with a Liquid Crystal Display (LCD).

B. Electrical Characteristics:
   1. General: From each circuit board to the controls, the electrical voltage shall be low voltage.
   2. Wiring: Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit then to the outdoor unit. Control wiring shall run from the indoor unit terminal block to the specific controller for that unit.
   3. Wiring Size: The wire shall be a shielded, size AWG18-2.

2.07 INDIVIDUAL ZONE CONTROLLER – WIRED REMOTE CONTROLLER

A. The wired remote controller shall be able to control 1 group (maximum of 16 fan coil units) and shall be able to function as follows:
   1. The controller shall have a self diagnosis function that constantly monitors the system for malfunctions (total of 80 components).
   2. The controller shall be able to immediately display fault location and condition.
   3. An LCD digital display shall allow the temperature to be set in 1 degree Fahrenheit units.
   4. The controller shall be equipped with a thermostat sensor in the remote controller making possible more comfortable room temperature control.

B. The wired remote controller shall have the following features:
   1. Operation: Start/Stop, Operation Mode, Temperature Setting, 60 degrees Fahrenheit - 90 degrees Fahrenheit, Set Point Range, Fan Speed, Airflow Direction.
   2. Monitoring: Status, malfunction flashing, malfunction content, filter sign, operation mode, temperature setting, permit/prohibit selection, fan speed, airflow direction.
   3. Scheduling: ON/OFF Timer
   4. Control Management: Field Setting Mode, Group Setting, Auto Re-start
   5. The controller shall also be able to switch an external dry contact via a 12 volt DC relay (field supplied).

2.08 SYSTEM REMOTE CONTROLLER

A. The controller shall control up to 64 units in 4 zones and shall be able to be used in conjunction with all room controller types. Provide as many system controllers as required to control the system. Collective and individual group commands are available with permit/prohibit individual remote controller function.. The system controller shall use the following connections for power and remote monitoring:
   1. L1: Power supply (60 Hz, 208-230 VAC)

2. C1: Inter-unit control wiring (Low voltage)
3. C3: Auxiliary
4. C4: Ground for inter-unit control wiring
5. A1: Input for turning ON air conditioners concurrently
6. A2: Input for turning OFF air conditioners concurrently
7. A3: Common input for turning air conditioners ON or OFF
8. B1: On operation state indicator output
9. B2: Alarm indicator output
10. B3: Common indicator output

2.09 WEB ENABLED INTELLIGENT CONTROLLER

A. This controller shall be wall mounted and hard wired, either directly to the VRF control system or via RS485 gateway. It will be manufactured in ABS plastic with an LCD display and will be the manufacturer's standard color. The controller will be capable of individually controlling the following functions on 256 indoor fan coil units:
   1. On/off.
   2. Operating mode.
   3. Set point.
   4. Fan speed.
   5. Louver position.
   6. Timer settings.
   7. Test run.

B. The controller shall also be capable of displaying the following information individually for 256 indoor fan coil units:
   1. On/off.
   2. Operating mode.
   3. Set point.
   4. Fan speed.
   5. Louver position.
   6. Timer settings.
   7. Test run.
   8. Fault diagnosis.

C. Each Intelligent controller unit can be accessed either locally or remotely via standard Internet Explorer IE6 or IE7 software. The Intelligent controller will be able to indicate system alarms via volt free contacts as well as providing control points for other D0 devices. Additionally, the intelligent controller shall be able to monitor individual tenant's usage of heating and cooling demands, report alarm and conditions to nominated email address, and enable remote alteration of systems set points to registered users.

2.10 GATEWAY:

A. Provide BACnet or LONworks Gateway to fully interface system function into building DDC control system. Manufacturer shall coordinate gateway requirements with control contractor prior to bid.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions. All refrigerant piping shall be ACR hard drawn copper with brazed joints. Flared fittings will not be acceptable. Installation must be per the manufacturer's piping tree diagram for the project. Before any pipe or length changes are made, proposed changes must be forwarded to the manufacturer's engineering representative and manufacturer's new piping tree diagram re-issued for installation, because any change made requires the review of the entire tree and verification that the change did not

impact the size of piping segments in other parts of the system. No oil traps, solenoid valves, sight glasses, filter dryers, or any other unauthorized refrigerant specialties are to be used.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit. Engage manufacturer or factory-authorized service representative to perform startup service. Manufacturer shall provide on-site startup and commissioning assistance through job completion. Complete installation and startup checks according to manufacturer's written instructions.

D. Unit manufacturer to provide services of factory trained personnel to verify operation of system installation and control hardware.

E. Provide all labor, refrigerant, and material required for a complete installation. Work to be performed shall be in accord with local codes, regulations, and OSHA standards.

F. Install all piping, fittings, and insulation to meet manufacturer's requirements. Install units level and plumb. Evaporator-fan components shall be installed using manufacturer's standard mounting devices securely fastened to building structure. Install and connect refrigerant tubing and fittings.

G. All lines from outdoor unit to BC controller / heat recovery box and all lines from BC controller to indoor fan coil unit shall be insulated. Refer to Section 23 07 10 Insulation for specific requirements.

H. Installer shall supply isolation ball valves for zoned refrigerant isolation. Installer shall supply Isolation ball valves with Schrader connection for isolating refrigerant charge and evacuation at each connected air handling unit and condensing unit. Isolation ball valves, with Schrader connection, are required for instances of air handling unit isolation for troubleshooting, repair or replacement without affecting the remainder of the system. Isolation ball valves with Schrader connection are also required at condensing unit connection to isolate unit for troubleshooting, repair or replacement and as required to provide partial capacity Heating/Cooling in the instance of a failure of one of the multiple outdoor unit (condensing unit) compressors.

I. Contractor shall install and pressure test piping system in accordance with manufactures instructions. Provide written documentation of all pressure tests. Perform the leak/pressure check at 150 psig for (5) five minutes (standing pressure check). Perform the leak/pressure check at 300 PSI for (15) fifteen minutes (second standing pressure check). Perform the leak/pressure check at 550 PSI fir (24) twenty-four hours to make sur ethe system is leak free.

3.02 OWNER TRAINING

A. The manufacturer that provides the VRV system for this project will include in his price the cost to have a "Factory Service Representative" provide onsite training for the VRV system to include, but not limited to:
   1. System rebooting.
   2. Identifying error codes.
   3. Resetting filter indicators.
   4. Basis system operation.
   5. Explanation of service indicators.
   6. How the manufacturer can support with system issues.

B. This training will be a minimum of:
   1. 8 hours during equipment startup.
   2. 8 hours at Substantial Completion.
   3. 8 hours and the end of the Manufacturer Warranty period.

C. Training shall be by a representative from the Factory. Training by local sales representative is not acceptable.

D. Prior to beginning of training, Manufacturer shall provide written material and outline of training for approval by Owner, Cx agent, and design team.

E. Contractor shall schedule training in advance with Owner.

END OF SECTION 23 81 29

SECTION 23 82 13
HEATING COILS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hot Water Coils.

1.02 CERTIFICATION

A. Certify coil capacities, pressure drops, and selection procedures in accordance with AHRI Standard 410.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Coils shall be the product of manufacturer regularly engaged in production of coils who issues complete catalog data on such products.

2.02 CONSTRUCTION

A. Tubes: Copper.

B. Fins: Aluminum or copper.

C. Headers: Heavy gauge cast iron or steel.

D. Casing: Minimum 16-gauge galvanized steel.

E. Testing: Proof test and leak test each coil at minimum 300 psig and 200 psig air pressure respectively with coil submerged in water.

2.03 HOT WATER COILS

A. Design for minimum 200 psig at 220 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount coil in accordance with SMACNA standards including a maximum transition angle of 30 degrees on the entering air side of coil and 45 degrees on leaving air side. Transitions on both entering and leaving side to be 20 degrees if space permits. Provide air-tight seal between coil and duct or unit casing.

B. Provide access door on entering air side of coil for cleaning and inspection purposes.

C. See drawings for required piping connections to hot water coils.

D. Externally insulate coil casing including return bends with 1" thick, blanket-type fiberglass insulation to prevent condensation.

E. Hot water reheat coils required for variable volume boxes or fan-powered boxes to be furnished factory mounted to boxes by terminal box manufacturer.

END OF SECTION 23 82 13

SECTION 23 82 39
UNIT HEATERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Unit heaters noted as horizontal projection type to be Trane Model S or approved equal.

B. Unit heaters noted as vertical projection type to be Trane Model P or approved equal.

C. Unit heaters noted as cabinet type to be Trane Force-Flo or approved equal.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Coils to be copper tube with aluminum fins for hot water service.

B. Cabinet unit heaters to be horizontal ceiling-suspended exposed style,[style as scheduled on the drawings].

C. Design coils for minimum of 150 psig working pressure. Fan motors to be direct drive, permanent split capacitor type complete with built-in thermal overload protection. Fans to be propeller type for horizontal and vertical projection unit heaters and centrifugal type for cabinet unit heaters.

D. Provide 4-way adjustable discharge louvers for horizontal projection unit heaters.

E. Provide adjustable louver cone discharge diffuser for vertical projection heaters.

F. Provide wall mounted line voltage thermostat with locking guard for each horizontal and vertical projection unit heater.

G. Provide unit mounted thermostat and high/low/off fan speed switch for unit heaters.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install unit heaters at locations shown on drawings in accordance with manufacturers' published installation instructions.

B. Unit heaters to be piped per diagrams on drawings.

C. Coordinate mounting height, throw, and thermostat locations with job conditions.

END OF SECTION 23 82 39

SECTION 23 82 40
ELECTRIC HEATERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide UL listed electric heaters of the type and capacities specified on drawings.

B. Heaters to have a five-year warranty.

C. Heaters to be by Markel, Berko, Q-Mark, or approved equal.

PART 2 PRODUCTS

2.01 UNIT HEATERS

A. Heaters to be Markel Series 5100 heavy-duty industrial service unit heaters for horizontal or vertical mounting.

B. Enclosure to be heavy gauge steel with baked enamel finish.

C. Heaters to be equipped with individually adjustable outlet louvers.

D. Elements to be high mass, all steel finned tubular type.

E. Motor to be equipped with permanently lubricated bearings and internal overload protection.

F. Fan to be propeller type with fan speed not exceeding 1550 rpm.

G. Heaters to be equipped with manual reset thermal cutouts to disconnect both heating elements and fan.

H. Heaters to be designed for single point power connection, with elements, motor, and control circuits subdivided with factory installed and wired fuses.

I. Thermostats to be low-voltage, wall mounted as scheduled on drawings, heavy-duty, tamperproof type. Manufacturer to furnish necessary contactors, relays, transformers, etc., for complete installation.

J. Provide factory engineered bracket for attachment to wall or ceiling.

2.02 WALL-MOUNTED HEATERS

A. Heaters to be Markel Series 3420 commercial service, wall-mounted, forced-air heaters.

B. Enclosure to be minimum 16 ga. galvanized steel with baked enamel finish.

C. Elements to be high mass, all steel finned tubular type.

D. Motor to be equipped with permanently lubricated bearings and internal overload protection.

E. Fan to be propeller type with fan speed not exceeding 1550 rpm.

F. Heaters to be equipped with manual reset thermal cutouts to disconnect both heating elements and motor.

G. Heaters to be designed for single point power connection, with elements, motor, and control circuits subdivided with factory installed and wired fuses.

H. Thermostats to be low-voltage, wall mounted as scheduled on drawings, heavy-duty, tamperproof type. Manufacturer to furnish necessary contactors, relays, transformers, etc., for complete installation.

I. See drawings for surface or recessed mounting requirements.

J. Provide plaster trim for heaters installed in "hard" ceilings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Heaters to be installed in accordance with manufacturers' published installation instructions.

END OF SECTION 23 82 40

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Secondary power wiring and distribution system.

B. Emergency power generation system.

C. Lightning protection system.

D. Fire alarm and smoke detection system.

E. Lighting control equipment.

F. Electrical control systems and interlock wiring.

G. Medical Imaging equipment rough-in.

H. Medical gas alarm wiring.

1.02 RELATED WORK

A. Foundations and pads required for equipment furnished under this division of the specifications.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

C. Electrical control systems and interlock wiring as required by mechanical drawings, specifications or manufacturer's schematics.

D. Flashing of conduits into roofing and outside walls.

E. Heating, ventilating, and air conditioning equipment.

F. Plumbing equipment.

G. Fuel oil storage tank and fuel transfer pumping system.

H. Laboratory equipment.

I. Nurses call system equipment.

J. Code Blue system equipment.

K. Television system equipment.

L. Intercommunication and sound paging system equipment.

M. Telephone system equipment.

N. Patient monitoring equipment.

O. Medical Imaging equipment.

1.03 QUALITY ASSURANCE

A. Comply with applicable local, state and federal codes.

B. Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.

C. Employ only qualified journeymen for this work. Employ a competent qualified electrician to supervise the work.

1.04 STANDARDS

A. Perform work specified in Division 26 in accordance with standards listed below including amendments or revisions. When these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Designer.

B. National Fire Codes (NFPA) including, but not limited to following:
   1. NFPA-70 - National Electrical Code. 2020 Edition.
   2. NFPA-72 - National Fire Alarm Code. 2019 Edition.
   3. NFPA-99 - Health Care Facilities. 2021 Edition.

4. NFPA-101 - Life Safety Code. 2021 Edition.
5. NFPA-110 - Power Systems, Emergency and Standby 2019 Edition.
6. NFPA-780 - Lightning Protection Code. 2020 Edition.

C. Applicable Codes:
1. Florida Building Code 2023 Edition.
2. Local Codes and Amendments.
3. The Guidelines for Design and Construction of Health Care Facilities 2022 Edition.

D. Should any work be construed as being contrary to or not conforming to aforementioned codes, such alleged confliction to be brought to attention of Architect in writing ten (10) days prior to bid date for review so that such point in question may be resolved. All work to be installed in strict conformity with applicable codes without additional cost to Owner.

E. Contractor to submit and/or file with proper authorities all necessary specifications and drawings as required by governing authorities.

1.05 DESIGN REQUIREMENTS

A. Complete Short Circuit, Protective Device Coordination, and Arc Flash Study to meet requirements of NFPA 70 and NFPA 70E. Refer to Section 26 05 73 – Power System Analysis for additional requirements.

1.06 SUBMITTALS

A. Within fifteen (15) days after contract has been awarded, Contractor to submit to Designer for review a complete list of materials, equipment, and accessories proposed for use, listing the item and manufacturer's name only.

B. Based upon aforementioned approved listing, Contractor to submit an electronic copy of COMPLETE BROCHURES AND SHOP DRAWINGS OF ALL MATERIALS, FIXTURES, AND EQUIPMENT that he proposes to use giving the names of manufacturers, trade name and specific catalog numbers.

C. Brochures to be submitted in time to allow fifteen (15) days from date of receipt in Engineer's office before final approval or disapproval is required to meet construction schedule. Submittals to bear Contractor's stamp of approval evidencing he has examined and checked same and information contained therein is in accordance with contract requirements, and any deviations to be clearly marked. Approval of shop drawings not to be construed as permitting departure from the contractual documents.

D. Above-mentioned brochures to be submitted and approved before any materials are ordered.

E. In the event that within time stated above contractor fails to submit complete list of materials, equipment and accessories in proper form, the Designer reserves the right to select a full line of materials, fixtures, and equipment, which shall be binding upon Contractor for these materials, fixtures, and equipment as the case may be and which shall be used in his work.

F. Brochures: Submit complete descriptions, illustrations, specification data, etc. of all materials, fittings, devices, fixtures, special systems, etc., including the following:
1. Panelboards.
2. Wiring devices and plates.
3. Motor starters and contactors.
4. Disconnect switches.
5. Enclosed circuit breakers.
6. Transformers.
7. Lighting, including lamps.
8. Short-circuit study, protective device coordination study, arc flash study calculations and printout of arc flash labels.

G. Proposed items to be clearly indicated when other items are shown on same sheet. When proposing items other than those specified, brochures to contain both specified item sheets and proposed item sheets for ease of comparison. On request from Designer, samples shall be

submitted and/or set up, as directed, for inspection and approval. Samples will be returned to Contractor.

H. Shop Drawings: Submit specific shop drawings for major materials including the following:
   1. Motor starters and contactors including custom wiring diagrams.
   2. Fire alarms and smoke detection systems, including point-to-point wiring diagrams.
   3. Emergency power generator system including automatic transfer switches.
   4. Lightning protection system.
   5. Dimensional layout of all electrical rooms, drawn to scale, with equipment location shown therein. Clearances to be in accordance with NEC and local codes.
   6. Electrical Coordination Study submitted by equipment manufacturer to include time-current curves and all related breaker data information. Coordination Study must be approved by the engineer prior to order of equipment.

1.07 OPERATING AND MAINTENANCE MANUALS

A. Prior to final acceptance of the project, furnish to Owner complete bound sets and electronic copies of operation and maintenance manuals of instructions for operation and maintenance of all pieces of equipment and systems provided under this division of specifications.

B. Manuals to also include all submittal data on all materials and equipment. Clearly indicate items provided on this project. A list giving name and address of nearest supply house carrying spare parts and name of Installation Contractor to be given to Owner.

C. Verbally instruct Owner's representatives. Contractor to obtain letter signed by the owner's representative indicating that the in-service training has been completed.

D. Three sets of the following data are required:
   1. Operating and maintenance instructions.
   2. Spare parts lists.
   3. Copies of approved submittal data.

E. Short Circuit, Protective Device Coordination and Arc Flash Study.

F. Arc Flash Hazard/Risk Category Chart, from NFPA 70E, identifying required protective clothing and Personal Protective Equipment (PPE).

G. Infrared scan reports.

1.08 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturers' original unopened packaging. Where this is not practical, cover items with protective materials, to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage.

C. All damaged painted surfaces of equipment to be touched up to match original paint.

1.09 RECORD DRAWINGS

A. Keep a set of prints at the job site exclusively for recording deviations from the drawings.

B. Record locations and depths of buried and concealed conduits from fixed easily identifiable objects, such as building walls. Where conduits are concealed in walls, indicate distances off of building corners or other building features not likely to be disturbed by future alterations.

C. Mark deviations in colored pencils so that work of various systems can be easily identified.

D. When work is completed, record all deviations on clean copies of drawings.

E. Submit three copies of completed "record drawings" to Owner's Representative for distribution.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications to be American made unless approved otherwise by the Owner and to be new and have UL listing, or listing by other recognized testing laboratory when such listings are available.

B. Contractors shall contact Graybar-Nashville to obtain pricing for all electrical products included in the specifications sections listed below, per HCA's purchasing agreement:
   1. Jess Hoover, Charlie Shannon
      Graybar-Nashville
      825 8th Avenue South
      Nashville, TN 37217
      HCA@graybar.com
      239-494-2088
      615-743-3226
      HPG Contract No. 5892
      a. 26 0519 Low-Voltage Electrical Power Conductors and Cables-600 Volt and Below
      b. 26 0526 Grounding and Bonding for Electrical Systems
      c. 26 0529 Hangers and Supports for Electrical Systems
      d. 26 0533 Raceways and Conduit Systems
      e. 26 0913 Energy and Resource Metering
      f. 26 2200 Low-Voltage Transformers
      g. 26 2416 Panelboards
      h. 26 2726 Wiring Devices
      i. 26 2816 Enclosed Switches and Circuit Breakers
      j. 26 2913 Enclosed Controllers
      k. 26 4313 Transient Voltage Surge Suppression
      l. 26 5100 Interior Lighting
      m. 26 5600 Exterior Lighting

PART 3 EXECUTION

3.01 COORDINATION

A. Intent:
   1. These sections of specifications and drawings form a complete set of documents for the electrical work of this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
   2. The intent of these specifications and drawings is to form a guide for a complete electrical installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner.
   3. Electrical layouts indicated on drawings are diagrammatical only. Exact location of outlets to be governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing-in of such without additional cost to Owner.

B. Deviations:
   1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
   2. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

C. Insofar as it is possible to determine in advance, leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required to be done is at this contractor's expense.

D. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.

E. Designer to be mediating authority in all design related deviations and disputes arising on the project.

F. Coordinate to assure that proper points of service transformer locations, voltage characteristics and capacity of service are in accordance with contract drawings.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of this contract.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Provide trenching, excavation, and backfilling necessary for performance of electrical work.

B. Trenching and excavation to be unclassified. No extra will be paid in event that rock is encountered.

C. Backfilling to be carefully done using only clean earth thoroughly tamped and compacted below and above embedded items.

3.04 FOUNDATIONS AND PADS

A. Provide foundations and pads required for equipment provided under this division of specifications. Coordinate proper size and location of foundations, pads, anchor bolts, and other items to be built into structure.

B. Concrete to be in accordance with concrete division of these specifications.

3.05 TESTS

A. On completion of work, installation to be entirely free from grounds, short circuits, and open circuits. Perform a thorough operational test in presence of Owner or his representative. Balance all circuits so that feeders to panels be not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. On completion of work, perform equipotential ground test in all patient care areas as described in NFPA 99. Contractor to record highest mV and ohm readings observed for each room on a chart. Furnish all labor, materials and instruments for above tests.

C. Furnish Owner, as a part of closing file, a copy of such tests including identification of each circuit and readings recorded, also the main service ground test as described in Section 26 05 26 of these specifications. Test information to be furnished to Owner includes ampere readings of all panels and major circuit breakers, insulation resistance reading of motors and transformers.

D. Prior to final observation and acceptance, test, leave in satisfactory operating condition all electrical systems and equipment including but not limited to the following:
   1. Electrical distribution system.
   2. Ground fault protection system.
   3. Emergency power generation system.
   4. Transformers.
   5. Fire alarm and smoke detection system.
   6. Electric motors for all equipment.
   7. Electric safety devices.
   8. Any alarm system, including narcotics, generator, door security, etc.
   9. CCTV system.

3.06 INSPECTION FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.07 IDENTIFICATION OF EQUIPMENT

A. Properly identify all starters, contactors, relays, safety switches and panels with permanently attached black (normal power), yellow (life safety power), orange (critical power), green (equipment power), and purple (essential distribution) phenolic plates with 1/4" engraved lettering

on the face of each attached, with two sheet metal screws. Starters and relays connected by the electrical tradesman to be identified by him whether furnished by him or others.

3.08 TEMPORARY LIGHTS AND POWER

A. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary work to be installed in a neat and safe manner in accordance with the National Electrical Code, Article 590, and as required by OSHA or applicable local safety codes.

B. Provide service and panelboards required for above lighting and power outlets.

C. Power consumption will be paid for by the Contractor.

D. Check with the Contractor prior to installation to determine whether single phase or three phase service is desired.

3.09 OBSERVATIONS

A. When field observation services are a part of the project scope, Engineer's office will provide periodic observation of the progress of work specified herein. Purpose of the observation is to ensure compliance of Contractor's work with specifications and drawings. Engineer's office will also observe tests required of Contractor as called for in other sections of specifications.

B. Specifications and drawings represent work to be done in view of total project requirements. Final location of conduits, fixtures, panels, switchboards, etc., to eliminate possible conflict with other trades is responsibility of Contractor. Contractor to provide all supervision required for his personnel to ensure that installation is made in accordance with specifications and drawings and all safety rules and regulations are observed. In event of conflicts of work on project with other trades, Contractor to make every reasonable effort to resolve conflict through meetings and discussions with other parties involved, by preparation of drawings or other appropriate action. Only after this has been done shall the Engineer's assistance be requested.

3.10 WARRANTY-GUARANTEE

A. Designer reserves right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.

B. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials for a period of one year from date of final acceptance, whichever is earliest. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION 26 05 00

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES 600 VOLT AND BELOW

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a complete system of conductors for lighting, power, and controls throughout building.

B. Refer to drawings for sizes of conductors.

C. Within 60 days of substantial completion, perform an infrared scan of each termination and splice in conductors #3 AWG and larger. Infrared scan reports shall be provided to HCA FacilitiGroup Engineer.

PART 2 PRODUCTS

2.01 CONDUCTORS - POWER AND LIGHTING

A. Provide 98% conductivity copper conductors with 600-volt insulation.

B. Interior conductors shall be Type THHN-2/THWN-2 insulation.

C. 600-volt insulation for conductors installed in underground raceways shall have XLP (cross-linked polyethylene) insulation, Type XHHW-2.

D. Stranded cables are acceptable for conductors #14 AWG and larger. Solid cables shall be utilized for conductors smaller than #14 AWG.

E. For all control and motor circuits, and all conductors No. 8 AWG and larger, provide stranded type.

F. Conductors shall be manufactured by Southwire, General Cable or approved substitute.

G. Provide white or gray colored neutral conductors; provide black or color coded phase conductors.

H. Provide No. 14 AWG stranded type THHN fixture conductors, for conductors entering fixtures and in stems of pendant fixtures.

I. Provide type THHN stranded conductors, 90° Degrees C for conductors running through continuous rows of fixtures.

2.02 ALUMINUM ALLOY CONDUCTORS

A. Normal power service and feeder wiring 200 amps and over shall be aluminum alloy unless prohibited elsewhere in this specification. Contractor may substitute copper at no additional cost.

B. Aluminum alloy conductors shall be compact strand, Southwire or Stabiloy Type XHHW-2 (90° Degrees C). Conductors shall be AA-8000 series.

C. Aluminum alloy conductors shall be in compliance to NEMA WC 70 and per ASTM B-800, B-801.

D. Connectors shall be dual rated (AL7CU or AL9CU) and listed by UL 486B for use with aluminum alloy and copper conductors and sized to accept aluminum alloy conductors of the ampacity specified.

E. Using a suitable stripping tool, to avoid damage to the conductors, remove insulation from the required length of the conductor.

F. Wire brush the conductor and apply a listed joint compound.

G. Tighten the connection per the connector manufacturer’s recommendation.

H. Wipe off any excess joint compound.

I. All feeders connected directly to motors, including but not limited to chillers and fire pumps shall be copper.

J. All essential power system (life safety, critical, equipment) circuits shall be copper.

2.03 HCF (METAL CLAD CABLE – HEALTH CARE FACILITIES)

A. Multi-conductor Cables: Comply with NEMA WC 70; Exterior sheath color coded to differentiate cable voltages and quantity of phase conductors. Heath Care Facilities armored cable, Type HCF; Comply with UL 4 and UL 1479; with green grounding conductor(s) in addition to Armor/Bond Wire ground combination; with exterior sheath colored green or appropriately marked and identified.

B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway and Type HCF in limited locations where indicated. Type HCF is acceptable for the following applications.
   1. Feeders for lighting fixture whips and for branch circuits concealed in walls and partitions only. Locate junction box and convert to single conductors in rigid raceway within the same room as where the cable enters/exits the wall.
   2. Use only for single-circuit cable (i.e. two wire plus ground). For devices in the same wall connected to different circuits, install separate single circuit cable for each circuit.
   3. The HCF length for power circuits shall be limited to 30′ from the junction box to the wiring device located in the wall. If the circuit continues outside the wall, the circuit must immediately transition to conduit.
   4. The HCF length for lighting circuits shall be limited to 30′ from the junction box to the first fixture and from that point only those fixtures above the enclosed space/room shall be served by this HCF circuit.

C. Type HCF is not acceptable for the following applications; instead provide single conductors in rigid raceway.
   1. Homeruns to Panelboard.
   2. Branch circuits serving Essential Electrical System (Emergency & Standby) loads; including Life Safety branch, Critical branch and equipment emergency system.
   3. Branch circuits serving HVAC, elevator/escalator, medical and kitchen equipment loads.
   4. Within mechanical, electrical or telecommunication equipment rooms.
   5. Exposed Branch Circuits within areas that do not have a ceiling (i.e. open to structure).
   6. Wet locations.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wiring in a homerun conduit shall be limited to two, 3-phase homeruns.

B. Each circuit shall have a separate neutral conductor.

C. Install pull boxes in circuits or feeders over 100' long.

D. All conductors shall be continuous from origin to panel or equipment termination without splices where possible. Where splices and taps are necessary or are required for branch circuits, they shall be made in splice boxes with suitable connectors. Feeder conductors shall not be spliced.

E. Make all splices or connections only at outlet, pull or junction boxes.

F. Use pulling compound to pull conductors.

G. Install instrument and data connection conductor in separate raceways from all other conductors. Separate control wiring from power wiring in separate raceways. Separation distances shall be as specified by control system manufacturer or as listed in IEEE Standard 518, whichever is greater.

H. Bend radius on conductors shall be less than the limitations listed by the cable manufacturer.

I. Deliver all conductors to job site new and in original wrapping, package or reel.

J. All conductors and connections shall test free of grounds, shorts, and opens.

K. For 20-amp, 120-volt branch circuits, provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 90 linear feet to prevent excessive voltage drop. Where branch circuit exceeds 175 linear feet, use No. 8 wire.

L. Use Ideal wing nuts, Scotchlok Type Y, R, G, or B, or approved equivalent connectors for fixture connections at outlet boxes.

M. Make feeder taps and joints with OZ type T, PT, PM or PTS, or approved equivalent clamp connectors as manufactured by Kupler, or with approved compression sleeves. Wrap connectors with No. 10 electro-seal or approved equivalent plastic filler and vinyl tape.

N. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

O. Color code conductors as follows:

CONDUCTOR COLOR CODE		
	120/208 Volt	277/480 Volt
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

P. If the above conflicts with existing color coding, match existing.

Q. Use factory color coded conductors where commercially available. If not, use black wire and band with color tape.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. The entire system of raceways and equipment to be grounded and bounded in accordance with Article No. 250 and No. 517 of latest edition of National Electrical Code and any local regulation or governmental governing authority.

PART 2 PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Main service disconnect means panelboard shall be connected to the grounding electrode system via the grounding electrode conductor. The grounding electrode conductor shall be sized in accordance with Table 250.66 of N.E.C. An additional ground wire of same size shall be run to a tripod grounding rod system driven in ground outside foundation of building. This system shall consist of three 3/4" x 10' copperweld ground rods driven in ground in an equilateral triangular configuration with a minimum of 15' spacing between each. Connection of each ground rod to one another shall be made using a conductor of same size as being run for main service ground. For new facilities, a ground grid (loop) installed around the building bonded by each corner column and every 2nd column in between. This system shall be in lieu of the tri-pod system. All grounding electrodes, as defined by Article 250 of N.E.C., present in the building or structure shall be bonded together to form the grounding electrode.

B. Feeder circuits to panels, motor control centers, etc., shall have a separate green grounding conductor in conduit sized in accordance with Table 250.122 of N.E.C.

C. All branch circuits shall have a separate green grounding conductor installed in same conduit as phase and neutral conductor from panel ground bus to device. The grounding conductor shall be sized in accordance with Table 250.122 of N.E.C.

D. Ground all electrically operated equipment utilizing separate code size grounding conductors run in feeder conduits or contained within outer jacket enclosing the circuit conductors contained in flexible cords.

E. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit shall have a jumper wire sized to ampacity of branch breaker and shall be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

F. Division 26 to provide grounding system testing of all receptacles and exposed fixed electrical equipment with conductive surfaces located within a patient care vicinity in accordance with NFPA-99. Results of the tests shall be recorded for each space with a report included in the closeout documents. Grounding to be corrected where results of test do not comply with the minimum requirements of NFPA-99.

G. Receptacle testing in patient care rooms shall be provided in accordance with NFPA 99; including: visual inspection for physical integrity, continuity of grounding, polarity and retention force. Results shall be recorded and included as part of the closed out documents. Corrections shall be made to devices that do not comply with the NFPA 99 requirements.

H. Bonding for other systems such as lightning protection, communications, cable TV, medical gas piping, etc. where required by N.E.C. or other codes shall be bonded per Article 250 of N.E.C.

2.02 GROUND CLAMPS

A. O-Z Gedney, Steel City, or approved substitute.

PART 3 EXECUTION

3.01 INSTALLATION

A. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground busses.

B. Provide a shunt path around main water meter by bonding around both sides of meter to assure continuity.

C. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

D. Clean all non-conductive surfaces on equipment to be grounded, to assure good electrical continuity.

E. Ground on main service shall be tested to obtain no greater than 10 ohms using 3-Point Fall of potential test. Test data shall be submitted to Engineer for review and such test data shall become a part of the final brochure.

F. Tie ground bus in both normal and emergency panels serving the same patient care areas together with an insulated continuous copper conductor not smaller than No. 10 AWG in accordance with National Electrical Code Article No. 517-14.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a system of supporting devices and hangers to ensure secure support or bracing for conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, cabinets, etc.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide appropriate supporting devices and hangers as manufactured by Erico Products, Inc., Steel City, Hubbell, or approved substitute:
   1. Vertical flange clamps (beam clamps).
   2. "Z" purlin clips.
   3. Conduit clips.
   4. Universal clamps (Beam clamps).
   5. Beam clamps (set screw type).
   6. Combination push-in conduit clips.
   7. Combination conduit hanger clamps.
   8. Flexible conduit clips.
   9. Special combination conduit clips.
   10. One hole steel straps.
   11. Minerallac conduit hangers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure conduits to within 3' of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed ten feet (10') for EMT and IMC conduit and in accordance with Table 344.30 (B) (2) for Rigid Steel conduit.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers or racks to support conduits run apart from the structure.

C. Furnish and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, outlet boxes, etc.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Use of chains, perforated iron, bailing wire, or tie wire for supporting conduit runs will not be permitted.

F. Where HCF is allowed under other sections of this specification, it shall be fully supported per the installation requirements of N.E.C.

END OF SECTION 26 05 29

SECTION 26 05 33
RACEWAYS AND CONDUIT SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide a complete conduit system with associated couplings, connectors, and fittings.

B. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

C. Provide each fixture, switch, receptacle, communication devices, and other wiring devices with a galvanized outlet box of appropriate size and depth for its particular location and use unless indicated otherwise.

D. Provide pull and junction boxes of appropriate size and depth or as indicated on the drawings and as specified hereinafter.

1.02 SUBMITTALS

A. Submittal for products furnished under this section is not required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. IMC, RGS and EMT conduit shall be hot-dip galvanized, or electrogalvanized steel by Allied, Wheatland Tube, Republic Conduit, Western Tube, or approved substitute.

B. Erickson couplings for IMC and RGS, shall be used where neither length of conduit can be rotated.

C. IMC/RGS conduit connectors from 1/2” to 4” trade sizes shall use compression type.

D. EMT conduit connectors from 1/2” to 2” trade sizes shall use set screw type. EMT conduit connectors from 2-1/2” to 4” trade sizes shall use two set screw type.

E. Weatherproof hub shall be complete with sealing "O" ring or sealing locknuts.

F. Provide polyvinyl chloride (PVC) conduit, Type 40, and associated couplings, connectors, and fittings. PVC conduit shall be UL listed and 90 degrees C UL rated.

G. Provide aluminum conduit in areas requiring non-ferrous materials.

H. Outlets and junction boxes shall be Steel City or approved substitute.

I. Provide 4" square x 1-1/2" deep boxes for switches and receptacles in drywall partitions. Use square cut plaster rings of proper gauge and depth.

J. Provide 4" x 1-1/2" octagonal boxes for ceiling outlets. For increased cubic capacity provide 4" x 2-1/8" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square boxes for ceiling outlets.

K. Provide 4" x 3-1/2" octagonal concrete rings with removable back plates and fixture studs for ceiling outlets in prestressed or reinforced concrete slabs.

L. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in dry wall construction.

M. For all systems boxes, provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls. Single gang device boxes are not acceptable.

N. Permanent barriers shall be furnished in multi-gang boxes if the voltage between adjacent wiring devices exceeds 300 volts.

O. Provide galvanized malleable iron fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

P. Provide galvanized malleable iron condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

Q. Pull and junction boxes shall be by Hoffman or approved substitute.

R. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, screw covers, etc.

S. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, bolted covers with full gaskets forming a completely water-tight assembly, equal to Hoffman, Concept Series.

T. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers to be fully gasketed, watertight and secured with plated screws or bolts. Crouse-Hinds Type WJB or approved substitute.

U. Conduit is to be color coded from the factory in accordance with facility's current color coding standard, where no standard exits for color coding, provide in accordance with FacilitiGroup guidelines. As an alternative, contractors may submit for evaluation a deduct to omit use of factory-painted conduit. Tape or paint are to be used to identify circuits and junction boxes and/or fittings are to be painted in accordance with facility standard or color table.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) for:
   1. Indoor branch circuits and feeders where concealed or where exposed and not subject to physical damage.

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) for:
   1. Panelboard feeders where subject to damage.
   2. Branch circuits installed in hazardous areas.
   3. Branch circuits and feeders installed in concrete slabs at ground floor.
   4. Branch circuits installed exposed below 6 feet above finished floor.
   5. Branch circuits installed in wet locations.
   6. Branch circuit and feeders installed on crawl spaces.
   7. Branch circuit concealed in masonry walls.

2.04 RIGID GALVANIZED STEEL (RGS)

A. Conduit Use:
   1. Exterior exposed primary service conduit.
   2. Interior and exterior exposed secondary service conduit.

2.05 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:
   1. Service entrance conduits for power encased in concrete.
   2. Service entrance conduits for telephone.
   3. Exterior feeders encased in concrete.
   4. Exterior underground branch circuits.
   5. Primary power conduits encased in concrete.

B. PVC conduit shall not be used for feeders or branch circuits inside the building.

2.06 FLEXIBLE METAL CONDUIT

A. Provide a flexible metal conduit system for the termination points at equipment that may possibly vibrate such as motors, etc. The length shall not exceed 6 feet.

B. Conduit shall be electrically continuous from outlet or conduit end to the utilization equipment.

C. The total length of flexible conduit in any circuit shall not exceed 6 feet.

D. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight flexible type, U.L. Type EF.

PART 3 EXECUTION

3.01 INSTALLATION

A. Minimum size of conduits shall be 1/2 inch (12.7 mm) for controls circuiting and ¾ inch (19.05mm) for feeder circuits and multiple branch circuits.

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors, and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run conduits concealed in floor slabs, below slabs, or in walls in direct line with long sweep bends or offsets. Run exposed conduits and conduits run above lay-in ceilings parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Secure conduits to all boxes and cabinets with two locknuts and bushings so system will be electrically continuous from service to all outlets.

F. Provide grounding bushings on all feeder conduits in critical care areas in accordance with NEC Article 517.

G. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

H. Complete conduit systems before pulling conductors.

I. Conduits shall be divided according to voltage and amperage service level. Conduits of different voltage levels shall be physically separated by the following distances unless otherwise specified on the drawings by the electrical engineer or control system supplier.

1. Level 1 conduits shall contain low level input/output signal conductors including RTD cables, thermocouple cables, and 4-20 mA d.c. cables from field transmitters.
2. Level 2 conduits shall contain all conductors for 24 volts d.c. power and signal.
3. Level 3 conduits shall contain all conductors for 120 volt a.c. power to the PLC control cabinets, motor control circuits, field devices requiring 120-volt power, etc.
4. Level 4 conduits shall contain all conductors for 120 volts d.c. control power greater than 3 amps, all 120 volts a.c. power greater than 20 amps, and all power circuits with voltage ratings higher than 120 volts a.c. (277, 480, 4160, 13,200 volts etc.). Examples include 480-volt motor feeds, 5-kV feeders, and 120-volt lighting circuit and input/output devices such as limit switches and solenoid valves.
5. Conduits shall be physically separated from each other by the following distances:

SPACING REQUIREMENTS (IN INCHES) FOR METALLIC CONDUITS			
From Level	To Level 2	To Level 3	To Level 4
Level 1	Minimum 1"	Minimum 6"	Minimum 26"
Level 2	0"	Minimum 6"	Minimum 26"
Level 3	Minimum 6"	0"	Minimum 18"

6. Levels 1, 2, and 3 conductors shall additionally be routed away from sources of high voltage or RF radiation such as switchgear, transformers, radio transmitters, and repeaters. Minimum separation from these sources of interference shall be 5 feet.
7. Data highway communications cable are generally considered Level 1 conductors; however, special requirements apply for routing to assure a low noise environment. Refer to electrical drawings and controls supplier requirements for special considerations before routing these conduits.

J. Where conduits of different levels must cross, the minimum separations shall be maintained, and they shall cross at right angles.

K. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300-19.

L. Provide nylon pull cord in all empty conduits. Steel wire not acceptable as pull wire.

M. Conduits which pass through floor slabs (except ground floor) shall be sealed with concrete grout. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire-rated walls. Refer to appropriate details on architectural and mechanical drawings.

N. Where IMC or RGS conduit is installed in a cabinet, junction box, pull box, or auxiliary gutter, conductors shall be protected by an insulated bushing. Locknuts shall be installed on conduit outside and inside enclosure.

O. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated hub, complete with recessed sealing "O" ring or sealing locknut shall be used.

P. Where conduits stub up in conduit space beneath switchgear and do not connect directly to equipment enclosures, use malleable iron nylon insulated ground bushing with a lay-in lug design complete with bonding screw, Raco 1212-1296.

Q. In concrete slabs, block up conduit from forms and securely fasten in place. All conduits in slabs shall have a minimum of 1-1/2 inches concrete coverage above and below.

R. Encase in 4 inches of 1:2:4 mix concrete on all sides all feeder conduits laid below ground outside building foundation line.

S. Conduits for feeders and branch circuits shall be terminated directly into panelboard enclosure without the use of pull boxes, junction boxes, wireways, or auxiliary gutters, unless the panelboard enclosure does not provide sufficient surface area for all conduits. Where such cases exist, the contractor shall notify the Designer. In no case will splices in such boxes, wireways, etc., be permitted.

T. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

U. Standard HCA color coding:
   1. Purple: Essential Distribution not listed herein
   2. Yellow: Life Safety Branch
   3. Orange: Critical Branch
   4. Green: Equipment Branch
   5. Red: Fire Alarm System

V. If the above conflicts with existing color code, use existing.

W. No conduit shall be installed in elevated slabs.

3.02 EMT

A. Do not use electric metallic tubing in cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 inches thick or unless the EMT is at least 18 inches under the fill. Use of set-screw fitting is not acceptable in concrete or in fill under slab.

3.03 PVC

A. Use threaded fittings for all connectors and adapters.

B. Provide code sized ground conductors in all power conduit runs.

C. Provide 1/4-inch nylon pull rope in all primary power and incoming telephone service entrance conduits.

D. Encase all PVC conduit in reinforced concrete with a minimum of 4-inch encasement on all sides except exterior branch circuits.

E. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to its emergence.

F. Make bends with standard ells or with an approved heat bender.

3.04 FLEXIBLE METAL CONDUIT

A. Conduits shall be 1/2 inch minimum size.

B. 3/8 inch flexible conduit may be used for light fixture whips.

C. Where fittings for liquidtight flexible conduit are brought into an enclosure with a knock-out, a gasket assembly, consisting of one piece "O" ring, with Buna-N sealing material, Raco Series 3500, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

D. In dry locations, where final connections to motors and other equipment may be made with flexible metal conduit, fittings shall be of steel or malleable iron only with insulated throats or insulated bushings, and shall be of wedge and screw type having an angular wedge fitting between convolutions of conduit.

E. An additional copper ground wire shall be installed inside of flexible conduit and bonded at each end to assure continuity of ground to lighting fixtures, controls, and other utilization equipment.

F. All recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture. Rigid conduit connections to lighting fixtures are not acceptable.

G. Install liquidtight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

H. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION 26 05 33

SECTION 26 05 73
POWER SYSTEM ANALYSIS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes short circuit, protective device coordination and Arc Flash study encompassing portions of electrical distribution system from normal and emergency power sources to the largest breakers in each panelboard.

B. Contractor shall engage services of a licensed engineer for purpose of performing electric power system studies as specified.

C. Contractor shall field verify all new and existing feeder sizes and lengths, as existing breaker types and settings associated with the studies.

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers:
   1. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book).
   2. IEEE 1584 – Guide for Performing ARC – Flash Hazard Calculations.

B. National Fire Protection Association: NFPA 70 - National Electrical Code, NFPA 99 – Health Care Facilities Code.

1.03 DESIGN REQUIREMENTS

A. Complete Short Circuit, Protective Device Coordination, and Arc Flash Study to meet requirements of NFPA 70 and NFPA 70E.

B. Short Circuit Report Preparation:
   1. Prepare study prior to ordering distribution equipment to verify equipment ratings required.
   2. Perform study with aid of computer software program.
   3. Calculate short circuit interrupting and, when applicable, momentary duties for assumed 3-phase bolted fault short circuit current and phase to ground fault short circuit current at each of the following:
      a. Utility supply bus.
      b. Medium voltage air interrupter switchgear.
      c. Medium voltage circuit breaker switchgear.
      d. Secondary unit substations.
      e. Automatic transfer switch.
      f. Manual transfer switch.
      g. Engine generator.
      h. Medium voltage motor controllers.
      i. Medium voltage oil switchgear.
      j. Low-voltage switchgear.
      k. Switchboards.
      l. Motor control centers.
      m. Distribution panelboards.
      n. Branch circuit panelboards.
      o. Each other significant equipment location throughout system.

C. Short Circuit Report Contents Include the following:
   1. Calculation methods and assumptions.
   2. Base per unit value selected.
   3. One-line diagram.
   4. Source impedance data including power company system available power and characteristics.
   5. Typical calculations.
      a. Fault impedance.
      b. X to R ratios.

c. Asymmetry factors.
d. Motor fault contribution.
e. Short circuit kVA.
f. Symmetrical and asymmetrical phase-to-phase and phase-to-ground fault currents
g. Tabulations of calculation quantities and results.

6. One-line diagram revised by adding actual instantaneous short circuits available.
7. State conclusions and recommendations.

D. Overcurrent Protective Device Coordination Study
1. Prepare time-current device coordination curves graphically indicating coordination proposed for system, centered on conventional, full-size, log-log forms.
2. Prepare with each time-curve sheet complete title and one-line diagram with legend identifying specific portion of system covered by that particular curve sheet.
3. Prepare detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.
4. Plot device characteristic curves at point reflecting maximum symmetrical fault current to which device is exposed. Include on curve sheets the following as applicable:
a. Power company relay characteristics.
b. Power company fuse characteristics.
c. Medium voltage equipment protective relay characteristics.
d. Medium voltage equipment protective fuse characteristics.
e. Low voltage equipment circuit breaker trip device characteristics.
f. Low voltage equipment fuse characteristics.
g. Cable damage point characteristics.
h. Pertinent transformer characteristics including:
1) Transformer full load current
2) Transformer magnetizing inrush.
3) ANSI transformer withstand parameters.
4) Significant symmetrical fault current
i. Pertinent motor characteristics.
j. Generator characteristics including:
1) Phase and ground coordination of generator protective devices.
2) Decrement curve and damage curve.
3) Operating characteristic of protective devices.
4) Actual impedance value.
5) Time constants.
6) Current boost data.
7) Do not use typical values for generator.
k. System shall fully coordinate at 0.1 seconds and higher per NFPA 70 and NFPA 99.
l. Coordination curves include generator's inherent protection.

E. Arc Flash Study: Perform Arc Flash Analysis to include the following at each distribution bus:
1. Bolted fault current.
2. Arc fault current.
3. Protective device characteristic and arc fault duration.
4. System voltages and equipment class.
5. Working distances.
6. Calculated incident energy.
7. Calculated arc flash protective boundary.

1.04 SUBMITTALS

A. Product Data: Submit the following report and summarize results of study in report format including the following:
1. Descriptions, purpose, basis, and scope of study.
2. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same.

3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
4. Fault current calculations including definition of terms and guide for interpretation of computer printout.
5. Arc flash calculations and printout of labels.

B. Submit five (5) copies of final report signed by professional engineer. Make additions or changes required by review comments.

1.05 QUALIFICATIONS

A. Perform study under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location with a minimum of five (5) years experience in power system analysis.

B. Demonstrate company performing study has capability and experience to provide assistance during system start up.

1.06 SEQUENCING

A. Submit short circuit and protective device coordination study to Engineer prior to receiving final approval of distribution equipment shop drawings and prior to releasing equipment for manufacturing.

B. When formal completion of study will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of study data sufficient in scope to ensure selection of device ratings and characteristics will be satisfactory.

1.07 SCHEDULING

A. Schedule work to expedite collection of data to ensure completion of study for final approval of distribution equipment shop drawings prior to release of equipment for manufacturing.

PART 2 PRODUCTS– NOT APPLICABLE

PART 3 EXECUTION

3.01 ADJUSTING

A. Perform field adjustments of protective devices and modifications to equipment to place equipment in final operating condition. Adjust settings in accordance short circuit and protective device coordination study.

3.02 ARC FLASH SIGN INSTALLATION

A. Implement the Arc Flash sign installation requirements for electrical equipment as specified in NEC Article 110.16 Flash Protection, NFPA 70E and OSHA.

B. Signs shall be adhesive vinyl for indoor use and engraved plastic for outdoor use.

3.03 ARC FLASH TRAINING

A. Provide training for the Owner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours).

B. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.

C. Include in Project Close-out Documents training notes, outlines, and Power Point presentation of training session. Also include attendance record of personnel attending the training session.

D. Training session shall be videotaped. Include copy of DVD of training session in Project Close-out Documents.

END OF SECTION 26 05 73

SECTION 26 12 19

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Service will be underground and will be a 480/277-volt, 3-phase, 4-wire, wye system.

B. System will be serviced by FPL.

PART 2 PRODUCTS

2.01 MATERIALS

A. Service shall be grounded in accordance with latest edition of National Electric Code, Article No. 250, and any special requirements as required by municipal, state, or federal authorities having jurisdiction.

B. Metering shall be provided as required by the power company. Coordinate final location with utility company, provide mounting support system as required for CT cabinets, metering cabinets, etc.

C. Transformers shall be provided by power company and shall be a pad-mounted type of transformer.

D. Transformer shall be mounted on a reinforced concrete pad, sized and detailed in accordance with utility company requirements.

E. Primary conduits shall be provided by Division 26 as shown on drawings, including pull rope, excavation, backfill, and a 4" concrete envelope. Conduits shall be run up pole as directed by power company (approximately 30 feet). Any spare conduits shown shall be capped off 12 inches above grade with plumber's pipe cap.

F. Conduits shall be terminated with OZ Type R, G & W Type CS, or equal cable terminator.

G. Primary conduits shall be provided by power company.

H. Secondary conduits, wire, excavation, and backfill to be provided by Division 26 as shown on drawings from transformer to main distribution point.

I. Division 26 to provide secondary lugs on transformer and shall coordinate with power company as to proper drilling and lugs required.

J. Coordinate any utility required disconnects with power company prior to rough-in exact requirements and location shall be per the utility’s guidelines.

PART 3 EXECUTION

3.01 INSTALLATION/COORDINATION

A. Division 26 shall coordinate with power company to determine final exact location of transformers, exact sizes required, and conduit stub-up points for primary and secondary entrances within transformer.

B. Division 26 shall coordinate with power company to determine final exact location of disconnects, metering cabinets, CT cabinets, etc.

C. Division 26 shall be responsible for furnishing a breakdown listing the loads as shown on the drawings for the power company.

END OF SECTION 26 12 19

SECTION 26 22 00

LOW VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Section 26 05 00.

B. Provide dry type transformers as specified herein, and as shown on the contract drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Transformers shall be as manufactured by Square D, per HCA's purchasing agreement.

1. Contact is as follows:

Jess Hoover, Charlie Shannon
Graybar-Nashville
825 8th Avenue South
Nashville, TN 37217
HCA@graybar.com
239-494-2088
615-743-3226
HPG Contract No. 5892

2.02 EQUIPMENT REQUIREMENTS

A. Single-phase and three-phase general purpose dry type transformers shall be of the two-winding type, self-cooled, with ratings (KVA) as indicated on the drawings. Transformers shall be built in accordance with applicable NEMA, ANSI, IEEE, OSHA, UL standards, and regulations on listings.

B. Transformers shall contain aluminum windings. Copper not required.

C. Sound levels shall not exceed the following ranges:
1. 0-9 KVA: 40 db.
2. 10-50 KVA: 45 db.
3. 51-150 KVA: 50 db.
4. 151-300 KVA: 55 db.
5. 301-500 KVA: 60 db.
6. 501-700 KVA: 62 db.

D. Transformers with single phase ratings through 10 KVA shall have a voltage ratio of 240/480 volts primary-120/240 volts secondary with a maximum temperature rise of 115 degrees C at full load rating for the non-ventilated type, suitable for indoor or outdoor use.

E. Transformers with three phase ratings through 9 KVA shall have a voltage ratio as indicated on drawings. Provide six 2-1/2% full capacity voltage adjusting taps, 2 above and 4 below primary rated voltage; Maximum full load temperature rise to be 115 degrees C; for the non-ventilated, HARDSHELL, encapsulated type, suitable for indoor or outdoor use.

F. Single and three phase transformers rated above 9 KVA to be insulated with UL listed Class 220 rated materials; and have a maximum average full load temperature rise of 150 degrees C.

G. Transformers to have voltage ratios as indicated on drawings. Transformers between 15 KVA and 300 KVA to be provided with six (6) 2-1/2% full capacity taps--two above and four below primary rated voltage.

H. Transformer core to be of low loss type, high quality, grain oriented steel. Core clamping members shall cover a minimum of 90% of the top and bottom core yoke laminations; and vertical framing members shall be contained within the insulated coil form, to minimize external flux path.

I. Coils to be wound of electrical grade, edge-conditioned aluminum strip on preformed rigid coil base; and be provided with corrugated aluminum positive spacing air duct forms, to increase air circulation and reduce hot spot temperature rise. Each coil to have a final protective outer wrap

of electrical insulating material. Coils with exposed magnet wire will not be acceptable. Coil leads to be terminated to suitable solderless lugs (thru 75 KVA), fully approved for use with either copper or aluminum cable and located on a solidly-braced, insulated terminal board.

J. Immediately prior to initial varnish impregnation, entire core and coil assembly to be thoroughly dried in a preheat cycle, and then thoroughly baked to ensure that all volatiles have been driven off in process. Core and coil assembly to be internally isolated from enclosure through use of an effective vibration dampening system.

K. Transformers shall have a terminal bar for all grounding and bonding conductors secured to the inside of the enclosure per NEC 450.10.

L. Transformers shall meet the requirements of the most current version of federal law 10 CFR Part 431.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide flexible conduit to and from transformer.

B. Install transformers in accordance with manufacturers' recommendations.

C. Provide trapeze type hangers for transformers supported from the structure or mount on the floor as shown on the drawings. Floor mounted transformers shall be securely anchored to a 4" reinforced concrete housekeeping pad. Provide working clearances as required by NEC.

D. Ground secondary neutral of all transformers to grounding conductor in primary feeder and to building steel or other approved electrode using grounding electrode conductor sized in accordance with NEC. Ground transformer enclosure with bonding jumper.

E. Transformers 45 KVA or less may be floor mounted or suspended. 75 KVA transformers may be floor mounted or rack mounted. Transformers above 75 KVA shall be floor mounted.

END OF SECTION 26 22 00

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide circuit breaker type panelboards as indicated on drawings and as specified in this section.
   1. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Provide panelboards by Square D, per HCA's purchasing agreement.
   1. Contact is as follows:
      Jess Hoover, Charlie Shannon
      Graybar-Nashville
      825 8th Avenue South
      Nashville, TN 37217
      HCA@graybar.com
      239-494-2088
      615-743-3226
      HPG Contract No. 5892

B. Lighting panelboards for 120/208-volts, 3-phase, 4-wire service shall be Square D type NQOD.

C. Lighting panelboards for 277/480-volts, 3-phase, 4-wire service shall be Square D type NF.

D. Power panelboards for 120/208-volt, and 480/277-volt, 3-phase, 4-wire service shall be Square D I-Line distribution type.

E. Lighting and power panelboards and their associated circuit breakers shall be furnished with a short-circuit current rating greater than the available fault current shown on the panel schedules.

F. Series rated panelboards are not acceptable.

G. Provide panelboards of circuit breaker, dead-front safety type, UL labeled and meeting all applicable requirements of the National Electrical Manufacturers Association.

H. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for aluminum and copper 75 degree C rated conductors.

I. Provide shunt trip and GFI breakers where indicated on panel schedule.

J. Provide electrically isolated neutral bars.

K. Provide separate ground bars complete with lugs or connectors on bar.

L. Provide panelboards with sequence phased bus bars or distributed phase bussing for: 3-phase, 4-wire, 277/480-volts wye and 120/208-volts wye.

M. Provide panel doors equipped with chrome-plated locks and catches, all keyed alike. Provide two keys for each lock. Provide fronts with adjustable indicating trim clamps.

N. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degree C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

O. Where specific panelboard types, breaker types, or adjustable breaker devices are shown on the drawings, and the contractor elects to use another manufacturer or type, contractor will be responsible for additional cost incurred by the designer for evaluation of breaker coordination.

PART 3 EXECUTION

3.01 INSTALLATION

A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors.

B. Balance all circuits to achieve not greater than 10% unbalanced neutral current in panel feeders.

C. Provide six circuit breaker handle lock-on devices for each lighting panelboard for installation by the contractor on circuits as directed by the Owner to prevent unauthorized personnel from turning off circuits. Circuits serving fire alarm equipment and circuits serving exterior signage shall be provided with locking devices. Turn the spare lock-on devices over to the Owner for his use.

D. Provide typed directory cards mounted under plastic on the doors of all panelboards. The directories shall indicate the type of devices being served, including the space number or space names in which the devices or fixtures are located. For areas of renovation, new typed directory cards shall be provided in existing panelboards where changes have occurred as a result of renovation or remodeling work.

E. Provide engraved Bakelite nameplates for all the circuit breakers in use on power panelboards. Indicate the device, panel, or motor being served with 1/4" high letters. Provide nameplates without engraving for the spare breakers and/or spaces. Secure all nameplates to the panelboard trim with two roundhead sheet metal screws.

F. Provide engraved Bakelite nameplates on the visible face of all lighting and power panels indicating the panel and essential system branch designation in 3/8" letters. Secure the nameplates with a minimum of two round-head sheet metal screws. Nameplates shall be yellow for life safety branch equipment, orange for critical branch equipment, green for equipment branch equipment, purple for essential distribution and black for normal branch equipment.

G. Provide No. 10 continuous ground conductor to bond the ground busses of the normal and emergency power panels which serve the same patient care areas in accordance with NEC Article 517.

H. Contractor to spot paint panel backbox per the following color code:
   1. Purple: Essential Distribution not listed herein
   2. Yellow: Life Safety Branch
   3. Orange: Critical Branch
   4. Green: Equipment Branch

I. Surge protection shall be provided for all life safety branch panels per Section 26 43 13 of these specifications.

J. The panelboard design shall allow access to solid state breaker displays and settings without removal of the dead front.

K. Surge protection shall be provided for all panelboards serving circuits which exit the building per Section 26 43 13 of these specifications.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide switches, receptacles, device plates, and other wiring devices as indicated on drawings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include Leviton, Acuity Controls or approved equal.

2.02 SWITCHES

A. 20-Amp, 120/277 VAC:
   1. Single pole: Leviton No. 1221-2I (normal branch).
   2. Single pole: Leviton No. 1221-2R (emergency branch).
   3. Three-way: Leviton No. 1223-2I (normal branch).
   4. Three-way: Leviton No. 1223-2R (emergency branch).
   5. Single pole, weatherproof: Leviton No. 1221-2W or 1221-2R with Steel City No. SW1-C weatherproof plate.

B. Universal Dimmers:
   1. Acuity Controls No. SPODMRD-EZ-IV (Normal Branch)
   2. Acuity Controls No. SPODMRD-EZ-RD (Emergency Branch)

C. Vacancy Sensors:
   1. Wall Mount: Acuity Controls No. WSX-PDT-VA-IV (normal branch)
   2. Wall Mount: Acuity Controls No. WSX-PDT-VA-RD (emergency branch)
   3. Ceiling Mount, single branch load: Acuity Controls No. CMPDT-9
   4. Ceiling Mount, multiple branch loads: Acuity Controls No. nCMPDT-9-RJB
   5. Wall Mount with dimming: Acuity Controls No. WSX-PDT-EZ-D-SA-IV (normal branch)
   6. Wall Mount with dimming: Acuity Controls No. WSX-PDT-EZ-D-SA-RD (emergency branch)

D. Power Packs
   1. Power Pack, single branch load: Acuity Controls No. PP20
   2. Power Pack, multiple branch loads: Acuity Controls No. nPP16-SA
   3. Power Pack, multiple dimming locations: Acuity Controls No. nPP16-D-SA

E. Low Voltage Switches
   1. Wall Mount for use with nPP16 power pack: Acuity Controls No. nPODM-IV (normal branch)
   2. Wall Mount for use with nPP16 power pack: Acuity Controls No. nPODM-RD (emergency branch)
   3. Wall Mount 3-way switch single branch load with vacancy sensor: Acuity Controls No. SPODM-SA-3X-IV (normal branch)
   4. Wall Mount 3-way switch single branch load with vacancy sensor: Acuity Controls No. SPODM-SA-3X-RD (emergency branch)
   5. Wall Mount 3-way switch dimming single location: Acuity Controls No. SPODM-SA-3X-D-IV (normal branch)
   6. Wall Mount 3-way switch dimming single location: Acuity Controls No. SPODM-SA-3X-D-RD (emergency branch)

2.03 RECEPTACLES

A. 20-Amp, 125-VAC, NEMA 5-20R:
   1. Duplex type, hospital grade: 8300-I (ivory) for normal power devices and 8300-R (red) for emergency devices.
   2. Ground fault circuit interrupter, 20-amp hospital grade: Leviton No. GFNT2-HGI (ivory) for normal power and GFNT2-HGR (red) for emergency power.
   3. GFCI Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton G5362-WTW (White).

4. Duplex type, hospital grade, tamper resistant: Leviton No. 8300-SGI (ivory) for normal power and 8300-SGR (red) for emergency power devices.
5. Duplex type, weather resistant, GFI: Leviton No. WT899-HGI (ivory) for normal power and WT899-HGR (red) for emergency power devices.
6. GFCI Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton G5362-WTW (White).
7. While-in-use, Weatherproof Cover: Leviton No. 5980-UCL.

2.04 DEVICE PLATES

A. Provide Leviton Series 80 nylon plates, red for emergency circuits and ivory for normal circuits, or approved substitute. Provide cast alloy or stamped metal plates on all exposed switches and receptacles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Mounting:
   1. Mount all switches 46" above the finished floor to centerline of switch unless noted otherwise.
   2. Mount all receptacles 18" above the finished floor to centerline of receptacle unless noted otherwise.
   3. Mount weatherproof receptacles vertically.
   4. Work devices to nearest block course using proper type outlet boxes as specified under Section 26 05 33. Check architectural and furniture drawings for counter (desk, special booth etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Properly wire all convenience outlets so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.

C. Grounding: Install all receptacles in boxes specified under Section 26 05 33, and install a No. 12 green ground wire from device grounding terminal back to the grounding bus in the panelboard and bond to outlet box.

D. Receptacles shown on the drawings as "special mounting height" shall be installed at mounting height as indicated on drawings. Where no mounting height is given and receptacles are above counters (or casework), they shall be mounted with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. The Contractor shall coordinate the installation of all special mounting height receptacles with architectural design.

E. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

F. Install device plates in full contact with surface-mounted box. Plates shall not project out from the edge of the box.

G. Provide engraved faceplates for all receptacles identifying the panel and circuit designation.

H. Provide engraved faceplates for all receptacles in critical care patient locations identifying the panel and circuit designation. All other device plates shall be labeled to identify panel and circuit designation using an adhesive tape method similar to p-touch by Brothers.

END OF SECTION 26 27 26

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide horsepower-rated, quick-make, quick-break, safety switches provided with the number of poles and fuses as required.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Safety switches and enclosed circuit breakers shall be as manufactured by Square D.

B. For 208- and 240-volt circuits, use general-duty type switches with Class R fuse clips. For 480-volt circuits, use heavy-duty type switches with Class R fuse clips.

C. Switches shall have arc shields, shall be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 250-volt AC or 600-volt AC service as required.

D. Safety switches for all part-winding or two-speed motors requiring remote disconnect to be similar to Square D Series HLL-660, six-pole.

E. All switches shall be capable of interrupting locked rotor current of motor which it serves.

F. Enclosures to be NEMA-1 for interior use and NEMA-3R for exterior use unless noted otherwise.

G. Provide dual-element Bussman type FRN (250 volt) or type FRS (600 volt) fuses for any fusible safety switch serving a motor circuit.

H. For non-motor loads, provide dual element Bussman type LPN (250 volt) or type LPS (600 volt).

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide non-fusible switches at remote motor locations (raintight where required) as indicated on drawings.

B. Mount switches to walls or adjacent to equipment enclosures using unistruts with a minimum of four bolts using toggle anchors for masonry construction, Phillips "Red Head" anchors for poured concrete construction and bolts, jumbo washers, lock washers and nuts for equipment enclosure mounting.

C. All safety switches to be identified with Bakelite nameplates.

D. All safety switches and enclosed circuit breakers shall be capable of being locked in the open position.

END OF SECTION 26 28 16

SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide conduit, wiring and electrical connections to motors, safety switches, starters, relays, electrical interlock circuits, valves, unit heaters, fan coil units, pumps, air handling units, etc., complete and ready for operation. The Division 26 contractor shall review the electrical requirements of other sections and divisions of these specifications and drawings and provide the required power and control wiring.

B. Provide starters as shown on mechanical drawings and as scheduled on Electrical Drawings except custom designed starter such as chiller machine, those physically mounted on the unit such as a deaerator, or any piece of equipment where starter is furnished as an integral part of the equipment.

C. Control Wiring:
   1. Division 23 shall furnish and install line- and low-voltage control wiring, including conduit, conductors, and terminations for same. Division 23 shall also furnish and install control components associated with the line- and low-voltage control systems and shall wire and connect components in accordance with approved wiring diagrams.
   2. Division 26 shall furnish and install power wiring including conduit, conductors, and terminations to motors, safety switches, starters, relays, valve and damper actuators, and other components requiring power as indicated on the electrical drawings, by the specifications, and in accordance with approved wiring diagrams. Division 26 shall also furnish and install starters as scheduled on the electrical drawings.

D. Thermocouples and special cables may be provided by the manufacturer of the special equipment. Contractor shall check Division 23 specifications for these requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Starters shall be as manufactured by Square D.

B. Starters used on 208-volt systems shall have two cartridge fuses in the control circuit.

C. Starters used on 480-volt systems shall have an individual 480/120-volt control transformer with two cartridge fuses in the primary and one in the secondary.

D. All starters to be provided with melting alloy overloads.

E. Starters used inside shall have NEMA 1 enclosures; starters used in damp locations or exposed to the weather to have NEMA 3R enclosures.

F. See starter schedule on electrical drawings for listing of starters to be provided.

G. Manual Motor Starter with Heater Unit: Square D Class 2510 or equal.

H. Provide H-O-A selector switch with one (1) green and one (1) red pilot light and two normally open and two normally closed auxiliary contacts in each starter.

I. Reduced voltage starters shall be auto-transformer, closed transition, or wye-delta starters, closed transition type.

J. Provide built-in power factor correction capacitors on load side of contractor in starters for motors 50 hp and larger.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect all pumps, fans, and heating and air-conditioning equipment and have equipment complete and ready for operation. Contractor shall be responsible for checking with equipment manufacturer to obtain exact requirements. Electrical drawings showing mechanical

requirements are diagrammatic only to indicate size, type, number of control items, and approximate location.

B. A short section of flexible conduit shall be used at each motor. Watertight flexible conduit shall be used on any motors in damp or exterior locations.

C. Flexible metallic conduit for motor connections shall be 1/2" minimum size.

D. Identify starters and controls as required by Section 26 05 00.

END OF SECTION 26 29 13

SECTION 26 29 23

VARIABLE FREQUENCY MOTOR CONTROLLER

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish complete variable frequency motor controllers (VFMC or VFD) as specified herein for the fans and pumps designated. All standard and optional features shall be included within the VFD enclosure unless otherwise specified.

B. All VFD's provided to be of the same manufacturer.

1.02 QUALITY ASSURANCE

A. To ensure quality and minimize infantile failures at the job site, the VFD shall be burned in at an ambient of 40 degrees Celsius minimum for at least 120 hours. The VFD shall be operating a dynamometer and the load and speed shall be cycled during the test. All optional and special features shall be functionally tested at the factory for proper operation.

1.03 WARRANTY

A. The VFD shall be warranted by the manufacturer for a period of 24 months from date of start-up. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized on-site service.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. VFD to be as manufactured by Johnson Controls Inc., Eaton Corp., ABB, Danfoss-Graham, Square D/Schneider or Yaskawa. No substitutions.

B. VFD's motor transfer circuit shall include three contactors for bypass switching from line to VFD and vice versa.

C. VFD's for all motors up to and including 50 hp shall be 6-pulse drives. VFD's for all motors greater than 50 hp shall be 18-pulse drives.

D. Provide VFDs with RFI/EMI filters.

E. VFDs serving fans and pumps (e.g. AHU's, chilled water, & cooling towers) shall have the ability to lock out critical speeds.

F. The VFD shall convert 3-phase, 60-Hz utility power to adjustable voltage and frequency, 3-phase, AC power for stepless motor speed control from 5% to 100% of the motor's Hz speed. Input voltage shall be as indicated on the equipment schedules on drawings.

G. Converter Section: Full wave diode bridge rectifier.

H. Inverter Section: Insulated Gate Bipolar Transistor (IGBT) sine coded pulse width modulated (PWM) type for stepless motor speed control.

I. Silicon-controlled rectifiers (SCRS) or GTOs shall <u>not</u> be used in the circuitry.

J. The VFD maximum output current rating shall be 110 percent of the motor nameplate full load current.

K. The VFD and options shall be tested to ANSI/UL Standard 508. The complete drive including all options shall be listed by a nationally recognized testing agency such as U.L. or ETL.

L. The VFD and options shall comply with the applicable requirements of the latest standards of ANSI, IEEE, and the National Electrical Code. The VFDs full load amp rating shall meet or exceed NEC Table 430-150.

M. <u>Provide 3% line reactors</u> sized to limit line notching. 5% DC link chokes will also be acceptable.

N. The VFD shall not emit either conducted or radiated RFI in excess of the limitations set forth in the FCC Rules and Regulations, Part 15, Subpart J, for class A computing devices. The VFD shall have an FCC compliance label. Provide RFI filters if required.

O. The increase in audible motor noise with the VFD operating shall not exceed 3 decibels. VFD shall include adjustable carrier frequencies to help reduce audible motor noise.

2.02 BASIC FEATURES

A. The VFD shall include the following basic features:
   1. The VFD shall be housed in a NEMA 1 wall-mounted enclosure.
   2. The following operator controls shall be located on the front of the enclosure:
      a. Hand/Off/Auto selector switch or keypad mounted soft touch button to start and stop the motor. In the auto position, the drive will start/stop from a remote contact closure.
      b. Auto/Manual selector switch or keypad mounted soft touch button. In the auto position, motor speed is determined by the follower signal. In the manual position, motor speed is determined by the manual speed potentiometer or keypad speed control buttons.
      c. Manual speed potentiometer or keypad mounted speed control buttons.
      d. Power on pilot light to indicate that the AFC is being supplied by the power line.
      e. Fault pilot light or keypad indicator to indicate that the AFC has tripped on a fault condition.
      f. Digital meter or keypad display to indicate percent speed and percent load.
   3. Two programmable form C, dry contacts to indicate VFD status such as “Running”, “Faulted”, “Ready”, “At Speed”, “Over temperature”, etc.
   4. One programmable form A, dry contact to indicate VFD status such as VFD status such as “Running”, “Faulted”, “Ready”, “At Speed”, “Over temperature”, etc.
   5. When input power returns to normal following a fault trip for under-voltage, over-voltage, or phase loss, the VFD shall has the ability to automatically restart. The VFD shall not automatically restart following fault trips due to overload or over-current.
   6. The VFD shall include a door interlocked, pad lockable, input power disconnect switch.
   7. Speed Control: The output frequency may be adjusted in proportion to any one of the following:
      a. 0-10 VDC Analog Signal.
      b. 4-20 MA DC Analog Signal.
   8. Coordinate with controls supplier for exact input signal and type to provide proper input follower (i.e., grounded or floating).
   9. Provide open protocol BACnet interface card to connect to Building Automation System. Coordinate with controls system provider for preferred interface type and language.

2.03 PROTECTIVE FEATURES

A. The VFD shall include the following protective features:
   1. Molded case circuit breaker, or manual motor protector for the power input.
   2. Separate overload relay for each motor controlled on multiple motor applications.
   3. Protection against input power under-voltage, over-voltage, and phase loss.
   4. Protection against output current overload and over-current.
   5. Protection against over-temperature within the VFD enclosure.
   6. Protection against over-voltage on the DC bus.
   7. In the event of a power loss, shutdown without component failure. Upon return of power, automatically return drive to normal operation, if the start is in the "ON" condition, being able to restart into a rotating motor regaining positive speed control without shutdown or component failure.
   8. In the event of a phase-to-phase short circuit, shutdown safely without component failure.
   9. In the event that an input or output power contactor is opened or closed while the drive is activated, no damage to the VFD shall result.
   10. Any disconnect switches between the VFD and the motor shall include an auxiliary contact interlocked to the VFD fault trip circuit. In the event that a disconnect switch is opened while the drive is running, the drive shall shut down.
   11. DC bus discharge circuit for protection of service personnel.
   12. Insensitive to incoming power phase sequence.

2.04 ADJUSTMENTS

A. The VFD shall include the following adjustments available via potentiometers inside the enclosure:
   1. Maximum speed, adjustable 50-100% base speed.
   2. Minimum speed, adjustable 0-50% base speed.
   3. Acceleration time, adjustable 2-60 seconds.
   4. Deceleration time, adjustable 2-60 seconds with override circuit to prevent nuisance trips if deceleration time is set too short.
   5. Current limit, adjustable 0-110%.

2.05 SERVICE CONDITIONS

A. The VFD shall be designed to operate within the following service conditions:
   1. Ambient temperature, 0-40 degrees C.
   2. 0-95% relative humidity, non-condensing.
   3. Elevation to 3300 feet without derating.
   4. AC line voltage variation, -5% to 10% of nominal.

2.06 SPECIAL FEATURES

A. The following special features shall be included in the VFD enclosure. The unit shall maintain its U.L. or ETL listing.
   1. Bypass Switch: VFD's serving AHU-[ ] shall be provided with a bypass. A motor starter shall be included in the bypass circuitry for constant speed motor control when the VFD is taken out of service. Manual bypass shall provide all the circuitry necessary to transfer the motor from the VFD to the power line, or from the line to the controller while the motor is at zero speed. Two motor contactors, electrically interlocked, shall be utilized. One contactor is to be between the controller and the motor. The other contactor is to be between the bypass power line and the motor providing across-the-line starting for motors 50 hp and less, and part-winding or "soft start" starting for motors greater than 50 hp. Motor overload protection is to be provided in both the controller mode and the bypass mode. The bypass section door shall include a "drive/line" switch, "on/off-reset" switch, and a "load transferred to line" pilot light.
   2. The VFD shall include a main fused disconnect switch or circuit breaker to provide a means of disconnecting all power to both the bypass circuitry and the controller. The disconnect switch or circuit breaker shall be door interlocked and pad lockable. The fuses or circuit breaker shall be sized to provide short circuit protection for the motor when in the bypass mode per the NEC.
   3. A second disconnect switch, circuit breaker, or contactors shall be provided to disconnect input power to the controller but not the bypass circuitry. This disconnect will allow troubleshooting and testing of the VFD, both energized and de-energized while operating in the bypass mode.
   4. Plug-in test meter shall provide a quick means for monitoring the different signals within the VFD for start-up and troubleshooting. Where the meter is capable of operating with different horsepower VFDs, only one meter needs to be supplied.

PART 3 EXECUTION

3.01 INSTALLATION

A. The manufacturer of the VFD equipment shall provide a competent, factory trained service technician to supervise the installation, start-up and testing of the VFD.

B. Install VFDs in locations shown on the drawings in strict accordance with the manufacturer's published installation instructions.

C. Contractor shall provide such materials and assistance as required by the manufacturer's representative.

D. Division 26 shall provide necessary electrical connections.

E. Contractor shall provide coordination of the necessary controls not provided by the VFD manufacturer.

3.02 START-UP, TESTING, DEMONSTRATION

A. The manufacturer's factory-trained service technician, assisted by contractor, shall verify correct installation, start-up equipment, and test it as a unit and a part of the system it serves. Verify by adjustments, tests, etc., that the equipment is functioning as specified. Provide three copies of test data to the Owner. As a minimum, check the following items:
   1. Motor voltage and frequency.
   2. Control input and automatic start/stop.
   3. Calibration and adjustment for minimum and maximum speed setpoints and acceleration and deceleration rates.
   4. Wire terminations.

B. VFD manufacturer shall provide a minimum of 4 hours instruction to Owner to demonstrate the operation of the system. Provide three copies of operation and maintenance manual to Owner at completion of instructions.

C. A copy of the variable frequency drives certified startup sheets for all AHUs shall be provided to the construction manager / Cx team for record purposes within one week of startup.

END OF SECTION 26 29 23

SECTION 26 32 13
ENGINE GENERATORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This specification defines requirements for an emergency standby engine/generator system to be installed as per plans and specifications. System shall provide for completely automatic unattended operation, for the duration of any loss of normal utility power. System to be capable of reaching operating range within 10 seconds of initial start signal (NFPA 99). Unit shall be of a continuous standby KW/KVA capacity as shown on plans. System voltage to be 480/277-volts, 3-phase, 4-wire, 60 Hz., .8 power factor.

B. Full service responsibility for satisfactory operation and performance of this system shall rest with Division 26 contractor supplying the emergency power system. Engine/generator to be furnished with all necessary features and options to comprise a complete operable system when installed as per manufacturers' recommendations.

C. Unit to meet requirements of NFPA-99 and NFPA-110.

D. Warranty to be furnished on all equipment covered by specifications for a period of one (1) year from date of Owner's acceptance of equipment. Warranty to cover all components and consist of repair and/or replacement of all parts judged defective due to faulty material or workmanship, at no charge to the Owner.

E. Unit to be equipped for outdoor installation as shown on drawings.

1.02 SUBMITTALS

A. Contractor shall provide as part of submittal data: Complete, composite electrical and mechanical drawings indicating control wiring routing, quantity and size, as well as size and suggested routing of coolant, fuel lines and exhaust lines. If options or special equipment other than those specified below are required, they shall be included in the submittals.

B. Submittal drawing for an outdoor installation shall include a plan view of the enclosure indicating entrance areas through pad for control, power, and service wiring conduit, as well as fuel line entrance locations.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Emergency generator shall be by Caterpillar, Cummins, Generac, or Kohler per HCA's purchasing agreement.

B. Contacts are as follows:

1. Keith Kraemer
   Kohler
   1515 JP Hennessy Dr.
   LaVergne, TN 37086
   email: HCASALES@NixonPower.com
   (615) 664-1487
   HPG Contract No. 66551

2.02 ENGINE

A. Engine shall be full diesel, compression ignition, liquid-cooled, domestically manufactured and capable of producing the rated KW at a governed speed of 1800 rpm as specified under job site conditions. Engine to be equipped with electric starting, battery charging generator, electronic governor, fuel filters, oil filters, air cleaners, cooling system, and other equipment to provide a complete operable system. Selling distributor to be a factory authorized distributor of the diesel engine utilized in the standby engine generator system.

2.03 COOLING

A. Engine shall be cooled by plant mounted radiator with engine driven fan, jacket water pump, and fan guard.

B. Engine shall be cooled by remote radiator with electric motor driven fan.

C. Engine shall be equipped with thermostatically controlled water jacket heater to maintain minimum 80 degree F. water jacket temperature under ambient conditions. Vendor shall consult with and coordinate special extreme cold weather needs with Electrical Engineer.

D. Complete cooling system shall be filled with anti-freeze coolant (0 degrees F. or less as required by the extreme of local weather conditions) supplied by the vendor at start-up.

2.04 OUTDOOR INSTALLATIONS

A. Complete engine/generator and associated accessories shall be installed in an enclosure for outdoor installation and service. When located within 60 miles of the coastline, enclosures shall be aluminum. Enclosure shall be mounted directly to engine/generator base and shall be of sheet steel construction. Hinged access doors shall be provided for access to control gear and areas of unit requiring periodic maintenance and/or service. Intake and outlet louvers shall be furnished to allow proper flow of cooling and combustion air with all doors closed, but arranged to prevent entrance of rain.

B. Mufflers shall be installed on enclosure top in a horizontal position. Discharge pipe, batteries, day tank, battery charger, control gear and water jacket heater, shall be completely installed, wired and piped prior to delivery to job site.

C. A.C. wiring inside enclosure shall be neatly routed and enclosed in same type conduit used in building.

D. In addition to the above devices, a duplex, grounded, 120-volt, weatherproof convenience receptacle shall be provided for maintenance, servicing and lighting. This receptacle shall be connected to a life safety branch circuit.

2.05 SILENCERS AND BATTERIES

A. Furnish and install exhaust silencer with a minimum dBA reduction of 25 decibels. VEE-type engines shall have dual inlet, single outlet. Condensate trap, pet cock drain shall be installed in the silencer. A flexible section, 36 inches minimum, shall be provided between the engine exhaust manifold and the silencer. This section shall be carbon steel bellows type. All exhaust system fittings shall be flanged n.p.t. connections. The silencer shall be provided with mounting brackets for ceiling suspension. The silencer shall be installed from the equipment room ceiling in a horizontal position.

B. Engine/generator manufacturer shall specify exhaust line size required for acceptable back pressure. Exhaust line shall be Schedule 40 pipe and be connected to engine manifold through seamless, flexible, carbon steel bellows type connection. Exhaust systems installed inside structure shall be fully insulated (under Division 23) and lines passing through walls shall pass through sleeves.

C. Provide starting batteries capable of starting unit in time specified under installed conditions and capable of 60-seconds of engine cranking. Batteries to be installed in steel, insulated rack(s).

D. Battery heater pads to be furnished on outdoor installations.

E. Provide batteries of the heavy-duty lead acid type (maintenance-free batteries not acceptable), Group 8 shipped dry with electrolyte installed at start-up.

F. Provide an automatic battery charger. Charger shall operate on 120-volt input and shall be a.c. line compensated. Input and output shall be fused. Charger shall provide continuous taper charging and provide float and equalize function. Charger shall be in NEMA-1 cabinet and equipped with d.c. ammeter, d.c. voltmeter, high/float switch, and low d.c. voltage alarm relay. Minimum continuous d.c. output shall be 10 amperes.

2.06 ABOVEGROUND FUEL STORAGE TANK:

A. GENERAL

1. Provide and install an aboveground tank with secondary containment for each pump station. The primary tank shall have a total useable volume to accommodate 96 hours of generator runtime at full load. The primary tank shall maintain 25psi of pressure for two hours with no loss for leak testing purposes.

B. DESIGN CRITERIA
1. The tanks shall be double-wall steel in accordance with UL142.
2. Integral secondary containment shall provide at minimum 150% containment of the primary storage tank. The interstitial space shall allow liquid to migrate through it to a monitoring point. A leak detection access tube shall be located in the interstitial space between the primary tank and the secondary barrier. Leak detection shall be provided as specified herein.
3. Venting: Provide properly sized emergency and standard vents to satisfy code requirements. Emergency relief vents shall bear a stamp indicating opening pressure and flow capacity. Vent pipe outlets shall be 5 feet from building openings and located such that eaves or other obstructions will not trap vapors.
4. Low and Pre-Low alarms shall be configured based upon Florida Building Code Requirements. Fuel probe lengths and fuel calculations shall be provided as part of the systems submitted for engineering approval.

C. ABOVEGROUND STORAGE TANK ACCESSORY EQUIPMENT
1. Inspection Port Adapter Cap: Tank shall be equipped with a 4-inch adapter and lockable cap for inspection and manual gauging of fuel level.
2. Venting: Provide properly sized UL listed emergency and standard vents to satisfy code requirements.
3. Steel Fill Pipe: ASTM A53 or A120, or ASME B36.10, Schedule 40 black.
4. Fittings: ASTM B16.3, 150 lb. malleable iron, or ASTM A234, forged steel welding type.
5. Disconnect Coupling: Stainless steel assembly with dust cap for supply delivery connection. Fitting shall be coordinated with fuel supplier to assure compatibility. Installed fitting shall be at a 45-degree angle pointing upward to minimize drippage.
6. Product Label Marker: Stainless steel band clamp with API color-coded plaque for product being stored.
7. Provide decal or placard affixed to the tank fill box that gives a detailed, step-by-step tank filling procedure as well as the tank calibration chart. The decal or placard must be readily visible during tank filling operations and must be of a material that does not deteriorate when exposed to weather.
8. Foot Valve: 2-inch size double poppet type with cast iron body, replaceable bronze seats and 20 mesh screen, similar to “Model #86” by OPW Division - Dover Corp or Preferred Utilities model 900.
9. Vent Cap: 2-inch size, vertical type aluminum body with brass screen (Preferred Model #23).
10. Overfill Alarm Sign: 20 inches wide x 14 inches high, 18-gauge steel with porcelain enameled finished bright yellow background and minimum 2-inch high black lettering reading "Caution: When alarm sounds, oil tank filled to capacity. Do not overfill"; similar to: “Model FA-S” by Preferred Utilities.

D. FUEL DISTRIBUTION PIPE – ABOVEGROUND
1. General
   a. Provide and install steel piping aboveground as indicated on the drawings. Fuel pipe connections shall be welded except where required to be threaded at tanks or specialized valves.
2. Design Criteria
   a. Pipe: The pipe shall be ASTM A53 schedule 40 black with socket welded connections. Threaded connections shall be kept to an absolute minimum, typically where pipe must be joined to a threaded connection on a day tank or pump.
   b. The pipe shall be supported as shown on the drawings.

c. Product compatibility: All the components of the piping system shall be compatible with the products to be stored.

d. All piping shall be sloped.

e. All piping must be pressure tested as per NFPA 30.

f. Piping shall include priming tees at the high point of any suction piping. Priming tees shall be line size and shall extend approximately one foot above the piping high point. There shall be a minimum of 3 feet between the priming tee opening and the ceiling. Each priming tee shall include a ¼ turn ball valve and threaded plug.

g. Finish: Prime and finish paint with industrial enamel.Finish: Prime and finish paint with industrial enamel.

3. Accessory Equipment
   a. Unions: 150 lb. malleable iron threaded unions.
   b. Ball Valves: Carbon steel or brass construction, two piece body, chrome plated steel ball.
   c. Swing Check Valves: Carbon steel or brass body, steel swing disc, threaded ends.
   d. Swing Check Valves with Integral Pressure Relief Valves: Carbon steel body, steel swing disc, teflon seat, steel stem and springs, automatic, direct, pressure actuated at maximum 40 PSI, threaded ends, UL listed for fuel.
   e. Anti-Siphon Valves: Bronze or Brass body, brass plug, spring loaded, normally closed, threaded ends, size to resist static siphon head, UL listed for fuel. Locate on all suction lines and where shown on the drawings.
   f. Emergency Shut-Off Valves: Provide a fusible link Emergency Shut-Off Valve exterior wall penetration as indicated.
   g. Flexible Connectors: Stainless steel inner hose and braided exterior sleeve, suitable for minimum 200 psi WOG and 250 degrees F. All flexible connectors must have welded (not swaged or crimped) ends. All flexible connectors must be vacuum rated.
   h. Sight Glasses: Carbon steel or brass body, 150 psi rated glass, delrin or nylon wheel, as manufactured by Ernst or McMaster Carr. Furnish on day tank(s) supply and return to main tank and generator supply and return lines to the day tank.

E. FUEL OIL SPILL KITS

1. Manufacturers: Fuel Oil Systems and Chemtrec

2. General: Provide a spill kit contained in 2 barrels in each room that has diesel fuel storage.

3. Barrel one of the spill kit shall contain a 20 pound bag of particulate absorbent, 2 packages of absorbent “socks” 12 feet long and 100 absorbent pads. Barrel two of the spill kit shall contain 12 gallon wet/dry shop vacuum, 100 foot extension cord, 2 tarpaulins, dust pan and broom, disposal bags and ties, 1 box contractor towels, 1 box of rubber gloves, 4 pair protective glasses.

2.07 GENERATOR

A. Alternator shall be four pole revolving field, twelve lead, reconnectable, single bearing, brushless type.

B. Entire insulation system shall be Class F or better and temperature rise to be within NEMA MG-1-22.40 for all nameplate voltages at full rated load.

C. All load connections shall be made up in rear mount junction box. Generator construction to allow load connections to be made on top, bottom or either side of junction box.

D. Rotating rectifier shall employ three phase sensing. Voltage regulation shall be plus or minus 1% from no load to full load with steady state modulation of 1/2%. Voltage regulator shall be static-type and a voltage adjusting rheostat to be furnished in the control panel. Voltage change to not exceed 15% upon application of full rated load with recovery to steady state conditions within 1-second. Frequency regulation by engine governor to be within 1% steady state with a maximum 2% drop, no load to full load. Generator/regulator system shall be capable of producing 250% of a full load rated current for a minimum of 10 seconds under a three phase short circuit.

E. Provide a line circuit breaker on generator output, 3-pole, with LSI adjustable settings. Refer to drawings for additional information.

F. Provide ground fault sensing at the generator output terminals. This sensor to annunciate at the generator-mounted control panel and remote annunciator.

G. Generator shall be UL2200 listed.

2.08 GENERATOR CONTROL PANEL

A. Generator control panel shall be NEMA-1, dead front construction and includes following:
   1. A.C. ammeter (2%), with phase selector switch.
   2. A.C. voltmeter (2%), with phase selector switch.
   3. Frequency meter.
   4. Elapsed time meter.
   5. Panel illumination lamps.
   6. Voltage adjusting rheostat.
   7. Governor speed control switch.
   8. Automatic start/stop control (solid state, cycle crank, four cycles of 10-seconds rest).
   9. Mode selector switch for "off", "manual", "automatic", "test."
   10. Automatic engine shutdown with indicating lamps to indicate that a shut-down took place for:
      a. "excessive engine temperature."
      b. "low oil pressure."
      c. "overcrank" (failed to start).
      d. "overspeed."
   11. Red lamp to function when mode selector switch is in a position other than "automatic."
   12. Adjustable timer shall provide up to 30-minute unload running of engine after automatic transfer switch returns to normal. Factory to preset timer to 5 minutes unload time.
   13. Engine oil pressure gauge.
   14. Engine water temperature gauge.
   15. Battery charging ammeter.
   16. A sensor device, plus visual warning device with alarm horn and silence switch indicating "low fuel level", "low water temperature" and visual pre-shutdown alarms for "low oil pressure", "high water temperature", and "ground fault".
   17. Generator control panel shall be shock mounted on unit unless otherwise shown on drawings.

2.09 REMOTE ANNUNCIATOR

A. Provide solid state remote annunciator panel, storage battery powered, shall comply with NFPA 99 and NFPA 110.

B. Remote annunciator shall indicate day tank low level fuel alarm in addition to the requirements of NFPA 99 and NFPA 110.

2.10 WARRANTY

A. Provide manufacturer’s warranty for 18 months from date of shipment from factory or 12 months from startup (whichever date is later), covering parts and labor required to remedy defects in materials or workmanship for the entire generator.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Entire unit shall be installed in accordance with manufacturers’ recommendations.

B. Mounting: Complete engine/generator and all mounted accessories shall be assembled on a common channel steel base. Fuel oil lines and lube oil drain shall terminate in base. Lube oil drain line shall be brought out to beyond the base to facilitate changing of the oil. Flexible fuel line sections (18" long) to be installed between base and fuel lines. Heavy-duty, steel spring vibration isolators shall be installed between the base and mounting pad. Isolators shall be sized and located as recommended by generator manufacturer.

C. Contractor shall provide the services of a factory-trained engineer for periodic job site visits during installation to ensure that the system is being installed in accordance with manufacturers' recommendations.

D. Complete engine/generator system shall be tested after installation to ensure that the engine/generator, automatic transfer switch, alarm annunciators, and all other equipment function in accordance with the specifications. Testing shall include a full Level 1 NFPA 110 Installation Acceptance Test. Documentation of test shall be provided by the design team and Owner as part of the Contractor's close out documents.

E. After Owner acceptance, Contractor and/or vendor, shall conduct a minimum 4-hour training session in operation and maintenance for Owner's personnel. After installation, a 4-hour full load test shall be conducted by the distributors' engineer. This test shall be conducted using available building load, plus temporary load bank capacity so that full nameplate reading is utilized during test. Temporary load banks shall be furnished by generator distributor and connected by Division 26 contractor. Test data shall be recorded and become a part of the three (3) Owners Manuals to be supplied.

F. Contractor shall receive, store, uncrate and temporarily connect resistive type load(s) furnished by the generator supplier for full-load testing of the system. After completion of this testing, the Contractor shall disconnect, crate and load for shipment, the temporary load banks.

G. Ground the engine generator frame and enclosure in accordance with the NEC.

END OF SECTION 26 32 13

SECTION 26 36 00

TRANSFER SWITCHES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide automatic transfer switch(es) as shown on the drawings.

1.02 RELATED SECTIONS

A. Section 26 09 13 – Energy and Resource Metering

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide automatic transfer switch as manufactured by ASCO, Cummins or Zenith.

2.02 EQUIPMENT

A. Switch shall be UL listed and CSA certified. It shall meet the voltage impulse withstand test in accordance with the proposed NEMA Standard 109ICS-109.21 and voltage surge withstand capability in accordance with ANSI C37.90A/IEEE 472. Switch(es) shall have ampere rating and voltage rating as shown on drawings.

B. Transfer switch(es) to be in NEMA-1 wall-mounted enclosures unless otherwise indicated. All control relays to be accessible from front of enclosure for maintenance and repair. Transfer mechanism to be electrically operated, mechanically held. Failure of the emergency source shall result in retransfer to the normal source. The transfer switch to be equipped with a manual operator to allow for manual transfer.

C. Engine starting contacts to be provided to start engine, should the voltage of the normal source drop below the preset value, after a time delay of 1-3 seconds to allow for momentary dips. Coordinate all wiring and raceway requirements with generator manufacturer.

D. After restoration of normal power, transfer switch shall remain in emergency position for an adjustable period of 0-30 minutes (set for 15 minutes unless directed otherwise). After retransfer to normal, engine/generator to continue to run for an adjustable period of 0-20 minutes to allow for cool down. A voltage/frequency relay to be provided to prevent transfer to the emergency source until operating level is attained.

E. In addition to position indicating lamps, auxiliary contacts to be provided (one normally open, one normally closed).

F. Provide test switch to simulate a power failure, under load conditions.

G. Provide an automatic exerciser to operate the unit for a period of 30 minutes every 168 hours. During exercise period, transfer switch(es) shall not transfer to the emergency source.

H. Transfer switches used with ground-fault equipment, 4-wire systems to be 4-pole switched neutral.

I. Switch(es) to be double throw actuated by a single operator, momentarily energized. Main contacts may be replaced without major disassembly. Transfer switch(es) with magnetic blow outs to be provided on each pole.

J. Normal voltage sensing to be on 3-phase with pick-up at 95 percent and drop-out at 90 percent of normal voltage.

K. Interlocked molded case circuit breakers, contactors or transfer devices with dual solenoid operators are not acceptable.

L. All transfer switches shall be delayed/programed transition unless otherwise noted.

M. Switches shall have provisions for manual transfer with cabinet doors closed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Switch shall be installed as shown on the drawing complete with all controls for engine starting and transfer.

B. All transfer switch adjustable settings shall be coordinated with the Owner and design team as part of the equipment start-up process.

END OF SECTION 26 36 00

SECTION 26 41 13
LIGHTNING PROTECTION FOR STRUCTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contractor shall provide all labor, materials and items of service required for the completion of a functional and unobtrusive system of air terminals, conductor, grounds and other components necessary for the protection of the building against damage by lightning.

B. The system shall be completely concealed where possible, with only the air terminals and roof conductor visible, and complying in all respects with the following Standards:
   1. Underwriters' Laboratories, Inc. - No. UL96A.
   2. National Fire Protection Association - No. NFPA780.
   3. Lightning Protection Institute-No. LPI-175.

1.02 QUALITY ASSURANCE

A. The installing contractor shall be actively engaged in the installation of lightning protection systems and shall be listed and published by Underwriters' Laboratories as such at www.ul.com, under “Certifications” (Category Code OWAY). He shall have a minimum of five years experience in this work.

B. The installing contractor shall be a Lightning Protection Institute Certified Master Installer as recognized and published at www.lightning.org.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials used shall be new and be the product of a manufacturer member of Lightning Protection Institute, approved and labeled by Underwriters Laboratories (UL96 Standard).

B. Cable downlead conductors, terminals and fittings at the roof line shall be aluminum and all components below the roof line shall be copper. When structural steel is utilized as the downlead system an aluminum cable connection below the roof to the top of the steel is acceptable.

C. All conductors, terminals and fittings shall be copper or bronze.

D. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the project include, but are not limited to the following:
   1. Erico, Inc.
   2. Preferred Lightning Protection.
   3. National Lightning Protection.

PART 3 EXECUTION

3.01 INSTALLATION

A. Submit a list of materials and system shop drawings to Architect for review. System design shall be by a certified Lightning Protection Institute Master Installer/Designer.

B. Install lightning protection components and system in accordance with NFPA 780, UL96A and LPI-175 Standards. Electrical service entrance surge protection device(s) (SPD) shall meet the requirements of UL96A, Para. 13.1.

C. Do not combine incompatible metals. Acceptable metal combinations shall be in accordance with UL96A Follow Up and Inspection Instructions.

D. Coordinate installation of lightning protection system with other building systems and components including electrical wiring, supporting structures, building materials/finishes and HVAC metal bodies requiring strike termination devices (air terminals) and/or bonding to the system.

E. Coordinate installation of strike termination devices and cable fasteners with roof system(s) manufacturer and roofing contractor.

F. Provide NFPA-780 Potential Equalization for buildings exceeding sixty (60’) feet in height above grade.

G. Lightning protection system shall be bonded to the building's grounding electrical system per Article 250 of NFPA 70.

H. A UL Master Label Certificate shall be furnished for new structures with no connections to existing structures.

I. A UL Certificate of Inspection shall be furnished for new structures connected to existing structures where the connection between them (at all elevations) meets UL requirements for firewalls and fire doors.

J. Per the Florida Building Code, where the new lightning protection system is connected to the existing system, the existing system shall be inspected and brought into compliance with current standards.

END OF SECTION 26 41 13

SECTION 26 43 13
(TVSS) TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide 3-phase, 4-wire Surge Protective Devices (SPDs) at electrical panels as indicated on the panelboard schedules and on the riser diagram.

B. Provide single-phase type SPDs to protect specific circuit as scheduled or noted on the drawings.

C. Provide individual circuit surge protection devices, as required by the Florida Building Code, for all circuits exiting or entering the building structure.

1.02 RELATED WORK

A. Section 26 24 16 - Panelboards.

B. Section 26 24 13 - Switchboards

C. Section 26 05 26 – Grounding and Bounding for Electrical Systems.

D. Section 26 41 13 – Lightning Protection for Structures

1.03 STANDARDS

A. UL compliance: Listed to UL 1449 current edition by an OSHA approved Nationally Recognized Test Lab (NRTL)

B. ANSI/IEEE compliance: Comply with ANSI/IEEE test procedures.

C. National Electric Code - Section 280 and 285.

D. UL96A.

E. NFPA 760.

1.04 SUBMITTALS

A. Submit product data and shop drawings as required by Section 26 05 00.

B. Submittals shall include the following:
   1. Complete manufacturers' data for each suppressor indicating part numbers and rated voltages and currents.
   2. Product performance analysis with graphic display of let-thru waveforms and peak clamping voltages for ANSI C62.41 tests, Categories A3 & B3 ringwaves and C1 & C3 impulses.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. SPDs shall be as manufactured by Square D, per HCA's purchasing agreement..
   1. Contact is as follows:
      Jess Hoover, Charlie Shannon
      Graybar-Nashville
      825 8th Avenue South
      Nashville, TN 37217
      HCA@graybar.com
      239-494-2088
      615-743-3226
      HPG Contract No. 5892

B. The suppressor manufacturer shall offer factory repair service for all units, which will include replacement for non-repairable sealed units.

2.02 WARRANTY

A. SPD devices shall be warranted for a minimum of 10 years.

2.03 SPECIFICATIONS

A. General:
1. SPD shall be internally fused, capable of allowing the suppressor's maximum rated transient current to pass through the suppressor without fuse operation. SPD shall be listed as a Type1 SPD without the need for upstream over current protection for safe operation.
2. Proper operation of the suppressor elements on each phase shall be indicated by a normally-on LED or lamp. Also, normally closed contacts shall be used for remote annunciation of suppressor failure.
3. The SPD shall be compatible with the electrical system voltage, current, and distribution configuration.
4. The SPD maximum continuous operating voltage shall be 115% of the nominal RMS voltage with no degradation. The MCOV value shall be a tested value as outlined in UL1449. The MCOV shall not be a claimed value based solely on the MCOV of the surge component used in the design, nor based solely on the 115% over voltage test outlined in UL1449.
5. The SPD shall be sine-wave tracking to provide added protection against oscillatory transients, such as Category A and B Ringwaves.
6. Failure of the SPD shall not cause any disruption of power.
7. Unit shall operate without the need for an external overcurrent protection device and be listed as such.
8. Protection Models – The SPD multi protect all models if the electrical system being utilized.

B. Service Entrance SPD Devices:
1. The SPD shall have a surge current capacity of 100,000 amps (8 x 20 microsec) minimum per mode.
2. SPD devices shall meet or exceed the following operating characteristics and ratings: (Series Ratings)
3. The SPD shall be a Type1 listed SPD per UL1449.
4. The SPD shall meet the requirements of UL96A.
5. The unit shall not have more than 10% deterioration or degradation of the UL1449, 3rd Edition Voltage Protection Rating (VPR) due to repeated surges. Acceptable clamping values are shown below based on test procedures outlined in UL1449.

System Voltage	Mode	MCOV	UL 1449 Fourth Edition VPR Rating
120/208	L-G		800
	N-G		800
	L-L		1200
277/480	L-N	320	1200
	L-G	320	1200
	N-G	0	1200
	L-L	550	2000

C. Distribution Panel SPD Devices:
1. The SPD shall have a surge current capacity of 60,000 amps (8 x 20 microsec) minimum per mode.
2. SPD devices shall meet or exceed the following operating characteristics and ratings: (Series Ratings)
3. The SPD shall be a Type1 or Type2 SPD per UL1449.

4. The unit shall not have more than 10% deterioration or degradation of the UL1449, Voltage Protection Rating (VPR) due to repeated surges. Acceptable clamping values are shown below based on test procedures outlined in UL1449.

System Voltage	Mode	UL 1449 Fourth Edition VPR Rating
120/208	L-G	800
	N-G	800
	L-L	1200
277/480	L-N	1200
	L-G	1200
	N-G	1200
	L-L	2000

PART 3 EXECUTION

3.01 WORK INCLUDED

A. The SPD shall be internally mounted to the panelboard or switchboard. Individual circuit devices may be installed external to the panelboard.

B. Ground the SPDs and cabinets in accordance with the manufacturer's instructions, the National Electrical Code (section 280 and 285), and wiring diagrams shown on the drawings.

C. Provide wiring to the remote monitor(s) in accordance with the manufacturer's instruction and as shown on the drawings.

D. The SPD shall not include multiple replacement modules.

E. All conductors associated with SPDs shall be installed in conduit. Minimum conductor size shall be #8 AWG copper. Conductors shall be as short and as straight as possible with no unnecessary length or turns. A maximum length of 12 inches is required where possible.

F. SPDs shall be connected in parallel with main conductors. Service entrance SPDs shall incorporate the use of an internally mounted disconnect. Panelboard surge protectors shall be installed behind a overcurrent/disconnecting device. Where 12 inches of lead length is not possible utilization of a low impedance preassembled cable assembly is required to lower the clamping voltages of the installed system to acceptable levels. Lead length must include phase connection plus neutral or ground.

G. Mounting position of the SPD and overcurrent protection device shall be coordinated to minimize the total phase, neutral and ground cable lengths to achieve minimum installed system clamping voltages.

END OF SECTION 26 43 13

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, material, equipment and services necessary to provide all interior lighting fixtures, necessary hangers and lamps. Fixtures include all interior fixtures plus all exterior fixtures mounted to exterior wall or to structures connected directly to building.

1.02 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete fixture lists of fixtures proposed to be used. Include cuts of both specified fixture and proposed equivalent fixtures if fixtures other than those specified are submitted.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lighting fixtures shall be by Acuity, per HCA's purchasing agreement.
   1. Contact:
      Toneah Ley
      Acuity Brands
      toneah@delighlight.net
      615-329-6700

B. Provide lighting fixtures indicated by type on lighting fixture schedule on drawings.

C. Electrical contractors must contact Graybar Electric Supply TN for all lighting fixture and lighting control quotations. Fixtures are to be quoted and ordered through Graybar Electric Supply Nashville without exception.
   1. Contact:
      Charlie Shannon
      Graybar-Corporate Accounts
      HCA@graybar.com
      615-743-3226
      HPG Contract No. 5892

2.02 EQUIPMENT REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Standards:
   1. ENERGY STAR certified.
   2. California Title 24 compliant.
   3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
   4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
   5. UL Listing: Listed for damp location.
   6. Recessed luminaires shall comply with NEMA LE 4.
   7. User Replaceable Lamps:
      a. Bulb shape complying with ANSI C78.79.
      b. Lamp base complying with ANSI C81.61.

C. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

D. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

E. Provide luminaires from a single manufacturer for each luminaire type.

F. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

G. Rated lamp life of 50,000 hours to L70.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Comply with NECA1.

B. Fixtures shall be securely mounted as required by Section 410, NEC and as specified herein.

C. Fixtures mounted in a suspended ceiling shall be secured to the grid with approved clips as required by the NEC.

D. Fixtures shall be mounted in locations as shown on architectural reflected ceiling drawings.

E. Mount fixtures as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact type.

F. Receive, store, uncrate, and install lighting fixtures shown in schedule on drawings to be furnished by others.

G. Recessed fixtures in dropped ceiling areas shall be connected using Greenfield and No. 14 THHN wire. Greenfield shall be connected to fixture and outlet box. Each piece of Greenfield shall include in it a separate insulated green grounding conductor not smaller than No. 14 AWG for grounding continuity between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and shall be electrical continuous. No conduit shall enter a recessed fixture directly as this would prevent removal of fixture without disturbing balance of circuit.

H. Joints in fixture wiring shall be made using wire nuts, preinsulated Scotch locks, Ideal No. 30-410 crimps and No. 30-415 wrap caps, or other approved mechanical means of connection.

I. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of Owner.

J. Any adjustable outside area lights or lights mounted on building shall be adjusted at night by the contractor to satisfaction of Owner.

K. Recessed fixtures installed in exposed or concealed tee bar ceilings may not use ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework per NEC Article 410, and shall be supported as described in seismic detail.

L. All light fixtures shall be grounded in accordance with the NEC. Any fixtures suspended from ceiling which do not include a separate ground wire shall be grounded in a method approved by section 250 of the NEC. Where the conduit is utilized as the ground with a hook pendant style mounting system, a separate ground conductor shall be bonded to the conduit where the conduit ceases to be continuous and routed to the fixture.

END OF SECTION 26 51 00

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials, equipment and services necessary for installation of all exterior lighting fixtures, lamps, poles, pole bases etc. for:
   1. Parking lot and access roads.
   2. Exterior signage.
   3. Walkways and exterior building lights.

B. Refer to details and arrangements shown on drawings.

C. Provide concrete bases for pole manufacturers as required, refer to details for additional information.

D. Provide concrete base for bollards, flood lights, etc. as required for manufacturers recommended installation on grade or in landscaped areas.

E. Fixtures, poles, and appurtenances, shall be suitable for exterior use, shall be UL listed, and shall be of standard design for intended application.

1.02 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete shop drawings and brochures including photometrics for each type of exterior lighting system specified. Shop drawings and brochures shall be specific and shall include all pertinent data and accessories. If substitute fixtures are proposed, include cuts of both specified fixture and proposed equivalent fixtures including photometrics of both fixtures.

B. If requested by Architect or Designer, submit a sample fixture which will be returned after inspection by Architect or Designer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lighting fixtures shall be by Acuity, per HCA's purchasing agreement.
   1. Contact:
      Toneah Ley
      Acuity Brands
      toneah@delighlight.net
      615-329-6700

B. Provide lighting fixtures indicated by type on the lighting fixture schedule on drawings.

C. Electrical contractors must contact Graybar Electric Supply in Nashville, TN for all lighting fixture and lighting control quotations. Fixtures are to be quoted and ordered through Graybar Electric Supply Nashville without exception.
   1. Contact:
      Charlie Shannon
      Graybar – Corporate Accounts
      HCA@graybar.com
      615-743-3226
      HPG Contract No. 5892

D. Contactors and selector switches shall be Square D.

E. Lighting Contactors: Square D.

2.02 MATERIALS

A. Provide luminaire and pole assemblies as scheduled.

B. Luminaires, including all components, shall be designed to meet extreme temperature (low), moisture, and wind conditions in area.

C. Poles: Aluminum, round, designed for wind load in the area of installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install parking lot/roadway luminaires and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaires to correct tilt and lamp all fixtures.

B. Adjust or rotate area and roadway lighting at night to maximize light utilization in intended areas.

C. Contractor to adjust or rotate area and roadway lighting at night to maximize light utilization in intended areas.

D. Ground all luminaires to poles and all poles to equipment grounding conductor or to separate 3/4" diameter x 10' copperweld ground rod driven at base of each pole.

E. Each pole mounted outside lighting luminaire shall have its conductors spliced to the branch circuit connectors in the pole base. Provide a Tron waterproof fuse holder with time delay fuse (1.5 X luminaire current) in the pole base for each ungrounded conductor for each luminaire.

END OF SECTION 26 56 00

SECTION 26 70 00

CONNECTION TO OWNER FURNISHED EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Owner-furnished equipment such as X-ray Equipment, Sterilizers, Blood Refrigerator and Alarm, Surgical Lights, Surgical Light Controllers, Laboratory Equipment, etc, shall be connected by this Contractor in accordance with manufacturers brochures and instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Conduit, wire, outlet boxes, disconnect switches, etc. to be provided and installed by this contractor to conform with applicable section of these specifications.

B. All materials and equipment shall be factory listed as complying with applicable standards of Underwriter's Laboratories, Inc. or other similarly established standards of a nationally recognized testing laboratory (NRTL) that has been certified by the Occupational Safety and Health Administration (OSHA) for that referenced standard.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical equipment as noted above shall be assembled, installed, and connected by this Electrical Contractor.

B. In Patient Care Rooms, the effectiveness of the grounding system shall be evaluated before acceptance, and a report shall be submitted for review by the engineer of record prior to final acceptance and made available at the time of AHJ inspections.

C. All equipment to be connected and left in satisfactory operating condition by the Contractor.

END OF SECTION 26 70 00

SECTION 27 00 00

GENERAL PROVISIONS FOR COMMUNICATIONS WORK

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of General Requirements/Provisions shall be considered a part of this section and shall have the same force as if printed herein full. In addition, all information related to communications infrastructure that is documented in the architectural, structural, mechanical, and electrical drawings/documents shall be included as part of the Communications documents.

1.02 QUALITY ASSURANCE

A. Specifications, Standards and Codes: All work shall be in accordance with the following:
   1. The National Electrical Code (NFPA 70) as adopted by the local AHJ
   2. American National Standards Institute (ANSI)
   3. National Electrical Manufacturers Association (NEMA)
   4. Telecommunications Industries Association (TIA)
   5. Electronic Industries Association (EIA)
   6. Institute of Electrical & Electronics Engineers (IEEE)
   7. Underwriters Laboratories (UL)
   8. American Standards Association (ASA)
   9. Federal Communications Commission (FCC)
   10. Occupational Safety and Health Administration (OSHA)
   11. American Society of Testing Material (ASTM)
   12. Americans with Disabilities Act (ADA)
   13. Local city and county ordinances governing electrical work
   14. In the event of conflicts, the more stringent provisions shall apply.

1.03 SCOPE

A. The work to be done under this section of the Specifications shall include the furnishing of labor, material, equipment and tools required for the complete installation of the work indicated on the Drawings or as specified herein.

B. All materials, obviously a part of the Communications Infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished and installed without additional charge.

C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the engineer shall be notified of the discrepancy.

1.04 WORK INCLUDED

A. The Communications Infrastructure installed and work performed under this Division of the Specifications shall include but not necessarily be limited to the following:

B. Voice/Data Cabling Infrastructure

C. CATV Cabling Infrastructure System

D. CATV Cabling Distribution System

E. Audio-Visual Systems

F. Satellite Distribution System

G. Overhead Paging System

H. Wireless Access System

I. Nurse Call System

J. Emergency Call System

K. Patient Wandering System

L. Emergency Phones / Call Boxes

M. Low Voltage & Communications conduits, raceways, cable tray, racks, cabinets and equipment mounting boards

N. Grounding and Bonding

O. Underground raceway excavation, backfill, and compaction

P. Concrete work for duct banks, maintenance holes, handholes, vaults and restoration (where applicable)

1.05 DEFINITIONS

A. Terms: The following definitions of terms supplement those of the General Requirements and are applicable to Division 27 - Communications:

B. Provide: As used herein shall mean “furnish, install and test (if applicable) complete.”

C. Infrastructure: As used herein shall mean cable, conduit, raceway, cable tray or j-hooks with all required boxes, fittings, connectors, and accessories; completely installed.

D. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

1.06 DRAWINGS

A. Drawings are generally diagrammatic and show the arrangement and location of pathways, outlets, support structures and equipment. The Contractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, the Contractor shall so advise the Engineer and secure approval before proceeding with such work.

B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Contractor shall request shop drawings, equipment location drawings, foundation drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.

C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

D. The right is reserved to make reasonable changes in locations of equipment indicated on Drawings prior to rough-in without increase in contract cost.

E. The Contractor shall not modify the size or number of conduit runs indicated on the Drawings without the written approval of the Engineer.

F. Any work installed contrary to Contract Drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.

G. The location of equipment, support structures, outlets, and similar devices shown on the Drawings are approximate only. Do not scale Drawings. Obtain layout dimensions for equipment from Architectural plans unless indicated on Communications plans.

H. Schematic diagrams shown on the Drawings indicate the required functions only. The technology of a particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic Drawings shown. Additional labor and materials required for such deviations shall be furnished at the Contractor's expense.

I. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering cabling and associated hardware. Notify the Engineer of any discrepancies or potential conflicts which may inhibit the completion of the specified work.

J. Review all architectural drawings for modular furniture. The contractor is not relieved of his/her responsibilities due to improper coordination. If the contractor feels they do not have the proper construction drawings in order to properly coordinate their work, they must request them of the owner, architect, engineer, or General Contractor.

K. Portions of these Drawings and Specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as “the Contractor shall,” “shall be,” “as indicated on the Drawings,” “In accordance with,” “a,” “the” and “all are intended” shall be supplied by inference.

1.07 SUBMITTALS

A. Submit for approval, details of all materials, equipment and systems to be furnished. Work shall not proceed without the Owner and/or the Designer’s approval of the submitted items. The contractor shall supply one (1) in electronic PDF format consisting of COMPLETE BROCHURES AND SHOP DRAWINGS OF ALL MATERIALS, HARDWARE, COMPONENTS AND EQUIPMENT:
   1. Submittals for individual systems and equipment assemblies that consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered, reviewed or stored, and such submittals will not be returned except at the request and expense of the Contractor.
   2. Materials, hardware or components to be used complete the work identified must be clearly identified with a bold arrow or circle on each individual cutsheet. The submittal will be rejected without the proper identification.
   3. Contractor shall generate shop drawings. Modify reviewed and accepted shop drawings to include revisions based upon completion of work. Submit shop drawings with record drawings on hard copy.
   4. Shop drawings shall include equipment racks, patch panels, termination blocks, connection details, rack mounting details and any other details not included in the construction drawings.

B. Any materials and equipment listed that are not in accordance with Specification requirements may be rejected.

C. The approval of material, equipment, systems and shop drawings is a general approval subject to the Drawings, Specifications and verification of all measurements at the job. Approval does not relieve the Contractor from the responsibility of shop drawing errors. The Contractor shall carefully check and correct all shop drawings prior to submission for approval.

1.08 QUALITY ASSURANCE

A. Equipment and materials required for installation under these Specifications shall be the current model and new (less than one [1] year from the date of manufacture), unused and without blemish or defect.

B. Equipment shall bear labels attesting to Underwriters Laboratories, where subject to label service. Manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Owner, be able to furnish proof of their ability by submitting affidavits and descriptive data about their product including size and magnitude comparable to requirements specified herein.

1.09 CONTRACTOR QUALIFICATIONS

A. The Contractor shall have total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications. The Contractor shall be a company specializing in the design, fabrication and installation of integrated communications systems.

B. Communications Systems specified shall be installed under the direction of a qualified Contractor. Qualification requirements shall include submittal by the Contractor to the Architect of the following:
   1. List of previous projects of this scope, size and nature; including names and sizes of projects, description of work, time of completion and names of contact persons for reference.
   2. Shall certify that they are manufacturer-authorized for work to be performed.

C. Contractor must employ at least one (1) full-time Registered Communications Distribution Designer (RCDD). The RCDD shall be a W2 employee and not a subcontractor.

D. Contractor must employ at least one (1) full-time certified Crestron programmer. The Crestron programmer shall be a W2 employee and not a subcontractor.

1.10 COORDINATION WITH OTHER TRADES

A. The Contractor shall coordinate communications work with that of other sections as required to ensure that the entire communications work will be carried out in an orderly, complete and coordinated fashion.

1.11 SITE INVESTIGATION

A. Prior to submitting bids of the project, visit the site of the work to become aware of existing conditions that may affect the cost of the project. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems, shall be restored to their original condition before the completion of this project.

1.12 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

1.13 RENOVATIONS AND ADDITIONS

A. All work that would adversely affect the normal operation of the other portions of the Owner's property shall be done at a time other than normal working hours. Normal working hours shall be considered 8 a.m. to 5 p.m. Monday through Friday.

B. Prior to submitting bids on the project, visit the site of the work to become aware of existing conditions that may affect the cost of the project.

C. Where work under this project requires extension, relocation, reconnections or modifications to existing equipment or systems, the existing equipment or systems shall be restored to their original and operating condition. Remove all equipment indicated to be demolished, including outlets, devices, raceways and support structures.

D. Care shall be exercised in the removal and storage of equipment indicated to be relocated or removed and reused. Prior to placing back into service, equipment shall be cleaned, and marred or chipped paint surfaces touched-up.

E. Provide all coring, cutting and patching to existing walls, floors, etc., required for the removal of existing work or the installation of new work.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval, similar equipment of other manufacturers as substitution. The Engineer's decision as to whether the submitted equipment is acceptable shall be final and binding.

B. All changes necessary to accommodate the substituted equipment shall be made at the Contractor's expense, and shall be as approved by the Engineer. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.

C. If substitutions are made in lieu of device specified; form, dimension, design and profile shall be submitted to the Engineer for approval.

D. Submit request for approval of substitute materials in writing to the Architect at least ten days prior to bid opening.

2.02 MATERIALS

A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories Inc. or certification by other recognized laboratory.

B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), and the American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.

C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.

D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.

E. Components of an assembled unit need not be products of the same manufacturer, but must offer a certified end-to-end solution.

F. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.

G. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 EXECUTION

3.01 EXAMINATION OF CONDITIONS

A. Prior to the start of work, the Contractor shall carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

B. Install equipment in accordance with applicable codes and regulations, the original design and the referenced standards.

C. In the event of a discrepancy, immediately notify the Project Manager.

D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.02 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.

B. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.

C. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.

D. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the Contract Documents. Decision of the Project Manager shall be final.

E. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.03 ACCESS TO EQUIPMENT

A. Equipment shall be installed in location and manner that will allow convenient access for maintenance and inspection.

B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.

C. Where the Project Manager determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Project Manager, at no additional cost to the Owner. “Conveniently accessible” is defined as being capable of being reached without the use of ladders

or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.

3.04 CLEANING

A. During construction, and prior to Owner acceptance of the building, remove from the premises and dispose of packing material and debris caused by communications work.

B. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

3.05 COMPLETION

A. General: Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.

B. Results Expected: Systems shall be complete and operational and controls shall be set and calibrated. Testing, start-up and cleaning work shall be complete.

C. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered to the Owner.

3.06 TESTING AND VERIFICATION

A. See specific Division 27 sections for testing parameters of sub-systems.

B. The Contractor shall verify that requirements of this Specification are met. Verification shall be through a combination of analyses, inspections, demonstrations and tests, as described below.

C. Verification by inspection includes examination of items and comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the Specifications. Inspection may require moving or partially disassembling the item to accomplish the verification, included as part of the work at no additional cost to the Owner.

D. The Contractor shall verify by formal demonstrations or tests that the requirements of this Specification have been met. The Contractor shall demonstrate that the communications systems, components and subsystems meet Specification requirements in the “as-installed” operating environment during the “System Operation Test.” Even though no formal environmental testing is required, the Contractor shall measure and record temperature, humidity and other environmental parameters and the environmental conditions, which were encountered during the “System Operation Test.”

E. The Contractor shall carefully plan and coordinate the final acceptance tests so that tests can be satisfactorily completed. The Contractor shall provide necessary instruments, labor and materials required for tests, including the equipment manufacturer's technical representative and qualified technicians in sufficient numbers to perform the tests within a reasonable time period.

F. The Contractor shall satisfy all items detailed in the final acceptance check-off list (punch list). The list shall be a complete representation of specified installation requirements. At the time of final acceptance punch list items shall be corrected until the system is found to be acceptable to the Owner and the Project Manager.

G. After the Contractor systems have been installed and tested, the completed test plan shall be signed by the Communications Contractor Project Manager and submitted for approval.

END OF SECTION 27 00 00

SECTION 27 05 00

COMMON WORK RESULTS FOR TELECOMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. The requirements contained in this Section apply to all Section of this Division.

B. Section Includes:
   1. Common terminology
   2. Submittal requirements used throughout this Division.
   3. Communication equipment coordination and installation.
   4. Contractor Qualifications
   5. Attachment A for Low Voltage Bid Form.

1.02 DEFINITIONS

A. AHJ: Authorities Having Jurisdiction.

B. ITG: Information Technology Group. Owner's IT representative.

C. RCDD: Registered Communications Distribution Designer

D. BICSI: Building Industry Consulting Service International

E. TIA: Telecommunications Industry Association

F. ANSI: American National Standards Institute

G. NEC: National Electrical Code

H. UTP: Unshielded twisted pair

I. EMT: Electrical metallic conduit

J. WAP: Wireless Access Point

K. Telecommunication Space: Room or space dedicated to serving telecommunication equipment and infrastructure.

L. HORIZONTAL CABLING: Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the Telecommunication Space.

M. ITG: HCA IT Group. Owner IT representative.

1.03 SUBMITTAL PROCEDURES

A. Common Requirements for Submittals:
   1. Provide product data submittals as required under Division 01 Section "Submittal Procedures".

B. Common Requirements for Shop Drawings:
   1. Provide product data submittals as required under Division 01 Section "Submittal Procedures".
   2. Submit hardcopy of Shop Drawings in the quantity as required under Division 01 Section "Submittal Procedures".
   3. In addition to Shop drawings required by Division 01 provide the following shop drawings and leave within the Telecommunication space:
      a. Provide one copy of Shop Drawings in electronic format. Files shall include both AutoCAD compatible source files (.dwg) and files printed to Portable Document Format (.pdf). Files to be stored on a portable disc labeled "Maitland FSER Telecommunications as Built Drawings".
      b. Provide one hard copy of Shop Drawings. Pages shall be neatly folded and located within a folder labeled "Maitland FSER Telecommunications as Built Drawings".
   4. Shop Drawings shall be of appropriate scale but shall not be smaller than a scale of 1/4-

inch equals one foot.

5. Shop drawings shall include all telecommunication devices.

1.04 QUALITY ASSURANCE

A. Contractor shall be, with no exception, a current Belden certified partner and familiar with working in a healthcare environment. A list for current preapproved contractors for each project can be received by contacting HCA's Belden representative:

1. Jake Jordan
   Jake.Jordan@belden.com
   513.520.0016

B. Sub-subcontracting by the Division 27 subcontractor is not permitted. Awarded contractor's personnel shall perform all work.

C. Common Requirements for Material Quality: Materials, equipment and devices shall be new and be free from defects.

D. Common Requirements for Code Compliance: In case where differences occur between building codes, state laws, local ordinances, industry standards, utility company regulations and the contract Documents, the most stringent shall govern. Perform the following:

1. Promptly notify the Architect in writing of any such difference.
2. Obtain approval from Architect before proceeding with the Work.
3. Should the Contractor perform any work that knowingly does not comply with local codes, laws and ordinances, industry standards, or other governing regulations; the Work shall be corrected at no cost to the Owner.

1.05 UNIT PRICES

A. Contractor shall be, with no exception, a current Belden certified partner and familiar with working in a healthcare environment. A list for current preapproved contractors for each project can be received by contacting HCA's Belden representative:

Jake Jordan
Jake.Jordan@belden.com
513.520.0016

B. Sub-subcontracting by the Division 27 subcontractor is not permitted. Awarded contractor's personnel shall perform all work.

C. Provide pricing breakdown showing unit pricing for material and labor for each type of system installed along with bid documents. An example Appendix A form is included at the end of this section.

1. Match all part numbers to those used in the project and called out with in the Division 27 specifications.
2. Unit Pricing for material to include part numbers for each item proposed.
3. An Electronic copy of the Appendix A can be requested through:
   a. Matt Dunaway
      matt.dunaway@hcahealthcare.com

D. Material Sourcing/Pricing. Healthcare Corporation of America (HCA), has a group pricing arrangement for all low voltage and structured cabling materials through HealthTrust Group Purchasing (HPG), with vendor Accu-Tech (http://www.accu-tech.com/).

1. The Contractor shall utilize Accu-Tech for all pricing of materials. Accu-Tech's HPG Contract #6715. Only when previous approvals have been made should you purchase outside of HPG pricing.
2. Accu-Tech contact: Tim Flannagan, Director of Healthcare, 615-585-3972; tim.flannagan@accu-tech.com

1.06 COORDINATION

A. Coordinate arrangement, mounting, and support of telecommunication cable, supports and

pathway:

1. To provide for ease of access to installed equipment and cable.
2. To allow right of way for piping, ductwork and conduit installed at required slope.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area. Work area outlet locations shall be located near an adjacent electrical outlet no more than 3 feet away and installed at the same height.

C. Any electrical devices, mechanical equipment or fixtures (e.g., water/drainage piping, ductwork, pneumatic tubing) not directly related to the support of the communications space shall not be installed in, pass through, or enter the communications space.

1.07 WARRANTY

A. Special Warranty: BELDEN standard form in which manufacturer agrees to repair or replace components of telecommunications equipment and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Twenty Five years parts and labor from date of Substantial Completion.
2. Contact Mr. Alan Halloy at 770.542.8811 alan.halloy@belden.com, at 50% project completion, to schedule a site visit.

1.08 COMMON REQUIREMENTS FOR TELECOMMUNICATIONS INSTALLATION

A. All materials, equipment and devices shall be installed in accordance with the recommendations of the manufacturer.

B. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period

C. Comply with NECA 1 - Standard Practices for Good Workmanship in Electrical Construction, as published by the National Electrical Contractors Association.

D. Use certified technicians and installers skilled in their respective trades.

1.09 EXAMPLE ATTACHMENT A

ATTACHMENT A			
STRUCTURED CABLING BID SUMMARY			
Vendor			
Contact			
Telephone			

ITG DATA/VOIP			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
ITG WAP Data Cable – CAT 6a Yellow 10GXS12004			
ITG Data/VOIP Cable – CAT 6 Black 2412010			$ -
ITG Data CAT 6 Jack – Black RV6MJKUBK-S1			$ -
ITG WAP CAT 6a Jack – Yellow RV6MJKUYL-S1			
2-Port Surface Mount Box White AX105253-EW			$ -
4 Port Faceplate White AX102249			$ -
ITG Data Patch Panels – CAT 6 RV6PPF2U48BK			$ -
ITG WAP Patch Panels – CAT 6a RVAPPF2U48BK			
Two Post Equipment Rack – 84" – BHRR194			$ -
Four Post Equipment Rack – 84" – XDR8419-3M62836			
Horizontal Wire Management – BHH192U			$ -
Vertical Wire Management 3" – BHVHH03			$ -
Vertical Wire Management 6" – BHVHH06			$ -
Telecommunication Space Overhead Cable Tray 18"			$ -
Overhead Cable Tray Mounting Accessories			$ -
Misc material (Blanks, Labels, Grounding, Etc.)			$ -
Material Total	$ -		
Labor Total			
Tax	$ -		
ITG Data/VOIP TOTAL	$ -		

UNIT PRICES				
		ON SITE DURING CONSTRUCTION		RETURN TRIP REQUIRED AFTER CONSTRUCTION
SLEEVES & CABLE SUPPORTS				
COMPONENT	QUANTITY	UNIT PRICE		TOTAL PRICE
One Jack Outlet				$ -
Two Jack Outlet				$ -
Three Jack Outlet				$ -
Four Jack Outlet				$ -
Misc Material (Hardware, Labels, Etc.)				$ -
Material Total	$ -			
Labor Total				
Tax	$ -			
SLEEVES & CABLE SUPPORT TOTAL	$ -			

CATV			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
CATV Data Cable – CAT 6 Blue 2412006			$ -
CATV Data CAT 6 Jack – Blue RV6MJKUBL-S1			$ -
CATV Coax Cable - RG6 5339Q5			$ -
4 Port Faceplate White AX102249			$ -
CATV Data Patch Panels – CAT 6 RV6PPF2U48BK			$ -
Horizontal Wire Management – BHH192U			$ -
Material Total	**$ -**		
Labor Total			
Tax	**$ -**		
CATV TOTAL	**$ -**		

NURSE CALL			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
Nurse Call Data Cable "A" 1212005			$ -
Nurse Call Data Cable "B" 5000UE			$ -
Nurse Call Data Cable "C" 5501UE			$ -
Material Total	**$ -**		
Labor Total			
Tax	**$ -**		
NURSE CALL TOTAL	**$ -**		

PHYSIOLOGICAL MONITORING			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
PM Data Cable – CAT 6 Orange 2412003			$ -
PM Data CAT 6 Jack – Orange RV6MJKUOR-S1			$ -
4 Port Faceplate White AX102249			$ -
PM Data Patch Panels – CAT 6 RV6PPF2U48BK			$ -
Horizontal Wire Management – BHH192U			$ -
Material Total	**$ -**		
Labor Total			
Tax	**$ -**		
PHYSIOLOGICAL MONITORING TOTAL	**$ -**		

OVERHEAD PAGING			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
18 AWG 2 Conductor Speaker Cable 5300UE			$ -
1x2 Lay in Ceiling Speaker			$ -
Cut in style Speaker with Back Can			$ -
Wall Mounted Volume Control			$ -
Amplifier 100 Watts			$ -
Misc Material (Hardware, Labels, Etc.)			$ -
Material Total	**$ -**		
Labor Total			
Tax	**$ -**		
OVERHEAD PAGING TOTAL	**$ -**		

CCTV			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
CCTV Data/VOIP Cable – CAT 6 Black 2412010			$ -
CCTV Data CAT 6 Jack – Black RV6MJKUBK-S1			$ -
2-Port Surface Mount Box White AX105253-EW			$ -
CCTV Data Patch Panels – CAT 6 RV6PPF2U48BK			$ -
Horizontal Wire Management – BHH192U			$ -
Material Total	**$ -**		
Labor Total			
Tax	**$ -**		
CCTV TOTAL	**$ -**		

DIVISION TOTALS		
DIVISION 27	SECTION NUMBER	SECTION TOTALS
ITG DATA/VOIP		$ -
SLEEVES & CABLE SUPPORTS		$ -
OVERHEAD PAGING		$ -
CATV		$ -
CCTV		$ -
PHYSIOLOGICAL MONITORING		$ -
NURSE CALL		$ -
DIVISION 27 TOTAL		$ -

HOURLY LABOR RATES		
COMPONENT	ON SITE DURING CONSTRUCTION	RETURN TRIP REQUIRED AFTER CONSTRUCTION
Regular Time/HR		
Overtime/HR		
Holiday Time/HR		

END OF SECTION 27 05 00

SECTION 27 05 26

GROUNDING AND BONDING FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section **provides all services, labor, materials, tools, and equipment required for the complete and proper installation of telecommunications grounding and bonding for the Structured Cabling System as called for in these specifications and related drawings.** Includes:
   1. Bonding conductors.
   2. Grounding connectors.
   3. Grounding busbars.

B. Related Sections:
   1. Section 260526 "Grounding and Bonding for Electrical Systems" for main grounding conductor types/sizes, grounding rods, grounding clamps and testing.

1.02 SYSTEM DESCRIPTION

A. **Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Bonding and grounding systems within the building are to have one electrical potential. Telecommunications grounding and bonding infrastructure shall start at the electrical service entrance ground and extend to all the metal telecommunications equipment.**

1.03 DEFINITIONS

A. BCT: Bonding Conductor for Telecommunications. BCT bonds the TMGB to the AC electrical service entrance.

B. **TBB (Telecommunications Bonding Backbone): An insulated copper conductor that bonds all TGBs in the TDR communications spaces with the TMGB in the TEC (i.e. MDF) communications space.**

C. TEBC: Telecommunications Equipment Bonding Conductor. TEBC bonds the equipment racks, cable tray and other metal components inside the Telecommunication space to the TMGB **or TGB as applicable**.

D. TMGB: Telecommunications main grounding busbar.

E. **TGB: Telecommunications grounding busbar.**

1.04 SUBMITTALS

A. **Submit product data for the following:**
   1. **TGB.**
   2. **TMGB.**
   3. **Two-hole and one-hole (with backstop) lugs.**
   4. **Conductors, as sized in this specification and drawings.**
   5. **Grounding pigtails or leads.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. **All material must be UL listed.** Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Bonding and grounding systems within the building are to have one electrical potential. Telecommunications grounding and bonding infrastructure shall start at the electrical service entrance ground and extend to all the metal telecommunications equipment.

B. **A single manufacturer shall be used for all grounding material.**

2.02 CONDUCTORS

A. Telecommunications Equipment Bonding Conductor **(TEBC)**: Stranded copper wire, green or green with yellow stripe insulation.
   1. No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

B. Bonding Conductor for Telecommunications (BCT): Stranded copper wire.
   1. Stranded, UL-listed, minimum size No. **3**/0 AWG or as indicated on drawings.

C. Telecommunications Bonding Backbone (TBB): Stranded copper wire.
   1. Stranded, UL-listed, size No. 3/0 AWG or as indicated on drawings.

2.03 CONNECTORS

A. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor.
   1. Electroplated tinned copper.
   2. Two holes spaced on 5/8" or 1" centers.
   3. Long barrel for two crimps.
   4. Sized to fit a specific size conductor.
   5. UL Listed as wire connectors.

2.04 GROUNDING BUSBARS

A. Coordinate arrangement, mounting, and support of telecommunication cable, supports and pathway:
   1. To provide for ease of access to installed equipment and cable.
   2. To allow right of way for piping, ductwork and conduit installed at required slope.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area. Work area outlet locations shall be located near an adjacent electrical outlet no more than 3 feet away and installed at the same height.

C. Manufacturers:
   1. Chatsworth Products, Inc.
   2. Or **approved** equal

D. Telecommunications Main Grounding Busbar (TMGB) :
   1. Predrilled, wall-mounted, ¼-inch by 4-inch, by 20-inch in length.
   2. Predrilling shall be with holes for use with lugs specified in this section.
   3. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a standoff from the wall.
   4. Chatsworth part number 10622-020 or **approved** equal.

E. **Telecommunications Grounding Busbar (TGB) :**
   1. **Predrilled, wall-mounted, ¼-inch by 4-inch, by 12-inch in length.**
   2. **Predrilling shall be with holes for use with lugs specified in this section.**
   3. **The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a standoff from the wall.**
   4. **Chatsworth part number 10622-012 or approved equal.**

2.05 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with TIA-607-B.

B. Conductors:
   1. General:
      a. Shall be routed the shortest distance possible.
      b. Shall not include splices.
      c. Secured/supported at a minimum of 36-inches intervals.
      d. Separated a minimum of 2-inches from any other power or telecommunication cables.
      e. Separated a minimum of 2-inches from any ferrous metals where achievable. If separation can't be accomplished then the ferrous metal shall be bonded to the telecommunication grounding bonding infrastructure.
      f. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
      g. Install within EMT conduit until conduit enters a telecommunications space.
      h. If installed in ferrous metallic conduit conductor shall be bonded, on each end, to the conduit.
      i. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend shall exceed 90 degrees.
   2. Telecommunications Equipment Bonding Conductor (TEBC).
      a. Meant to connect equipment racks, overhead cable tray and other metallic telecommunications equipment to the TMGB or TGB.
      b. Shall be a minimum No. 6 AWG size.
   3. Bonding Conductor for Telecommunications (BCT).
      a. Meant to bond the TMGB to the AC electrical service equipment.
      b. Shall be a minimum No. 1/0 AWG size.

C. Grounding Bussbar
   1. Telecommunications Main Ground Bussbar (TMGB) **and/or Telecommunications Ground Bussbar(TGB).**
      a. Install horizontally a minimum of 24-inches above finished floor and a maximum of 84-inches above finished floor.
      b. Located within the telecommunication space.

D. Conductor Connections:
   1. General:
      a. All metallic telecommunications equipment within the telecommunications space shall be bonded to the TMGB **and/or TGB**.
      b. When connecting conductors to TMGB **and/or TGB** stacking of multiple connections/conductors shall not be allowed.
   2. Telecommunications Equipment Bonding Conductor (TEBC) connection to TMGB**/TGB**.
      a. Irreversible two hole bolted compression connector except where noted below.
      b. Antioxidant compound shall be applied to all bolted and compression connections.
      c. Each equipment rack within the telecommunications space shall have a dedicated TEBC to the TMGB**/TGB**.
      d. Overhead cable tray that is classified as a ground and bonding conductor may include one TEBC to the TMGB**/TGB**.
      e. Provide TEBC from TMGB**/TGB** to building structural steel.
         1) Exothermic welding connections on both ends.
   3. Bonding Conductor for Telecommunications (BCT) connection to TMGB and AC electrical service equipment.
      a. Exothermic welding connections at TMGB.

3.02 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label the BCT, **TBB,** and each TEBC conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.03 TESTING AND INSPECTION

A. Visually inspect telecommunications grounding infrastructure to ensure all connections were made properly.

B. Test for ground loop currents using a digital clamp-on ammeter, with a fullscale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
   1. With the grounding infrastructure completed and the communications system electronics operating, measure the current in TMGB **and TGB**. Maximum acceptable ac current level is 1 A.
   2. Excessive Ground Resistance: If resistance to ground exceeds 100 milliohms, notify Architect promptly and include recommendations to reduce ground resistance.

C. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements:
   1. TMGB**/TGB** to electrical ground in telecommunication space.
   2. TMGB**/TGB** to structural building steel.
   3. Structural building steel to electrical ground.

D. Prepare test and inspection reports. All testing shall be performed in the presence of the Architect or owner's representative and the results shall be submitted to the Engineer for review and approval.

END OF SECTION 27 05 26

SECTION 27 05 28

PATHWAYS FOR TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Products
   1. Conduit and Outlet Boxes for Telecommunications.
   2. Non-continuous Cable Supports.
   3. Sleeves.

B. Related Sections:
   1. Section 26 05 33 "Raceways and Conduit Systems" for exterior duct banks, manholes, and underground utility construction.
   2. Section 27 11 00 “Telecommunications Equipment Room Fittings” for overhead cable support within the telecommunication space.

PART 2 - PRODUCTS

2.01 CONDUIT AND OUTLET BOXES

A. General Requirements for Metal Conduits and Outlet Boxes:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Comply with TIA-569-C.
   3. Comply with section 26 05 33 "Raceways and Conduit Systems".
   4. Flexible metal conduit shall not be used.
   5. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 3-1/2 inches deep.
   6. For Tracker Monitor locations, the Electrical Contractor shall provide a special recessed backbox that will house power and data. Hubbell Part Number NSAV62M. Refer to Telecommunications Drawings for Tracker Monitor locations.
   7. For HCA “Vision” Board locations [noted as 2(TV) on drawings] the Electrical Contractor shall provide a special recessed back box that will house power, data, and coax. Hubbell part number NSAV124M. Refer to Telecommunications Drawings for “Vision” Board locations.

2.02 NON-CONTINUOUS CABLE SUPPORTS

A. Manufacturers: provide products by one of the following:
   1. Caddy.
   2. Cooper B-Line.
   3. Or preapproved equal.

B. General Requirements: Comply with TIA-569-C.

C. Description: J-Hook Style Cable Support NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

2.03 SLEEVES

A. General Requirements:
   1. Comply with Section 07 84 00 "Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
   2. Comply with TIA-569-C

B. Sleeves for pathway and cable penetration of non-fire-rated construction walls.
   1. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
      a. Galvanized-steel sheet; round tube closed with welded longitudinal joint.
      b. Fitted with plastic Bushings.

C. Sleeves for pathway and cable penetration of fire-rated construction walls.

1. Manufacturers: provide products by one of the following:
   a. Hilti.
   b. STI.
2. Description: Enclosed fire rated cable management device. Contains integrated intumescent firestop materials sufficient to maintain the hourly rating of the barrier being penetrated.
3. 2” Sleeve:
   a. Hilti Speed Sleeve Part Number 2008603.
   b. STI EZPath Sleeve Part Number EZD22.
4. 4” Sleeve:
   a. Hilti Speed Sleeve Part Number 2008604.
   b. STI EZPath Sleeve Part Number EZDP44.

PART 3 - EXECUTION

3.01 INSTALLATION

A. CONDUIT AND OUTLET BOXES

1. General Requirements:
   a. Comply with NECA 1, NECA 101, and TIA-569-C for installation requirements except where requirements on Drawings or in this article are stricter.
   b. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
   c. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes.
   d. Install horizontal pathway runs above water and steam piping.
   e. Fasten junction and pull boxes to or support from building structure.
   f. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 3-1/2 inches deep. Refer to contract documents for backbox sizes.
   g. Flexible metal conduit shall not be used.
   h. No single bend shall be greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points.
   i. Conduits shall not contain any continuous sections longer than 100 feet between pull points.
   j. Conduits shall be bonded to ground on one or both ends in accordance with AHJ.
   k. Conduits that penetrate through the structural floor shall protrude a minimum 3 inches above the finished floor.
   l. All conduit ends shall be reamed and fit with plastic bushings to prevent cable damage.
   m. Pull boxes shall not be used in lieu of a conduit bend.
   n. Conduits entering opposite sides of a pull box shall be aligned
   o. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated.
   p. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 24-inches of slack at each end of pull wire.
2. Stub-ups to Above Recessed Ceilings:
   a. Use EMT for pathways.
   b. Use a conduit bushing or insulated fitting to terminate stub-ups.
   c. Minimum Pathway Size: 3/4-inch trade size. Refer to contract drawings for conduit sizes.
3. Outlet Boxes:
   a. Comply with section 26 05 33 "Raceways and Conduit Systems".
   b. Mount boxes at heights indicated on Drawings.

B. Non-Continuous Cable Supports
   1. General Requirements:
      a. Comply with TIA-569-C.
      b. Material: Steel, pre-galvanized.
      c. Size not to exceed a 40% fill ratio based on present needs.
      d. Locate a minimum of 8 inches above ceilings not more than 60 inches apart.
      e. Design fasteners and supports to carry supports and the cables.

C. Sleeves
   1. General Requirements:
      a. Comply with TIA-569-C
      b. Comply with Section 07 84 00 "Firestopping" for penetration firestopping installed in fire-resistance-rated walls and smoke barriers.
      c. Conduit sleeves shall be sized not to exceed a 40% fill ratio based on present needs.
      d. Provide STI EZ-Path or Hilti speed sleeves where applicable and shown on contract drawings. Shall be installed per manufacturer's specifications.
      e. For locations that STI EZ-Path and Hilti Speed sleeves can't be used, use EMT metal conduit, equipped with plastic bushings and sized not to exceed a 40% fill.
      f. EMT shall be reamed and equipped with plastic bushing on each end to prevent cable damage.
      g. EMT sleeves to be used for not rated penetrations. Insert conduit filler material and sealant around outside of conduit to create an air dam.
      h. EMT Sleeves shall protrude a minimum 3 inches on both sides of barrier being penetrated.
      i. Sleeves shall be located that they are in line with the cable pathway being served.
         1) Locate a minimum of 8 inches above ceilings measured from the bottom of the sleeve.
      j. When EMT sleeves are used for vertical cable pathways through floors sleeves are to extend a minimum of 3-inches above finished floor.

D. PROTECTION
   1. Separation from EMI Sources:
      a. Comply with BICSI TDMM and TIA-569-C for separating unshielded copper voice and data communication cable from potential EMI sources.
      b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
      c. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
      d. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
      e. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
      f. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

END OF SECTION 27 05 28

SECTION 27 11 00

TELECOMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes
   1. Telecommunications equipment racks.
   2. Cable Management.
   3. Overhead Runway.

PART 2 - PRODUCTS

2.01 EQUIPMENT RACKS

A. Manufacturer:
   1. Belden

B. General Frame Requirements:
   1. Freestanding, modular-aluminum units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
   2. Module Dimension: Width compatible with EIA 310-D standard, 19-inch panel mounting.
   3. Finish: Manufacturer's standard, baked-polyester powder coat.

C. Floor-Mounted Racks: Modular-type.
   1. Two Post rack with tapped and threaded rails. Belden Part Number BHRR194.
   2. Four Post rack with square hole pattern for M6 clip nuts. Belden Part Number XDR8419-3M62836.

2.02 CABLE MANAGEMENT

A. Manufacturer:
   1. Belden

B. Vertical Cable Manager
   1. Double sided 6” wide vertical cable manager. Belden Part Number BHVHH06.
   2. Double sided 3” wide vertical cable manager. Belden Part Number BHVHH03.

C. Horizontal Cable Manager
   1. 2RU Horizontal manager. Belden Part Number BHH192UR.
   2. 1RU Horizontal manager. Belden Part Number BHH191UR.

2.03 OVERHEAD RUNWAY

A. Manufacturer:
   1. WBT

B. Description:
   1. Cable tray will consist of continuous, rigid, welded steel wire mesh.
   2. Finish shall be standard manufacturer’s black powder coating.
   3. All accessories shall be by same manufacturer.

C. Straight Section:
   1. Width: 18 inches. Height: 2 inches.
   2. WBT Part Number WBT2X18SBL.

D. Cable radius drop:
   1. 6-inch-Wide cable drop out radius: WBT Part Number Radius Down 6.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General Requirements:
   1. Comply with NECA 1.
   2. Comply with TIA-569-C.

3. Coordinate layout of patch panels and horizontal wire managers within equipment racks with owner's IT representative.
4. Coordinate location of lighting within telecommunication space so that lighting is located within equipment isles.
    a. Lighting within the telecommunication space shall be minimum of 500 lux in the horizontal plane and 200 lux within the vertical plane when measured 3 feet above finished floor in the middle of isles between cabinets and equipment racks.
5. Coordinate location of mechanical equipment so that cool air is being distributed at the front of equipment racks.
6. Coordinate location of fire protection piping and devices so that piping and devices are not installed or routed over equipment racks and active communication equipment.
    a. All sprinkler heads shall include cages to prevent accidental discharge.
7. Systems that are not directly related to supporting the telecommunication space shall not be permitted to pass through the room.

B. Equipment racks:
1. Mount in orientation as shown on the contract drawings.
2. Racks shall be secured to building structure per manufacturers recommendations. Each rack shall be secured.

C. Overhead Runway:
1. Install as a complete system, including fasteners, support systems, splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, and bonding.
2. Install so that the runway is accessible for cable installation and all splices are accessible for inspection and adjustment.
3. Locate a minimum of 4 inches above equipment racks.
4. Remove burrs and sharp edges.
5. Fasten hanging supports to building structure.
6. Design fasteners and supports to carry cable runway and the cables.
7. Place supports so that spans do not exceed maximum spans allowed per manufacturer.
8. Construct supports from channel members, threaded rods, and other appurtenances furnished by the manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
9. Do not install more than one splice between supports.
10. Make changes in direction and elevation using manufacturer's recommended fittings.
11. Make runway connections using manufacturer's recommended fittings.
12. Install cable waterfalls in locations cable exits runway.
13. Runway to be attached to communication equipment racks using manufacturer's recommended fittings.

D. Cable Management:
1. Mount in orientation as shown on the contract drawings.
2. Cable management shall be secured to equipment racks per manufacturer's recommendations.
3. Horizontal wire manager to be mounted above and below each installed patch panel as a starting point. Contractor to request rack mounted equipment orientation from owner's IT representative.

E. Grounding:
1. Comply with requirements in Section 270526 "Grounding and Bonding for Telecommunications Systems" for grounding conductors and connectors.

3.02 IDENTIFICATION

A. Identify system components complying with TIA-606-B.
1. Administration Class: "1".

B. Labels shall be preprinted or computer-printed type.

C. Equipment Racks
   1. Each Rack shall be labeled using letters and numbers no smaller than 1 inch at the top of each rack.

D. Contractor to coordinate labeling scheme with owner's IT representative.

END OF SECTION 27 11 00

SECTION 27 15 00

TELECOMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes infrastructure requirements for the following:
   1. Voice/Data/Network
   2. Physiological Monitoring
   3. CATV
   4. CCTV
   5. Nurse Call

1.02 PERFORMANCE REQUIREMENTS

A. General Performance:
   1. Splices shall not be installed in the horizontal cabling.
   2. Maximum allowable cable length shall be 295 feet.
   3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NFPA 70 for the following types:
      a. Communications, Riser Rated: Type CMR, complying with UL 1666.
         1) CMP/Plenum may be required by local AHJ.

PART 2 - PRODUCTS

2.01 UTP CABLE

A. Manufacturers: provide products by the following:
   1. Belden

B. Voice/Data/Network Cabling
   1. Four pair UTP Category 6 cable, Belden part number 2412010.
      a. Cabling shall have a black cable jacket.

C. Wireless Access Point (WAP) Data Cabling.
   1. Four pair UTP Category 6a cable, Belden part number 10GXS12004.
      a. Cabling shall have a yellow cable jacket.

D. CCTV Data Cabling
   1. Four pair UTP Category 6 cable, Belden part number 2412010.
      a. Cabling shall have a black cable jacket.

E. Physiological Monitoring Data Cabling
   1. Four pair UTP Category 6 cable, Belden part number 2412003.
      a. Cabling shall have an orange cable jacket.

F. CATV Data Cabling
   1. Four pair UTP Category 6 cable, Belden part number 2412006.
      a. Cabling shall have a blue cable jacket.

G. Nurse Call Cabling:
   1. General: Refer to contract documents for the nurse call riser diagram outlining the manufacturer and match the following requirements.
   2. Hillrom:
      a. Cable “A”: Four pair UTP Category 6 cable, Belden part number 2412005.
         1) Cabling shall have a green cable jacket.
      b. Cable “C”: Three Conductor 22 AWG stranded copper, Belden part number 5501UE.
   3. Rauland Borg:
      a. Cable “A”: Four pair UTP Category 6 cable, Belden part number 2412005.
         1) Cabling shall have a green cable jacket.
      b. Cable “B”: Two conductor 12 AWG stranded copper, Belden part number 5000UE.
      c. Cable “C”: Three Conductor 22 AWG stranded copper, Belden part number 5501UE.

2.02 UTP CABLE HARDWARE

A. Manufacturers: Provide products by the following:
   1. Belden.

B. Voice/Data/Network Cabling Termination Hardware
   1. Category 6, RJ45, 8-Position, 8-wire jack assembly, Belden part number RV6MJKUBK-S1.
      a. Color shall be Black.

C. Wireless Access Point (WAP) Cabling Termination Hardware.
   1. Category 6a, RJ45, 8-Position, 8-wire jack assembly, Belden part number RV6AMJUYL-S1.
      a. Color shall be Yellow.

D. CCTV Data Cabling Termination Hardware
   1. Category 6, RJ45, 8-Position, 8-wire jack assembly, Belden part number RV6MJKUBK-S1.
      a. Color shall be Black.

E. Physiological Monitoring Data Cabling Termination Hardware
   1. Category 6, RJ45, 8-Position, 8-wire jack assembly, Belden part number RV6MJKUOR-S1.
      a. Color shall be Orange.

F. CATV UTP Data Cabling Termination Hardware
   1. Category 6, RJ45, 8-Position, 8-wire jack assembly, Belden part number RV6MJKUBL-S1.
      a. Color shall be Blue.

G. Nurse Call UTP Data Cabling Termination Hardware
   1. Nurse call cable termination hardware provided and installed by nurse call vendor.

H. Workstation Faceplate
   1. Four-port, single-gang, white plastic, Belden Part Number AX102249
   2. Two-port, surface mount, white plastic, Belden part Number AX105353-EW.

I. Patch Panel
   1. Cat 6 48 Position Patch panel:
      a. Category 6, 48 position, Belden part number RV6PPF2U48BK.
   2. Cat 6a 48 Position Patch panel:
      a. Category 6a, 48 position, Belden part number RVAPPF2U48BK.

2.03 CATV COAXIAL CABLE

A. Manufacturers: Provide products by the following:
   1. Belden.

B. RG-6/U: NFPA 70, Type CATV.
   1. No. 18 AWG, solid, bare copper conductor.
   2. Gas-injected, foam-PE insulation.
   3. Quad shielded with 100 percent bonded aluminum foil polyester tape, 60 percent aluminum braid, 100 percent aluminum foil polyester tape and 40 percent aluminum braid.
   4. Belden part number 5339Q5.

2.04 CATV COAXIAL CABLE TERMINATION HARDWARE

A. CATV coax termination hardware is provided and installed by the CATV vendor.

2.05 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.01 INSTALLATION OF CABLES

A. General Requirements for Cabling:
   1. Make terminations only at indicated outlets, terminals, and patch panels.
   2. Splices shall not be installed in the horizontal cabling.
   3. The maximum allowable horizontal cable length is 295 feet.
   4. Bundle, lace, and train cable without exceeding manufacturer's limitations on bending radii.
   5. Do not install bruised, kinked, scored, or deformed cable.
   6. Unless noted elsewhere in this division install a 10-foot long service loop on each end of cable.
   7. Do not exceed manufacturer's limitations on pulling tension.
   8. In inaccessible areas cabling shall be installed within conduit pathways.
   9. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
   10. Separation from EMI Sources:
      a. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
      b. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
      c. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
      d. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
      e. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

B. UTP Cable
   1. General:
      a. Do not untwist UTP cable pairs more than 1/2 inch from the point of termination.
      b. UTP cabling to be supported using non-continuous cable support (J-Hook).
   2. Voice/Data UTP:
      a. Cable: Four Pair UTP Cat 6.
         1) Cable Jacket Color: Black.
      b. Outlet: ITG data cabling shall be terminated on an 8 position Category 6 Black jack housed in a 4 position white faceplate.
         1) Vacant ports in the faceplate shall be equipped with blanks.
      c. VOIP Wall Mount Telephone Outlet: ITG data cabling shall be terminated on an 8 position Category 6 Black jack housed in a wall telephone faceplate, Belden Part Number AX104126.
      d. Wall Mount Ring Down Telephone Outlet: ITG data cabling shall be terminated on an 8 position Category 6 Black jack housed in the rough in back box without a faceplate. Owner’s telephone installation vendor shall provide final device and cover.
      e. Patch Panel: Provide 48 port rack mounted Cat 6 patch panel.

3. CCTV UTP:
    a. Cable: Four Pair UTP Cat 6.
        1) Cable Jacket Color: Black.
    b. Outlet: CCTV data cabling shall be terminated on an 8 position Category 6 Black jack housed in a 2 position surface mount box.
        1) Vacant ports in the faceplate shall be equipped with blanks.
    c. Patch Panel: Provide 48 port rack mounted Cat 6 patch panel.
    d. CCTV data outlets shall be cabled to the location shown on the contract drawings with a 25 foot service loop at the camera location.
    e. For exterior cameras mounted to the building the jack shall be left in the interior of the building within 2 feet of the conduit/sleeve leading to the exterior camera back box. Camera vendor shall provide patch cable from outlet location to camera.
4. Wireless Access Point (WAP) UTP:
    a. Cable: Four Pair UTP Cat 6a.
        1) Cable Jacket Color: Yellow.
    b. Outlet: IT&S WAP data cabling shall be terminated on an 8 position Category 6a Black jack housed in a 2 position surface mount box.
        1) Vacant ports shall be equipped with blanks.
    c. Patch Panel: Provide 48 port rack mounted Cat 6a patch panel.
    d. Wireless ceiling outlets shall be:
        1) Cabled to the location shown on the contract drawings. No less than 25 feet shall be coiled at the location. Each cabled shall be coiled separate and housed within separate surface mount boxes.
        2) After Ceilings, walls, doors are complete the owner's ITG personnel/vendor will complete a site coverage survey to determine the final location of the access points.
        3) After the owner has completed wireless coverage survey, contractor shall move cabling to final location.
        4) Owner will provide the wireless access points and patch cables for installation to the contractor. Contractor shall install wireless access points per manufacturer.
        5) Contractor responsible for coordinating with owner's ITG personnel for labeling scheme of wireless access points.
5. Physiological Monitoring (PM) UTP:
    a. Cable: Four Pair UTP Cat 6.
        1) Cable Jacket Color: Orange.
    b. Outlet: PM data cabling shall be terminated on an 8 position Category 6 Orange jack housed in a 4 position white faceplate.
        1) Vacant ports in the faceplate shall be equipped with blanks.
    c. Patch Panel: Provide 48 port rack mounted Cat 6 patch panel.
6. CATV UTP:
    a. Cable: Four Pair UTP Cat 6.
        1) Cable Jacket Color: Blue.
    b. Outlet: CATV data cabling shall be terminated on an 8 position Category 6 Blue jack housed in a 4 position white faceplate.
        1) Owner's CATV vendor will provide coax connector and nurse call control cable outlet within open ports of faceplate.
    c. Patch Panel: Provide 48 port rack mounted Cat 6 patch panel.
7. Nurse Call UTP:
    a. Cable: Four Pair UTP Cat 6 and multi-conductor low voltage cabling
    b. Contractor shall install nurse call cable as shown on the contract drawings.
    c. Leave a minimum of 8 feet of slack at each device location and a minimum of 15 feet of slack at the panel location within the telecommunication space.
    d. Termination of cabling and device installation to be provided by owner's nurse call vendor.

8. CATV Coaxial Cable:
    a. Coaxial cabling to be supported using non-continuous cable support.
    b. CATV Coaxial Cable:
        1) Cable: Quad shield RG6.
        2) Outlet: Contractor shall install CATV coaxial cable as shown on the contract drawings. Leave a minimum of 2 feet of slack at each outlet location and a minimum of 15 feet of slack at the TVJ location within the telecommunication space. Termination of coax cabling and device installation to be provided by owner's CATV vendor.
            a) Owner's CATV vendor will provide coax and nurse call connections that will mount in the contractor provided faceplate.

3.02 LABELING

A. Identify system components, wiring, and cabling complying with TIA-606-B.
    1. Administration Class: "1".

B. Cable and Wire Identification:
    1. Label each cable within 4 inches of each termination using computer generated wrap around heat shrink labels.

C. Jack Assemblies
    1. Label each jack assembly in each workstation outlet, cabinet, rack, and patch panel.

D. Labels shall be computer-printed type with printing area and font color that contrasts with cable jacket, faceplate, and patch panel color but still complies with requirements in TIA-606-B.

3.03 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
    1. UTP Performance Tests:
        a. Test for each outlet. Perform the following tests according to TIA-568-C.1 and TIA-568-C.2:
            1) Wire map.
            2) Length (physical vs. electrical, and length requirements).
            3) Insertion loss.
            4) Near-end crosstalk (NEXT) loss.
            5) Power sum near-end crosstalk (PSNEXT) loss.
            6) Equal-level far-end crosstalk (ELFEXT).
            7) Power sum equal-level far-end crosstalk (PSELFEXT).
            8) Return loss.
            9) Propagation delay.
            10) Delay skew.
        b. Coaxial Cable Tests: Contractor shall visually inspect cable and insure it is undamaged and installed as outlined in this section. Owner's CATV vendor will complete additional testing.

B. Document data for each measurement.

END OF SECTION 27 15 00

SECTION 27 51 01

TELEVISION CABLE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. All work specified in this section shall comply with the provisions of Section 27 05 00.

B. Section Includes:

1. The work includes furnishing all labor, materials, tools, equipment, mounting hardware and documentation required for the television cable distribution system (CATV).

A. Products
1. Indoor CATV Distribution Amplifiers
2. Indoor/Outdoor Directional Couplers

B. Related Sections:
1. Section 27 05 00 “Common Work Results for Telecommunications” for general provisions and submittals.
2. Section 27 15 00 "Telecommunications Horizontal Cabling" for infrastructure cabling related to the CATV system.

1.02 SUBMITTALS

A. Submittals are required for this section.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. All TV’s and mounts in this section will be provided by the owner. Contractor will be required to mount and install all owner provided equipment.

2.02 COMPONENTS

A. Indoor distribution amplifiers to be provided as required, equal to QRF Model QDAX750.

B. Provide two-way ready indoor/outdoor directional couplers equal to DigiTop Series 2-4-8 port taps.

PART 3 - EXECUTION

3.01 COORDINATION

A. All mounting heights are to be coordinated with architectural elevations and shall meet ADA requirements of 80" AFF to bottom of any obstruction from wall.

B. Controls of patient televisions shall be connected to the Nurse Call pillow speaker and patient bed side rails. This connection shall be coordinated between the Nurse Call supplier and this contractor and all items necessary for this feature is to be considered a part of this specification.

C. All backing in the walls and wall bracket installation shall be coordinated with television vendor.

3.02 INSTALLATION

A. Install system per the manufacturer’s guidelines.

B. System to be free of RF noise and loss of dB signal. Precautions are to be made to prevent and filter out any visible noise.

C. Grounding shall be sufficient to meet manufacturer requirements.

D. This contractor is to provide a surge suppressor on the cables entering the television head end equipment from the cable service provider and/or satellite dish.

3.03 WARRANTY

A. The product shall be warranted to be free from defects in material and workmanship under normal use for a period of one (1) year from the date of first beneficial of all or any part of the product, or 12 months after product shipment, whichever is earlier.

B. Designer reserves the right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.

C. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION 27 51 01

SECTION 27 51 16
OVERHEAD PAGING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Power amplifiers.
   2. Volume control.
   3. Speakers.
   4. Speaker cable.

1.02 FUNCTIONAL DESCRIPTION OF SYSTEM

A. System Functions:
   1. Telephone paging adapter shall allow paging by dialing an extension from any local telephone instrument and speaking into the telephone.
   2. One zone.

B. Compatibility of Components: Coordinate component features to form an integrated system.

PART 2 - PRODUCTS

2.01 POWER AMPLIFIERS

A. Output Power: 70V. Built in telephone paging adapter. Wall mountable. 100 watt power amplifier, Bogen part Number TPU100B.

2.02 VOLUME CONTROL

A. Bogen Part Number AT10A.

2.03 SPEAKERS

A. Lay-In ceiling mounted speaker. Flush-Ceiling-Mounted units designed for installation within standard lay-in type ceiling. Bogen part number CSD1X2U.

2.04 SPEAKER CABLE

A. Description:
   1. Twisted pair, untinned solid copper, covered with a thermoplastic jacket.
   2. 18 AWG 2-conductor: Belden part number 5300UE.
      a. Plenum rated cable only required when required by AHJ.

PART 3 - EXECUTION

3.01 INSTALLATION OF CABLES

A. General:
   1. Bundle, lace, and train cables to termination points without exceeding manufacturer's limitations on bending radii.
   2. Do not splice cable between termination points. Remove and discard cable if damaged during installation and replace it with new cable.
   3. Install a service loop on each device as follows:
      a. Speakers: 10 feet.
      b. Amplifiers: 6 feet.
      c. Volume Control: 6 feet.
   4. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
   5. Separation from EMI Sources:
      a. Separation between open speaker/audio cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
         1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
         2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
         3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

b. Separation between speaker/audio cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
c. Separation between speaker/audio cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
   2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
d. Separation between speaker/audio cables and electrical motors and transformers, 5 kVA or HP and larger: A minimum of 48 inches.
e. Separation between speaker/audio cables and fluorescent fixtures: A minimum of 12 inches.

B. Cable pathway and support:
   1. Speaker/Audio cable shall be supported using non-continuous j-hook style hangers when routed above accessible ceiling.
   2. Speaker/Audio cable shall not share supports, pathways, or sleeves with other cables.
   3. Sleeves:
      a. Use EMT sleeves for speaker/audio cable pathway through rated and non-rated wall/floor partitions.
      b. Use fire caulk and putty to obtain a fire rating that of which of the barrier being penetrated.
      c. EMT Sleeves shall protrude a minimum 3 inches on both sides of wall being penetrated.
      d. EMT shall be reamed free of burrs and equipped with a plastic bushing on each end to prevent cable damage.
      e. Sleeves shall be located that they are in line with the cable pathway being served.
      f. Sleeves shall be located a minimum of 8 inches above ceilings, lights and other ceiling mounted devices measured from the bottom of the sleeve.

3.02 INSTALLATION OF SPEAKERS

A. Coordinate layout and installation of speaker and suspension system with other ceiling mounted equipment, including light fixtures, HVAC equipment, fire-suppression system, fire alarm devices, power conduits, plumbing piping and structural support members.

B. Lay in ceiling style speakers:
   1. Speakers shall be installed as recommended by manufacturer.
   2. Speaker shall include a minimum 12 AWG support wire attached to the structure using the appropriate attachment hardware.
   3. Speaker wire connection to speaker shall be made within speaker back box.

C. Speaker-Line Matching Transformer Connections:
   1. Ceiling mounted speakers: Make initial connections using 2 watt tap settings.

3.03 INSTALLATION OF AMPLIFIERS

A. Amplifier shall be mounted within close proximity of power outlet.

B. All speaker wire connections to amplifier shall be made per manufacturer recommendations.

C. All controls on amp shall be labeled to what it controls with computer generated label.

3.04 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operational Test: Perform tests that include originating page messages at all inputs.
   2. Verify proper routing and volume levels and that system is free of noise and distortion.

3. Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

END OF SECTION 27 51 16

SECTION 27 52 23

NURSE CALL AND CODE BLUE SYSTEMS

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The Owner's Vendor shall provide all equipment, devices, power supplies and terminal cabinets necessary for the operation of the nurse call system.

B. The Cabling Contractor shall provide and pull all cabling associated with the Nurse Call System. Nurse call cable termination hardware to be provided and installed by Owner's nurse call vendor.

C. The Electrical Contractor shall provide all conduit, standard backboxes necessary in conjunction with this Owner furnished equipment for completely operational nurse call system in accordance with this specification.

D. The systems shall conform to the current NFPA standards and shall be listed as a total system by Underwriter's Laboratories, Inc. Each major component shall bear the manufacturer's name, catalog number, and UL label.

E. The communications vendor shall be responsible for providing a complete functional system including all necessary components, whether specifically included in this specification or not.

F. Local service by factory-trained personnel from an authorized distributor of the equipment manufacturer, shall be available. The distributor shall have available a stock of the manufacturer's standard parts.

G. The systems shall be guaranteed for a period of one year. Provide labor, replacement parts, and materials necessary to repair defects, unless damage or failure is caused by misuse, abuse or accident.

H. Communications vendor shall provide two copies of maintenance and operating manuals for the Owner, upon completion of the project. These manuals shall include all operating instruction, routine test information, maintenance and trouble-shooting information, as installed wiring diagrams and parts lists for component ordering.

I. Nurse Call Systems shall be provided as indicated on the drawings.

J. Refer to the drawings for a nurse call device layout for each of the above listed areas.

1.02 RELATED WORK

A. Section 27 05 00: Common Work Results for Telecommunications.

B. Section 27 15 00: Telecommunications Horizontal Cabling.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The system shall be a Hillrom Versacare**.**

B. The system shall be a Microprocessor based system and shall provide the following features and functions as a minimum:

1. Two-way signaling and communications between Control Station(s) and patient rooms or staff locations.
2. Simultaneous digital display of up to four (4) incoming calls at the Control Station.
3. Incoming calls displayed by room number, bed designation and priority.
4. Automatic selection of calls by priority and/or time of call.
5. Provisions for up to fourteen (14) call priority levels with automatic sequencing.
6. Patient priority status programmable at Control Station.
7. Patient privacy programmable at Control Station.
8. Ability to program priority status individually on dual bed stations.
9. Provisions for registering and locating staff members by sequential display.

10. Provisions for single button communications with registered staff nearest calling station. If a Network Controller is being used, during night mode, this search is only conducted in the system which the call was initiated from.
11. Solid-state waterproof membrane touchpad on Control Station.
12. User programmable, permitting simple on-site changing of room numbers in non-violative memory.
13. Twelve or twenty-four hour clock displaying time in hours, minutes and seconds.
14. Staff follow mode permitting incoming call tones to be automatically routed to a room or rooms where staff members are registered.
15. Ability to monitor one or several rooms simultaneously.
16. Ability to set "Nurse (GREEN LEVEL)", "Nurse (AMBER LEVEL)", or "Stat" service required.
17. Ability to display all patients in "Priority" status.
18. Ability to display all patient stations in "Privacy" mode.
19. "Privacy" indicator on Control Station.
20. Ability to respond to calls out of sequence using numeric touchpad, without losing calls in progress or calls waiting.
21. Provisions for making paging announcements to one, several, or all areas. If a Network Controller is being used, during night mode, it is possible to page from one (1) to four (4), or all systems involved in the capture.
22. Visual display of zone(s) being paged.
23. Automatic page with reply to only those locations where staff have registered.
24. Automatic display of service requirements not answered within an allotted time frame (over-time display).
25. Individually programmable software timers for each of three (3) service required priorities.
26. Choice of communications via Control Station handset or "Push-to-Talk" loud-speaking communications via built-in speaker/microphone.
27. Ability to communicate with registered staff members without losing call in progress.
28. Ability to replace current call on hold while answering a higher priority call.
29. Preannounce tone to alert patient of call from Control Station.
30. Provisions for operating Control Station(s) in parallel or in day/night transfer mode.
31. Universal call cord receptacle(s) on patient stations allowing the use of a wide range of cord sets and entertainment speakers.
32. Provisions for automatic cancellation of patient call when staff member registers into patient room.
33. Full operation (including intercom and page) during power failure utilizing standard built-in battery back-up power supply for up to seven (7) minutes.
34. Color-coded plug-in terminations on all control stations, patient, staff and duty stations.
35. All solid-state plug-in modular construction.
36. Single touchpoint operation of all system functions.
37. Provisions for including optional features/functions by simply installing the appropriate system components. Software changes or special software shall not be required.

2.02 SYSTEM OPERATION

A. The system shall operate in the following manner: Patient Station - "Normal" Call - Normal calls shall be originated at the patient station by momentarily depressing the "Call" button on the patient's entertainment speaker or call cord. This action shall cause the following to occur:
   1. The "Call Placed" indicator on the patient station shall illuminate.
   2. The corridor dome light shall illuminate steady white.
   3. An alert tone shall sound and the "Normal" indicator shall illuminate at all duty stations.
   4. An alert tone shall sound and the patient's room number, bed designation and "n" call priority shall be displayed on the Control Station(s) incoming call screen.

B. Patient Station - "Priority" Call - When programmed in the priority status mode, a patient priority call shall be originated at the patient station by momentarily depressing the "Call" button on the patient entertainment speaker or call cord. This action shall cause the following to occur:
   1. The "Call Placed" indicator on the patient station shall illuminate.

2. The corridor dome light shall flash white.
3. An "Emergency" alert tone shall sound and the "Emergency" indicator shall illuminate at all duty stations.
4. A "Priority" alert tone shall sound and the patient's room number, bed designation and "P" call priority shall be displayed on the Control Station(s) incoming call screen, automatically moving ahead of all priority calls.

C. "Priority" calls shall be answered in the same manner as "Normal" calls. When appropriate action has been initiated, the Priority call shall be automatically transferred to the "Nurse Service" mode by pressing the "Cancel" touchpoint, thus maintaining the integrity of the call while permitting the Control Station operator to handle other incoming calls.

D. Patient station - "staff emergency call"
1. When a staff member has registered into a patient room using a staff registered station, calls placed from that station shall automatically be classified as staff emergency and shall cause the following to occur:
   a. The "Call Placed" indicator on the Patient Station shall illuminate.
   b. The Corridor Dome Light shall flash white.
   c. An "Emergency" tone shall sound and the "Emergency" indicator shall illuminate on all Duty Stations.
   d. An "Emergency" alert tone shall sound and the patient's room number, bed designation and "E" call priority will be displayed on the Control Station(s) incoming call screen, automatically moving ahead of all lower priority calls.
2. "Staff Emergency" calls shall be answered in the same manner as patient "Priority" calls.

E. Patient "Priority" and "Staff Emergency" calls must be canceled at the Patient Station.

F. Patient Station - Miscellaneous Functions
1. Removal of the patient's call cord accidental or intentionally shall automatically place a "Staff Emergency" call.
2. All other Patient Station calls may be canceled in the patient's room by depressing the "Cancel" button on the Patient Station or by a staff member registering in by means of a staff registration station.

G. Call From Staff Stations
1. "Staff" calls shall be originated by the staff station by momentarily depressing the "Call" button. This action shall activate the same sequence that occurs when originating a "Normal" patient call, except that the Control Station shall display the room number and "S" call priority.
2. "Staff" calls may be canceled at the Control Station by answering that call or at the staff location by depressing the "Cancel" button.
3. Staff stations located in operating rooms may be connected to a separate explosion-proof switch for call placement.

H. Calls From Duty Stations
1. "Staff" calls from duty stations shall be originated in the same manner as the staff stations, with the same sequence of events occurring. Duty station calls shall display the room number and "d" call priority on the Control Station.
2. In addition to the staff communication functions, the duty station shall provide audible and visual signals to annunciate any call placed in the system by priority level.
3. The duty station shall also have the ability to control one or more "Zone" lights for its area.

I. Calls From Bath, Shower, Or Emergency Stations
1. Activating the switch on a Bath, Shower, or Emergency station shall cause the following to occur:
   a. The "Call Placed" indicator on the Bath/Emergency station shall light to assure the patient that his call has been properly placed.
   b. The corridor dome light shall flash red.
   c. An alert tone shall sound and the "Bath" or "Emergency" indicator shall illuminate at all duty stations.

d. A Bath or Emergency tone shall sound and the room number and "b" or "e" call priority shall be displayed on the Control Station(s) taking precedence over all unanswered except at the Bath, Shower, or Emergency stations itself.

J. Calls From Staff/Emergency Stations
   1. Activating the switch on a Staff/Emergency station shall cause the following to occur:
      a. The "Call Placed" indicator on the Staff/Emergency station shall light to indicate that the call has been properly placed.
      b. The corridor dome light shall flash white.
      c. An alert tone shall sound the "Emergency" indicator shall illuminate at all duty stations.
      d. A Staff/Emergency tone shall sound and the room number and "E" call priority shall be displayed on the Control Stations(s) taking precedence over all unanswered calls of lower priority.
   2. It shall be possible to cancel "Staff/Emergency" calls by resetting the switch at the calling station. It shall not be possible to cancel "Staff/Emergency" calls by any other means.

K. Call Storage - Any calls placed on the system in excess of display space available shall automatically stored in the memory of the microprocessor-based area control unit. As calls are completed, waiting calls will automatically register on the Control Station display screen in order of priority and or time placed.

L. Answering Calls At The Control Station
   1. To answer a call at the Control Station, the operator shall simply lift the handset and converse in a conventional telephone manner or, if preferred, operate the "Push-to-Talk" touchpoint and converse over the built-in speaker. An indicator shall illuminate on the "Push-to-Talk" touchpoint when in use. The "Push-to-Talk" touchpoint shall not be required when conversing over the handset.
   2. This action shall cause all audio and visual signals for the call station to cease for the normal call level, while continuing to display the room number, bed designation and call priority in the "Current Call" screen. Hanging up the handset or pressing the "Cancel" touchpoint shall complete the call.
   3. All the call is answered, a preannounce tone shall sound at the patient station and a "Monitor" indicator shall light. The patient shall then be able to converse in a normal voice without the necessity of operating any switches or turning toward the speaker/microphone.
   4. Calls from staff or duty stations shall be handled in the same manner as described above.
   5. It shall be possible to answer a call using the "Push-to-Talk" method and then, if required, transfer to the handset mode by simply lifting the handset.
   6. It shall be possible, should the need arise, the manually control speech direction while conversing over the handset, by operating the "Push-to-Talk" touchpoint.
   7. Patient "Priority", "Bath/Emergency", and "Staff Emergency" calls shall automatically be placed in the "Nurse (GREEN LEVEL) Service Required" mode when answered at the Control Station.
   8. Calls from "Bath/Emergency" or "Staff Emergency" stations cannot be canceled at the Control Station and shall require dispatching the proper personnel to the calling station.
   9. Stand-Alone bath stations shall automatically be placed in the "Nurse (AMBER LEVEL) Service Required" mode when answered at the Control Station.

M. Originating Calls From the Control Station
   1. The Control Station operator shall be able to place outgoing calls by simply dialing the desired room number and bed designation by means of the touchpad dial on the membrane control panel.
   2. It shall be possible to dial the desired room number with the handset on or off the hookswitch.
   3. As the call is dialed, the called station's number shall appear on the Utility Display of the Control Station. The called number shall move to the "Current Call" Screen, a preannounce tone shall sound, and the "Monitor' lamp shall illuminate at the patient station when communication is established.

4. When the call is placed with the handset on the hook, voice communications shall be established by lifting the Control Station handset and conversing in a conventional telephone manner, or by pressing the "Push-to-Talk" touchpoint and conversing over the master speaker/microphone.
5. When the call is placed with the handset off-hook, communications will be established when the last digit is dialed.
6. The "Privacy" indicator shall illuminate below the Utility Display if the operator dials a room has been placed in the "privacy" mode. It shall be possible to talk to the patient in this mode but it shall not be possible to hear the patient until the "Privacy" mode has been reset.
7. It shall be possible to interrupt "Privacy" for the duration of the call by instructing the patient to press his "Call" button. "Privacy" shall be automatically re-established when the call is completed.
8. The "Privacy" mode shall not operate when the patient initiates the call to the Control Station, making normal two-way conversations possible without the need to reset the "privacy" mode for each call.
9. Any system which does not provide an absolute "Privacy" mode or which does not indicate "privacy" on the Control Station when the called station is in this mode will not be acceptable.

N. Placing A Call On Hold
1. It shall be possible for the Control Station operator to place the current call on "Hold" call shall move to the end of the Calls Waiting stack and shall automatically return to the Current Call Screen when all other calls have been cleared, or it may be manually recalled at any time by simply touching the Recall touchpad.
2. Any system forces the operator to hurriedly finish or cancel a call in progress in order to answer a higher-priority call will not be acceptable.

O. Placing A Nurse (Green Level), Nurse (Amber Level) Or Stat Service Requirement
1. If the control station operator determines that service is required, the appropriate level of staff may be dispatched by pressing the "Nurse (GREEN LEVEL) Service", "Nurse (AMBER LEVEL) Service", or "Stat Service" buttons. This action shall cause the following to occur:
   a. The green (Nurse Service), amber (Nurse Service), or both (Stat Service) corridor lamp(s) shall flash.
   b. The overtime reminder circuit, if utilized, shall be activated.
   c. The "Calling/Responding" indicator on the patient station shall illuminate. On dual patient stations, only the indicator for the patient requiring service shall illuminate.
2. Upon responding to the service requirement, the nurse shall cancel the service requirement by pressing the "Cancel" button on the patient station, or, if staff register stations are utilized, by registering into the patient's room.
3. Upon cancellation of the service requirement, all associated signaling shall cease and the overtime function, if utilized, shall be reset.
4. It shall be possible, by software adjustment at the time of installation, to individually program the overtime period for each service priority from two to nine minutes or off.
5. In the event that a service requirement is not answered within the allotted time, the patient's room number shall reappear in the incoming calls screen followed by an "O" Priority to indicate "overtime".
   a. Stat required.
   b. Nurse (GREEN LEVEL) required.
   c. Nurse (AMBER LEVEL) required.

P. Monitoring A Patient's Room(s)
1. To monitor a room, the Control Station operator shall dial the room and press the "Monitor" touchpoint. The operator may monitor one or several rooms at random without the need to monitor an entire zone.
2. When a patient is selected for monitoring, a preannounce tone shall sound and the "Monitor" indicator on the patient station(s) shall illuminate to ensure the patient's privacy.
3. It will not be possible to monitor a patient station in the "privacy" mode.

4. Any system that requires the operator to monitor an entire zone in order to monitor more than one station will not be acceptable.

Q. Making Voice Announcements
   1. It shall be possible for the Control Station operator to selectively make voice announcements to individual rooms, multiple room zones, multiple zones, the entire nursing unit or when using staff registration, only to those locations where staff members are located.
   2. When paging by zone, it shall be possible to monitor the zone using the handset or "Push-to-Talk" speaker. (page with reply)
   3. It shall not be necessary to operate the "Push-to-Talk" touchpoint when paging/monitoring over the handset.

R. Placing Patient Station In "Priority" Status Mode
   1. It shall be possible to place a patient station in the "Priority" status mode at the Control Station by dialing the room number and bed number and pressing the "Change Priority" touchpoint. The number dialed and priority status shall be verified on the "Utility" Screen.
   2. If the patient station is already in the "Priority" status mode, the same procedure shall be sued to remove the station from the "Priority" mode.

S. Placing Patient Station In Privacy Mode
   1. It shall be possible to place a patient station or stations in the absolute "Privacy" mode using the same procedure described for changing "Priority" and pressing the "Change Privacy" button.
   2. System that require the nurse to go to the patient's room to set or cancel the "Privacy" mode will not be acceptable.

T. Displaying Stations In "Priority" Or "Privacy" Modes
   1. It shall be possible to contact the nurse registered nearest the calling patient while in communications by simply pressing the "Nurse (GREEN LEVEL)" or "Nurse (AMBER LEVEL)" touchpoint on the Control Station. This single action shall automatically register the location of the nearest nurse in the "Utility" screen and shall place the operator in voice contact with the selected staff member.
   2. Pressing the "Display Priority" touchpoint will sequentially display all stations in the "Priority" mode.
   3. It shall be possible to change "Priority" or "privacy" status during the sequential display sequence by simply pressing the "Change Priority" or "Change Privacy" touchpoint when the appropriate room number is displayed in the "Utility" Screen.
   4. Displaying stations in "Priority" or "privacy" modes shall not interfere with calls displayed on the "Calls Waiting" or "Current Call".

U. Contacting Registered Staff
   1. It shall be possible to contact the nurse registered nearest the calling patient while in communications by simply pressing the "Nurse (GREEN LEVEL)" or "Nurse (AMBER LEVEL)" touchpoint again shall automatically connect the operator to the next nearest staff member.
   2. The current time shall reappear in the "Utility" screen when no more staff members are registered.
   3. When the proper staff member has been dispatched, pressing the "Recall" touchpoint shall automatically reconnect the Control Station to the calling patient permitting the operator to assure the patient that help is on the way.

V. Locating Nurses
   1. It shall be possible to locate registered staff members at any time by simply touching the "Nurse (GREEN LEVEL)" or "Nurse (AMBER LEVEL)" touchpoint.
   2. This action shall cause registered staff members to be sequentially displayed in the "Utility" screen.

W. Reviewing Nurse (Green Level), Nurse (Amber Level), Or "Stat" Service Requirements
   1. It shall be possible to review unattended service requirements at any time by pressing the "Nurse (GREEN LEVEL)", Nurse (AMBER LEVEL)", or "Stat" touchpoints.
   2. This action shall cause all locations awaiting service to be sequentially displayed in the "Utility" screen.

X. Communications With Station Displayed In "Utility" Screen
   1. It shall be possible to communicate with any station displayed in the "Utility" screen during "Display Priority", "Staff Follow", "Nurse (GREEN LEVEL) Service", "Nurse (AMBER LEVEL) Service", "Stat Service", "Nurse (GREEN LEVEL)", or "Nurse (AMBER LEVEL)" scan (review) sequence, by simply lifting the handset or pressing the "Push-to-Talk" touchpoint.
   2. This single action shall cause the room number to transfer to the Current Call screen, the preannounce tone to sound at the Control Station and at the called station, and will open the voice channel for communication.

Y. Placing The System In The Staff Follow Mode
   1. In the event the Control Station is to be left unattended, it shall be possible to reroute incoming call tones to rooms where Staff are located by utilizing the "Staff Follow" mode.
   2. "Staff Follow" shall function in either of two ways:
      a. Automatic Staff Follow: When staff register stations are utilized, the "Staff Follow" mode shall be initiated by simply pressing the "Staff Follow" touchpoint. This single action shall cause the following to occur:
         1) The LED indicator on the "Staff Follow" touchpoint shall light.
         2) Incoming calls shall continue to annunciate in the normal manner at the Control Station.
         3) Incoming call tones shall annunciate by priority over the patient station(s) and/or staff station(s) in all locations where staff members have registered in.
      b. It shall be possible for the nurse to silence the incoming call tones by simply pressing the "Cancel" button on the station.
      c. Manual Staff Follow
         1) It shall be possible to manually program one or more patient staff station(s) into the "Staff Follow" mode by dialing the appropriate room number(s) and then pressing the "Staff Follow" touchpoint.
         2) The same sequence of events, as described in the preceding paragraph A shall occur.

2.03 EQUIPMENT

A. To provide the preceding features and functions, the following equipment shall be provided.
   1. Control Station
      a. The Control Station shall be housed in a finished steel cabinet with a moisture-proof membrane control panel.
      b. The Control graphics shall be organized in a logical left to right sequence permitting operators with little or no training to operate the basic Control Station functions without being confused by controls and indicators with which they are unfamiliar. All operations shall be initiated by a single touchpoint operation. Systems requiring shift keys or the operation of two buttons simultaneously will not be acceptable.
      c. In addition to the moisture-proof control panel, the Control Station shall incorporate the following features:
         1) A lightweight high impact telephone handset with retractable cord for privacy. Systems requiring Push-to-Talk operation when using handset will not be acceptable.
         2) A built-in combination tone reproducer, monitor, and intercom speaker.
         3) All solid state modular construction.
      d. The Control Station shall provide two way voice communications and signaling between nursing unit locations and patient rooms or auxiliary staff locations as indicated on the plans.

e. Calls for patients and staff shall be individually annunciated at the Control Station on digital displays by room number, bed designation and call priority. The system shall automatically display and select calling stations by priority and/or time of call placed. Subsequent higher priority calls shall automatically move ahead of lower priority calls. In the case of multiple calls, all calls shall be held in memory and automatically transferred by priority to the "Calls Waiting" display as space becomes available.

f. The Control Station shall have the capability of indicting the following levels of priority:
   1) Staff emergency
   2) Priority patient call
   3) Bath/emergency
   4) Alarm
   5) Normal patient call
   6) Duty station call
   7) Staff station call
   8) Stat service overtime
   9) Nurse service overtime
   10) Aide service overtime
   11) Hold call

g. Patient "priority" status shall be programmed at the Control Station without the use of keys or other special tools, and in such a manner that the patient station does not indicate the status electrically or mechanically. In semi-private rooms equipped with dual patient stations, it shall be possible to program each patient's status on an individual basis.

h. It shall be possible for the control station to set the level of "service required or to cancel "normal" patient calls. "Priority" calls shall be automatically set to the "Nurse (GREEN LEVEL) Service" required mode when the "cancel" touchpoint is pressed, thus maintaining the integrity of the call while permitting the operator to answer other calls.

i. Patient station "privacy" shall be programmed at the control station. When calling a station in the "privacy" mode, a "Privacy" indicator shall light on the Control Station.

j. It shall be possible to monitor one (1) or more rooms simultaneously in any combination.

k. It shall be possible to operate as many as three (3) Control Stations in parallel in the same system.

l. It shall be possible to transfer control between Control Stations in different systems on a Day/Night transfer basis. Transfer shall be accomplished by "taking" control at the operating Control Station rather than by "giving" control at the transferring Control Station thus making it impossible to transfer control to an unattended Control Station.

2.04 AREA CONTROL UNIT

A. The Area Control Unit shall be located as indicated in the plans.

B. The Area Control Unit shall be modular in construction and shall provide quick disconnect circuitry for switching, storing, programming, reviewing, amplifying, signaling and interconnecting system components.

C. The Area Control Unit shall have built in diagnostics to assist in locating and servicing component failure.

D. In the event of power failure, the Control Station Utility screen shall display P-Fail, indicating power failure. The built-in battery supply shall provide full operation including intercom and paging during the time (up to seven minutes) required for the hospital to switch to auxiliary power.

E. It shall be possible to reprogram room numbers in non-volatile memory whenever the need arises. It shall not be necessary to change components or order new programming from the factory to accomplish these changes.

F. All programmable information entered from the Control Station, i.e., room number, bed number, priority, paging unit, station designation, staff search location, pocket pager assignment, etc., shall be programmed in non-volatile memory.

G. Systems requiring external equipment for programming functions or back-up battery to retain memory will not be acceptable.

2.05 BEDSIDE PATIENT STATIONS

A. Patient stations shall provide the following facilities:
   1. "Calling/Responding" and "Monitor" indicators.
   2. Momentary action "Cancel" button.
   3. Universal Call Cord Receptacle(s) designed to accept standard cord sets or entertainment speakers.
   4. A safety switch which automatically places a "staff emergency" call when a cord set or entertainment speaker is removed.

B. Control circuits and indicators shall be all solid state for reliable operation; no mechanical devices requiring periodic maintenance shall be employed.

C. Hook up shall be made by push-on connectors; solder screw or "wire/nut" connection shall not be required. The push on connectors shall contain individual wires (ribbon cables shall not be permitted) for increased reliability and flexibility.

D. "Priority status" shall be programmed at the Control Station eliminating the change of accidental change by the patient or a visitor.

E. "Absolute Privacy" shall be programmed at the Control Station, eliminating the need for the patient to leave the bed or require staff assistance, and the possibility of accidental or intentional change by visitors.

F. Patient stations shall be manufactured of high-impact molded plastic in accordance with UL 1069 requirements.

G. It shall be possible to interface with 37-pin SideCom beds through the use of the patient stations; no extra components or modifications to equipment shall be acceptable.

H. It shall be possible to provide intercom over the pillow speaker through the use of the patient stations; no extra components or modification to equipment shall be acceptable.

2.06 BATH STATIONS

A. The Bath Station shall be pull cord type.

B. A water-resistance gasket shall be provided with all stations mounted in shown areas. Extension cord shall be provided, where necessary, to ensure the pull cord is within easy reach of the patient.

C. A call placed indicator shall be located on the face plate to assure the patient that the call has been placed. The Bath station shall be equipped with a cancel capability and a pull cord with adequate tension strength to resist breakage.

D. The Bath station shall mount in a single-gang electrical box; a face plate for flush mounting shall be provided.

2.07 STAFF/EMERGENCY STATIONS

A. The Staff/Emergency stations shall be push-button type or approved equal.

B. The push-button staff/emergency station shall have a Call Placed indicator, located on the face plate, to assure the patient that the call has been placed. The call shall be canceled by pressing the activating button. face plate shall be provided for flush mounting.

C. The push-button staff/emergency station shall have separate membrane touchpads for both the Call Place and Cancel functions. Hookup shall be made by push-on connectors; solder screw or "wire/nut" connection shall not be acceptable. A Call Placed indicator, located on the face plate, shall be provided to assure the patient that the call has been placed. It shall be possible to connect a remote reset switch.

D. The Staff/Emergency stations shall mount in a standard one (1) gang electrical boxes.

2.08 SHOWER STATION

A. The shower station shall be pull cord type.

B. The shower station shall pass the UL1069 water resistance test. The cancel function shall be accomplished with a membrane cancel touchpad. A color coordinated water-resistant gasket and a nylon cord shall be provided with the station. A Call Placed indicator, located on the face plate, shall be provided to assure the patient that the call has been placed. Hook up shall be made by push on connectors; solder screw or "wire/nut" connection shall not be acceptable. It shall be possible to connect a remote reset switch.

C. The shower station shall mount in a standard one (1) gang electrical box.

2.09 CORRIDOR DOME LIGHTS

A. The Corridor Dome Lights shall consist of:
   1. A wedge shaped, temperature resistant, translucent lens of even glow polystyrene.
   2. A single gang submount plate complete with five lights colored white, red, green, amber and blue.

B. The lens shall be snap fitted to the back plate assembly to facilitate changing lamps without the use of tools.

C. The wires shall be color coded to match the lamp color to reduce installation time.

2.10 STAFF STATIONS

A. Staff stations shall provide the following:
   1. "Call placed" and "monitor" indicators.
   2. One momentary action "call" button.
   3. One momentary action "cancel" button.
   4. One speaker/microphone.

2.11 DUTY STATIONS

A. Duty stations shall provide the following:
   1. One combination "normal call/staff call" and "call placed" indicator.
   2. One "bath call" indicator.
   3. One "emergency call/priority call" indicator.
   4. One momentary action "call" button.
   5. One momentary action "cancel" button.
   6. One combination "intercom/tone reproducer" speaker.
   7. One tone volume control settable at installation.

B. Duty stations shall be same size and of the same construction as the bedside patient stations.

C. The Duty Station shall annunciate all calls within its zone. The priority level of the call shall be indicated both audibly and visually on the station.

D. The Duty Station shall be capable of controlling zone lights to indicate:
   1. White steady for "normal" calls and "staff" call within the specified zone.
   2. White flashing for "emergency" calls and "priority" calls within the specified zone.
   3. Red flashing for "bath" calls within the specified zone.

E. Duty Stations that do not indicate the priority level of the call will not be acceptable.

2.12 ZONE LAMP CONTROLLER

A. The Zone Lamp Controller shall be capable of annunciating all calls or all staff registration/service requirements in this zone.

B. The Zone Lamp Controller shall control up to four (4) parallel zone lamps. The Zone Lamp Controller shall be capable of controlling the zone lights to indicate the various call priorities indicated in section 2.03.

C. It shall be possible to interface the Zone Lamp Controller with a remote speaker for tone annunciation. A volume control shall be provided for tone level adjustment.

D. The Zone Lamp Controller shall be manufactured in accordance with UL1069 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Vendor shall furnish and install all system equipment, devices, and shall perform all final system testing.

B. The electrical contractor is to pull cable per vendor wiring schematics.

C. Vendor shall coordinate all work and schedule the work with the General Contractor.

D. Electrical contractor to furnish and install back boxes and conduit stub-outs for Nurse Call devices.

E. Where open cable is run above dropped ceilings and penetrates a smoke or fire rated wall, furnish and install a minimum 1" empty sleeve, bushings on both ends. Conduit shall be sealed with fire resistant thermofibre provided and installed under other Divisions. The requirement for a sleeve applies only where the bundle of cables or single cable is greater than 1" in diameter. When the cable is smaller than 1", it may penetrate the partition without a sleeve provided the penetration hole is sealed up.

3.02 TRAINING OF PERSONNEL

A. Nursing staff of the hospital as well as maintenance staff shall be thoroughly instructed in the use of the system by authorized distributor personnel. Such service shall be provided in conjunction with the nurse's call equipment.

B. The vendor shall provide the hospital one in service color video tape of professional quality which shall provide audio and visual instructions for the proper use of the Nurse Call system by staff members after the training period.

C. The vendor shall provide instruction to the staff by means of an actual instructional system which shall be set up in the conference room or auditorium and allow hands on experience by the staff without disrupting the staff on duty. The instruction system shall consist of a Control Station, single and dual patient stations, staff, duty and emergency stations, and assorted call-in cord sets. The instructor shall demonstrate each function on the system with all lamps, screens and tones in operation. Maintenance instruction shall be performed in the same manner as described above.

END OF SECTION 27 52 23

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SCOPE AND RELATED DOCUMENTS

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the fire alarm system as shown on the drawings and as herein specified.

B. The requirements of the conditions of the Contract, Supplementary Conditions, and General Requirements apply to the work specified in this section.

C. The complete installation shall conform to the applicable sections of NFPA-72 International Fire Code, NFPA 70, NFPA 101, NFPA 90A, ADA accessibility guidelines and local code requirements.

D. The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the project specifications.

E. Any vendor suggested modifications of the plans shall be submitted to the design team for review prior to bid.

1.02 QUALITY ASSURANCE

A. Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the UL label.

B. All control equipment must have transient protection to comply with UL864 requirements.

C. Where fire alarm circuits leave the building, additional transient protection must be provided for each circuit. Devices must be UL listed under Standard 497B, Isolated Loop Circuit Protectors.

1.03 GENERAL

A. Furnish and install a complete fire alarm system as described herein and as shown on the plans, to be wired, connected, and left in first class operating condition. Include sufficient control unit(s), annunciator(s), initiating devices, notification appliances, controls, supervisory devices, wiring, terminations, electrical boxes, and all other necessary material for a complete addressable operating system. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.

B. Fire alarm system shall be by Johnson Controls, Siemens or Edwards, per HCA's purchasing agreement. Contacts are as follows:

1. Kevin Tolbert
Johnson Controls
BE-HCA@jci.com
478-952-8740
HPG Contract No. 3273

2. Ed Tambornino
Siemens
ed.tambornino@siemens.com
615-329-2601
HPG Contract No. 3574

C. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. Panels shall be capable of full system operation during software downloads.

D. Resident software shall allow for full configuration of initiating circuits so that additional hardware shall not be necessary to accommodate changes in, for instance, sensing of normally

open contact devices to sensing of normally closed contact devices, or from sensing of normally open contact devices to sensing a combination of current limited and non-current limited devices on the same circuit and being able to differentiate between the two, or changing from a non-verification circuit to a verification circuit or vice-versa.

E. The system shall have the capability of recalling alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

F. Panels shall automatically store all program changes to the panels non-volatile memory each time a new program is downloaded. A compare utility program shall be available to compare any two saved programs.

G. The system shall be capable of recording all alarm, supervisory and trouble events by means of a system printer.

H. The Fire Alarm Control Unit (FACU) shall provide the necessary hardware to provide supplemental notification, remote service and remote user access to the FACU. A standard RJ-45 Ethernet connection shall connect to Owner's Ethernet network.

I. [Contractor shall provide sensitivity test reports for all new and re-worked smoke and duct detectors installed in the project areas at the final AHCA survey.]

J. [Contractor shall provide an approved "Record of Completion" for the modification work performed on the fire alarm system at the final AHCA survey.]

1.04 OPERATION

A. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch shall be as follows:
   1. Identification of alarm condition at FACU and annunciator(s).
   2. Identification of the device/zone that is source of the alarm at the FACU and the annunciator(s).
   3. Operation of audible notification applications until silenced at the FACU or annunciator.
   4. Operation of visible notification appliances until system is reset.
   5. Closing of doors normally held open by door control devices.
   6. Unlocking of electric door locks in designated egress paths.
   7. Releasing of fire shutters.
   8. Initiation of air handling and fan controls per NFPA 90. Refer to mechanical controls drawings for additional information.
   9. Initiation of smoke control systems. Refer to mechanical drawings and specifications for additional information.
   10. Transmission of signal to remote alarm receiving station.
   11. Initiate elevator recall to primary or alternate floors.

B. Activation of duct smoke detectors shall activate supervisory signals and shall initiate the shutdown or closing of associated fans and dampers.

C. Upon reset of the fire alarm control panel, air handling units shall sequentially start up to minimize power demand.

D. The alarm activation of any elevator lobby smoke detector shall, in addition to the operations listed above, cause the elevator cabs to be recalled according to the following sequence:
   1. If the alarmed detector is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.
   2. If the alarmed detector is on the main egress level, the elevator cabs shall be recalled to the predetermined alternate recall level as determined by the local authority having jurisdiction.

E. The control panel shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.
   1. The activation of any standpipe or sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the

control panel and the remote annunciator. Differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring shall be provided.

2. Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED "ON" indicating the off-normal condition.
3. Restoring the valve to the normal position shall cause the supervisory service LED to extinguish, indicating restoration to normal.

F. The method of communication between the protected premises and supervising station shall comply with communication requirements of NFPA 72. Contractor shall verify with Owner the desired communication technology prior to issuance of shop drawings. Provide all components required for fully operational communications system.

1.05 SUPERVISION

A. The system shall contain Class "B" independently supervised signaling line device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.

B. There shall be supervisory service initiation device circuits for connection of all sprinkler valve supervisory (tamper). Device activation shall cause a supervisory alarm at the control panel.

C. There shall be independently supervised and independently fused notification appliance circuits. Disarrangement conditions of any circuit shall not affect the operation of other circuits.

D. Auxiliary manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble.

E. Each independently supervised circuit shall include a discrete LCD readout to indicate disarrangement conditions per circuit.

F. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.

G. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote annunciator.

H. The system modules shall be electrically supervised for module placement. Should a module become disconnected, the system trouble indicator shall illuminate and the audible trouble signal shall sound.

I. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

1.06 POWER REQUIREMENTS

A. The control panel shall receive 120 VAC power (as noted on the plans) via a dedicated circuit.

B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of four (4) hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

C. All external circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.

PART 2 PRODUCTS

2.01 FIRE ALARM CONTROL UNIT

A. Control unit construction shall be UL 864 listed modular with solid-state, microprocessor-based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions.

1. A local audible device shall sound during alarm, trouble, or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition

from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly.

B. The following primary controls shall be visible through a front access panel:
   1. Eighty character liquid crystal display.
   2. Individual red system alarm LED.
   3. Individual yellow supervisory service LED.
   4. Individual yellow trouble LED.
   5. Green "power on" LED.
   6. Alarm Acknowledge key.
   7. Supervisory Acknowledge key.
   8. Trouble Acknowledge key.
   9. Alarm Silence key.
   10. System Reset key.

C. The following secondary control switches and LEDs shall be available behind an access door:
   1. City disconnect/switch.
   2. Manual evacuation (drill).
   3. Elevator bypass.
   4. Door holder release bypass.
   5. Future.

D. The control panel shall provide the following:
   1. Setting of time and date.
   2. LED testing.
   3. Alarm, Trouble, and Abnormal condition listing.
   4. Enabling and disabling of each monitor point separately.
   5. Activation and deactivation of each control point separately.
   6. Changing operator access levels.
   7. Walk Test enable.
   8. Running diagnostic functions.
   9. Displaying software revision level.
   10. Displaying historical logs.
   11. Displaying card status.
   12. Point listing.

E. For maintenance purposes, the following lists shall be available from the point lists menu:
   1. All points list by address.
   2. Monitor point list.
   3. Signal/speaker list.
   4. Auxiliary control list.
   5. Feedback point list.
   6. Psuedo point list.
   7. LED/switch status list.

F. Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user. These controls shall be located behind an access door.

G. Primary Keys, LEDs, and LCD Display:
   1. The control panel shall have an 86 character liquid crystal display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
   2. The display shall support both upper and lower case letters. Lowercase letters shall be used for softkey titles and prompting the user. Uppercase letters shall be used for system status information. A cursor shall be visible when entering information.

2.02 SYSTEM FRONT PANEL OPERATION AND CAPABILITIES

A. Under normal condition, the front panel shall display a "System is Normal" message and the current time and date.

B. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

C. The LCD shall display the following information relative to the abnormal condition of a point in the system.
   1. 40 character custom location label.
   2. Type of device (i.e., smoke, pull station, water flow).
   3. Point status (i.e., alarm, trouble).

D. Alarm Silencing:
   1. Should the Alarm Silence button be pressed, all audible alarm signals shall cease to operate.
   2. Signals shall not be silenced during alarm silence inhibit mode.

E. System Reset:
   1. The System Reset button shall be used to return the system to its normal state after an alarm condition has been remedied.
   2. Should an alarm condition continue to exist the system control relays shall not reset.
   3. Should the Alarm Silence Inhibit function be active, the SYSTEM RESET key press will be ignored.

F. LED Supervision: All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the LCD shall display the module and LED location numbers to facilitate location of that LED.

G. System Trouble Reminder: Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmed to suit the owner's application.

H. RS-232-C Output: The fire alarm control panel shall support up to five (5) RS-232-C ports and one service port. All (5) RS-232-C ports shall be capable of two-way communications.

I. Fire Alarm Control System Network:
   1. Each fire alarm control panel shall operate as a proprietary local system with data communication to a higher order Fire-Alarm Control Unit (FACU).
   2. The FACU shall monitor all alarms and troubles of each fire alarm control panel.
   3. The FACU shall control each fire alarm control panel as listed in this specification.
   4. All data communication wiring between the FACU and fire alarm control panel shall be supervised for opens, shorts, and grounds.

J. Equipment Enclosures: Provide cabinets of sufficient size to accommodate the aforementioned equipment. Cabinet shall be equipped with locks and transparent door panel providing freedom from tampering yet allowing full view of the various lights and controls.

2.03 REMOTE ANNUNCIATOR(S)

A. Where shown on the plans, provide and install a LCD annunciator. The LCD display shall mimic the LCD display on the control panel.

B. The serial annunciator shall consist of:
   1. A minimum of four programmable control switches and associated LEDs.
   2. The display shall be provide the following information relative to the abnormal condition of a point in the system:
      a. 40 character custom label location
      b. Type of device
      c. Point status

2.04 MULTIPLE ADDRESSABLE PERIPHERAL NETWORK (MAPNET)

A. Communication with addressable devices. The system must provide communication with initiating and control devices individually. All of these devices will be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:
   1. Alarm.
   2. Trouble.
   3. Open.
   4. Short.
   5. Device missing/failed.

B. All addressable devices shall have the capability of being disabled or enabled individually.

C. Identification of Addressable Devices: Each addressable device must be uniquely identified by an address code entered on each device at time of installation.

D. Wiring Type, Distances, Survivability, and Configurations: Wiring types will be approved by the equipment manufacturer. Existing wiring may be utilized in retrofit applications where applicable. The system shall allow a line distance of up to 2,500 feet to the furthest addressable device on a Class B circuit. (Class A communications will be provided where shown on the drawings. Wire will be so routed to maintain sufficient distance between the forward and return loop as called for by the authority having jurisdiction.) To minimize wire routing and to facilitate future additions, t-tapping of the communications channel will be supported except where Class A wiring is required.

E. Addressable Device Types:
   1. General: The system control panel, must be capable of communicating with the types of addressable devices specified below. Addressable devices will be located as shown on the drawings.
   2. Addressable Sensor Bases - All addressable smoke, heat and CO detectors as specified below will be pluggable into their bases. The base will contain electronics that communicate the sensor status (normal, alarm, trouble) to the control panel. Different sensor heads must be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel. Bases shall contain magnetically activated test switches and LED status indicators.
   3. Addressable Analog Smoke Sensors:
      a. The photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base, and shall comply with UL 268.
      b. Each sensor shall self-restore after the actuation without resetting or readjustment.
      c. Each device shall be individually monitored by the fire-alarm control unit for calibration, sensitivity and alarm condition and shall be adjustable for sensitivity by fire-alarm control unit.
   4. Addressable Heat Sensors:
      a. Heat sensors shall comply with UL 521.
      b. Sensor shall be combination fixed temperature (135F) and rate-of-rise (15F/minute) type unit.
      c. Fixed temperature sensing shall be independent and shall be programmable at 135F or 155F with rate-of-rise defection selectable at 15F/minute or 20F/minute.
      d. Each device shall be analog addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity and alarm condition and individually adjustable by the fire-alarm control unit.
   5. Addressable Pull Stations:
      a. Addressable pull stations will contain electronics that communicate the station's status (normal, alarm, or trouble) to the fire-alarm control unit. The address will be set on the station. They will be manufactured from high impact red Lexan. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will bedouble action push top activation door.
      b. The addressable manual station shall comply with UL 38.

6. Addressable Photoelectric Duct Sensor:
    a. Sensors shall be photoelectric type with sampling tubes of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied.
    b. Duct housing shall be provided with relay or relay device as required for fan shutdown.
    c. Environmental compensation, programmable sensitivity settings, status testing and monitoring of sensor dirt accumulation shall be provided by the fire-alarm control unit.
    d. Duct housing shall be provided with magnetic test area and status indicators and shall have transparent cover to monitor presence of smoke.
    e. Duct housing shall have two test ports for measuring of airflow and testing. Ports shall allow for aerosol injection in order to test activation of sensor.
    f. Each sensor shall be provided with a remote test station. Exact locations of test stations shall be coordinated with the Owner prior to installation.
7. Addressable Circuit Interface Modules: Modules shall be arranged to monitor or control system components that are not otherwise equipped for addressable communication. Modules shall be utilized for monitoring of waterflow, valve tamper, non-addressable devices, and for control of HVAC systems.
    a. Modules shall be supervised and uniquely identified by the fire-alarm control unit. Module shall have on board status indicator.
8. Addressable CO Sensor:
    a. The CO sensor shall be an addressable carbon monoxide (CO) sensing module providing toxic gas detection and shall comply with UL 268.
    b. The sensor shall be provided with an integral status indicator, reporting to the fire-alarm control unit.
9. Addressable Device Supervision:
    a. All devices shall be supervised for trouble conditions. The system control panel will be capable of displaying the type of trouble condition (open, short, device missing/failed).
    b. Should a device fail, it will not hinder the operation of other system devices.

2.05 ONE-WAY VOICE COMMUNICATION

A. Provide one-way voice communication and tone generating capabilities.

B. A central audio control module shall be provided for the necessary alarm message/tone generation, main and remote microphone connections, music inputs, and mixer/pre-amplifier circuits. Continuous supervision shall be provided. Audio outputs shall have individual gain control.

C. A hand-held, push-to-talk microphone shall be provided recessed within a protective panel-mounted enclosure.

D. An audio control switch module shall be furnished to provide manual to the audio functions. These switches and associated LED indicators shall be supervised from disarrangement or failure.

E. A pre-recorded digitized voice message capability shall be provided for automatic transmission to building occupants during alarm conditions. Three (3) messages shall be provided, one for alarm, one for testing. A standard evacuation message shall be provided under this contract; however, the message player must be capable of transmitting a customized message of up to 4 minutes long.
    1. A self-contained speaker will provide testing of the message(s) without disturbing the occupants of the facility.

F. Automatic Voice Evacuation Sequence:
    1. The audio alarm signal shall consist of an alarm tone for a maximum of 10 seconds followed by automatic pre-selected voice evacuation messages. At the end of each voice evacuation message, the alarm tone shall resume. The alarm tones shall sound until the alarm silence switch at the fire alarm control panel has been operated.

2. All audio alarm operations (speaker circuit selection and alarm tone/voice message timing variations) shall be activated by the system software so that any required future changes to the evacuation sequence can be facilitated by authorized personnel without any component rewiring.

G. Manual Voice Paging Sequence:
   1. The system shall be configured to allow selective voice paging. Upon activation of any speaker manual control switch, two (2) seconds of tone shall sound over the speakers indicating an impending voice message will occur.
   2. If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the preselected speakers.
   3. Facility for total building evacuation and paging shall be provided to allow for activation of speakers. This shall be accomplished by the means of an "All Circuit" switch.

2.06 NETWORK VOICE COMMAND CENTER

A. Provide a network voice command center in the building's fire command center. Unit shall include all voice alarm system components required to integrate fully with individual network node voice alarm panels.

B. All network voice command center functions shall allow network wide operation of live emergency voice communications or pre-recorded messages originating from the fire command center or other voice system nodes.

C. System shall allow for simultaneous transmission of different announcements to different zones automatically or by use of central control microphone.

D. All announcements shall be made over dedicated, supervised communication lines.

E. Emergency Phone Jacks
   1. Provide emergency phone jacks as shown on the plans. Each jack shall be mounted on a stainless steel single gang plate with the words "Fire Emergency Phone" screened on each.
   2. Provide emergency phone jacks for installation in each elevator car by the elevator contractor. Required wiring from elevator controls to each elevator car shall be furnished and installed by the elevator contractor.

2.07 ALARM NOTIFICATION APPLIANCES

A. Provide conventional alarm notification appliances as indicated in the project drawings and all associated equipment accessories as required for operation on compatible signaling line circuits.

B. All devices shall be UL listed.

C. Visible appliances shall be provided with the appropriate candela rating to provide full coverage of the spaces they serve.

D. Devices located outdoors or in interior spaces subject to water shall be rated for weatherproof operations.

2.08 MAGNETIC DOOR HOLDERS

A. Shall be listed to UL 228.

B. Shall be equipped for wall mounting, unless indicated otherwise in project drawings, with matching door plate.

C. Finish shall match door hardware.

2.09 DEVICE GUARDS

A. All devices located in Behavioral Health shall be provided with tamper resistant covers listed for use with applicable initiating and notification appliances.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor.
   1. All junction boxes shall be sprayed red and labeled "Fire Alarm." Wiring color code shall be maintained throughout the installation.

B. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

C. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

D. The manufacturer's authorized representative shall provide on-site supervision of installation.

E. All wiring shall be installed in conduit.

F. Existing fire alarm equipment shall be maintained fully operational until new equipment has been tested and accepted. After acceptance of new fire alarm system remove existing equipment and restore damaged surfaces.

G. Identify system components, wiring, cabling and terminals.

H. Install ground wire from FACU to main service ground.

I. Installation shall meet pathway survivability requirements of NFPA 72

3.02 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72 by the contractor in the presence of the owner's representative and the local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor.

B. Prior to final testing contractor shall complete a series of pre-test and all deficiencies shall be corrected.

3.03 TRAINING

A. Provide a minimum of 8 hours of demonstration and training to the Owner on operation, troubleshooting and maintenance of the fire alarm system.

3.04 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The Contractor shall provide up to 3 visits within the warranty year to make adjustments to the system not associated with warranty issues.

C. Update software to latest version at project completion. Provide and install software upgrades that become available within 2 years of substantial completion.

END OF SECTION 28 31 00