HCA Florida
St. Lucie Hospital

Project Manual For:

HCA Florida
St. Lucie Hospital
Parking Garage
1800 SE Tiffany Ave.
Port St. Lucie, Florida 34952

Construction Documents

July 30, 2024

TMP Project # A00324
HCA Project # 3099600023

TMPartners, PLLC
Architecture Interiors Planning

HCA Healthcare℠

Architect & Interior Design
TMPartners, PLLC
Project Manager: Laney Brown

211 Franklin Road, Suite 200
Brentwood, TN 37027
615.377.9773

8131 Lakewood Main Street, Suite 202
Lakewood Ranch, FL 34202
941.907.9711

Civil Engineering
Kimley-Horn
1920 Wekiva Way, Suite 200
West Palm Beach, FL 33411
561.845.0665

Structural Engineering
Stanley D. Lindsey & Associates
750 Old Hickory Blvd., Building 1, Suite 175
Brentwood, TN 37027
615.320.1735

MP&E Engineering
I.C. Thomasson Associates, Inc.
2950 Kraft Drive
Nashville, TN 37204
615.346.3400

Landscape Architecture
Kimley-Horn
1920 Wekiva Way, Suite 200
West Palm Beach, FL 33411
561.845.0665

General Contractor
Brasfield & Gorrie
1201 Demonbreun Street
Suite 200
Nashville, TN 37203
615.313.2900

HCA Design Manager
Ryan Rohe

HCA Construction Manager
Greg Atkinson

Project Manual

HCA FLORIDA ST LUCIE HOSPITAL
PARKING GARAGE

Port St. Lucie, Florida
HCA No. 3099600023
TMP No. A00324

CONSTRUCTION DOCUMENTS
July 30, 2024

Owner	**HCA HEALTH SERVICES OF FLORIDA, INC.** **dba HCA FLORIDA ST. LUCIE HOSPITAL** 1800 SE Tiffany Ave. Port St. Lucie, FL 34952
Architecture **Interior Design**	**TMPARTNERS, PLLC** 211 Franklin Road, Suite 200 Brentwood, Tennessee 37027 8131 Lakewood Main Street, Suite 202 Lakewood Ranch, FL 34202
Civil Engineering	**Kimley-Horn** 1920 Wekiva Way, Suite 200 West Palm Beach, FL 33411
Structural Engineering	**Stanley D. Lindsey & Associates** 750 Old Hickory Blvd., Building 1, Suite 175 Brentwood, TN 37027
Mechanical, Plumbing, Electrical and Telecomm Engineering	**I.C. Thomasson Associates, Inc.** 2950 Kraft Drive, Suite 500 Nashville, TN 37204
General Contractor	**Brasfield & Gorrie** 1201 Demonbreun Street Suite 200 Nashville, TN 37203

STATE OF FLORIDA
ANTHONY JOHN CATALANO III
AR-91721
REGISTERED ARCHITECT

Digitally signed by Anthony John Catalano III
Date: 2024.07.30 16:52:53-04'00'

BENJAMIN NELSON
LICENSE
NO. 97590
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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W. Nelson
Date:

ZACHARY N. MCCOY
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No. 93060
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PROFESSIONAL ENGINEER

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Zachary N. McCoy
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JOSHUA R. CARTWRIGHT
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No. 71893
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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Digitally signed by Josh Cartwright
Date: 2024.07.29 17:35:21-05'00'

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PARKING GARAGE
Port St. Lucie, FL
TMP No. A00324
HCA Project # 3099600023

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SECTION 002150 – PREFERRED VENDORS AND MANUFACTURERS

PART 1 - GENERAL

1.1 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

1.2 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.

1.3 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.

1.4 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.

PART 2 - LIST

2.1 The HCA Preferred Vendor List begins on the following page.

2.2 The HPG suppliers and manufacturers with negotiated purchasing agreement numbers not identified in the list.

PART 3 - DEFINITIONS

3.1 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.

3.2 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.

3.3 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.

END OF SECTION **002150**

HCA Healthcare Capital Deployment Peferred Vendors		Last Update: JUNE 2023
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	
NA	Not applicable to work / scope preformed internally	

Contract Category	Supplier	HPG Contract Nu	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	5768	Casey Chandler cchandler@tremcoinc.com Phone 704-575-7613	Multi source

EPDM	Carlisle - Syntec			Multi source
	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi source
	Firestone	55355	Matt Traverse traversematt@bfusa.com (615) 937-5152	Multi source
	Genflex			Multi source
	J. Reynolds & Company	5641	Matt Skipper mskipper@jreynolds.com Phone 817-306-9596	Multi source
	Tremco	5768	Casey Chandler cchandler@tremcoinc.com Phone 704-575-7613	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	55355	Matt Traverse traversematt@bfusa.com (615) 937-5152	Multi source
	Genflex			Multi source
	J. Reynolds & Company	5641	Matt Skipper mskipper@jreynolds.com Phone 817-306-9596	Multi source
	Sarnafil	18262	Bill Love love.bill@us.sika.com Phone: 586-201-0431	Multi source
	Tremco	5768	Casey Chandler cchandler@tremcoinc.com Phone 704-575-7613	Multi source
Modified Bitumen	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi source

	Firestone	55355	Matt Traverse traversematt@bfusa.com (615) 937-5152	Multi source
	J. Reynolds & Company	5641	Matt Skipper mskipper@jreynolds.com Phone 817-306-9596	Multi source
	Johns Manville	15419	Eric Smith eric.smith@jm.com 916-230-1536	Multi source
	Siplast			Multi source
	Soprema	12456	Eric Younkin eyounkin@soprema.us 330-334-0066 ext. 2228	Multi source
	Tremco	5768	Casey Chandler cchandler@tremcoinc.com Phone 704-575-7613	Multi source
	WP Hickman			Multi source
Sheet Metal Roofing	Centimark	5781	Wayne Barr wayne.barr@centimark.com Phone: 615-991-9223	Multi source
	J. Reynolds & Company	5641	Matt Skipper mskipper@jreynolds.com Phone 817-306-9596	Multi source
	Tremco	5768	Casey Chandler cchandler@tremcoinc.com Phone 704-575-7613	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 WW Grainger, Inc. mike.harrod@grainger.com phone: 502-655-0258	Multi source
Joint Sealants	Sherwin Williams	5893	Patrick Noble patrick.t.noble@sherwin.com Phone 216-515-7925	Multi source
	Koroseal			Multi source
	Tremco	5768	Casey Chandler cchandler@tremcoinc.com Phone 704-575-7613	Multi source
Division 08 - Doors and Windows				
Wood Doors	VT		Doug Bachand VT Doors dbachand@vtindustries.com 919-452-3716	Preferred
Metal Doors and frames	Steelcraft	7702	Gene Jones SSC South / Allegion gene.jones@allegion.com phone: 615-631-8650	Sole Source
	Republic			
Mechanical lock	Schlage	7702	Gene Jones SSC South / Allegion gene.jones@allegion.com phone: 615-631-8650	Sole Source
	Falcon			
Door closers	LCN	7702	Gene Jones SSC South / Allegion gene.jones@allegion.com phone: 615-631-8650	Sole Source
	Falcon			
Exit Devices	Von Duprin	7702	Gene Jones SSC South / Allegion gene.jones@allegion.com phone: 615-631-8650	Sole Source

	Falcon		phone: 615-631-8650	
Accessories	IVES	7702	Gene Jones SSC South / Allegion gene.jones@allegion.com phone: 615-631-8650	Sole Source
	Glenn-Johnson			
	Falcon			
Sliding Glass ICU/CCU Doors Automatic Door Operators	Besam			Multi source
	Stanley			Multi source
Division 09 - Finishes				
Gypsum Board Assemblies	USG			Preferred
	Georgia Pacific			Preferred
Resilient Flooring	Mannington	5468	Terri Bailey HCA@mannington.com Phone: 615-427-8980	Sole Source
Resinous Flooring				
Carpeting	Shaw	500169	Deborah Smith deborah.smith@shawinc.com 704-249-6758	Multi source
	Tandus	500148	James Bourgeois james.bourgeois@tarkett.com 225-205-4519	Multi source
	Masland	6573	Jeff Taylor jeff.taylor@maslandcontract.com Phone: 404-543-7167	Multi source
	Mannington	5468	Terri Bailey HCA@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 HCA@mannington.com Phone: 615-427-8980	Sole Source
Paint and coatings	Sherwin Williams	5893	Patrick Noble patrick.t.noble@sherwin.com Phone 216-515-7925	Multi 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	Patrick Noble patrick.t.noble@sherwin.com Phone 216-515-7925	Multi source
Wall Protection	InPro Corporation	44661	Julie Mooney 262-679-9010 ext. 5254 jmooney@inpro.com	Sole Source
Solid Surface	Avonite			Multi source
	Corian			Multi source
	Formica			Multi source
	Wilsonart International, Inc.			Multi source
Acoustic Ceilings	Armstrong World Industries	6924	Anna Justice HCA@armstrong.com Phone: 717-396-4325	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 615.656.3280 ext 1	Multi source
	Eagan Visual		Available through contract furniture dealers	Multi source
	Staples Advantage	2532	Deb Mailmstrom deb.malmstrom@staples.com Phone: 770-532-8033	Multi source
	Peter Pepper		Available through contract furniture dealers	Multi source
Solid Surface Shower System	InPro Corporation	44661	Mike O'Connell Inpro Corporation moconnell@inprocorp.com Phone: 608-640-8196	Sole Source
Lockers	Quantum Medical	5522	Elizabeth Faller elizabethf@quantumstorage.com 15800 NW 15th Ave Miami, FL 33169	Multi source
	Storage Systems	500166	Bill Kreager bkreager@storagesystems.com Phone: 888-614-0004	Multi source
Division 11 - Equipment				
Food Service Equipment	Inman Foodservices Group	7227	Billy Inman billy.inman@inman-inc.com 3807 Charlotte Ave, Nashville TN 37209 Phone: 615-812-6500	Multi source
Division 12 - Furnishings				

Ice Machines	Follett Corporation	5000041	Gary Gutman ggutman@follettice.com 800-523-9361	Multi source
Audio-Visual Equipment (TVs, Accessories)	Grainger	4077	Mike Harrod mike.harrod@grainger.com phone: 502-655-0258	Multi source
	Remar	3248	Kevin Kolff kkolff@remarinc.com 615-449-0231	Multi source
	Telehealth	500045	Darrell Leftwich darrell.leftwich@telehealth.com 615-383-7836	Multi source
Division 13 - Special Construction				
Division 14 - Conveying Systems				
Elevators	Schindler	7257	Daniel Winder daniel.winder@schindler.com 972-358-5063	Multi source
	Otis	4229	Ernie Dominguez Ernie.Dominguez@otis.com 512-567-7840	Multi source
	Kone	6008	Bruce Norden bruce.norden@kone.com 309-314-1515	Multi source
Pneumatic Tube System	Pevco	31267	James Valerino 410-961-3050 jvalerino@pevco.com	Preferred
	Swisslog			Preferred
Division 21 - Fire Suppression & Detection				
Division 22 - Plumbing				
Domestic Water Piping and Valves	Mueller			
	Borzan			

	Dura-Line	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Uponor			
	Nibco			
	Milwaukee			
	B-Line			
	FNW			
	Conbraco			
	Anvil			
	Ipsco			
	Victaulic			
Domestic Water Backflow Preventers, Trap Primers, and Shock Absorbers	Zurn/Wilkins	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Proflo			
	PPP			
	Sioux Chief			
	Watts			
Domestic Water Pumps	Taco	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com	Multi source
	Grundfos			Multi source
	Bell & Gossett			Multi source
	SyncroFlo			Multi source
	Canariis			Multi source
	Systecon			Multi source
Domestic Waste Piping and Drains	Charlotte	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Tyler Pipe			
	ABI			
	Ideal			
	Proflo			
	Zurn			
Mechanical Piping	Ipsco	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com	Sole Source
	Borzan			
	Nupi-Niron			
	Weldbend			
	Milwaukee			
	Nordstrom			

	B-Line		Phone: 615-316-1920	
	FNW			
	Nibco			
	Anvil			
General Service Compressed Air Piping and Valves	Beacon Medeas			Multi source
	Allied Health Products			Multi source
	Amico			Multi source
	Powrex			Multi source
Commercial Domestic Water Softeners	Culligan			Multi source
	Anderson Chemical			Multi source
	Bruner			Multi source
	Hydromax			Multi source
	Stay-rite			Multi source
	Marlo			Multi source
	Garratt-Callahan Company	3968	John Reseland ireseland@g-c.com 412-721-5292	Multi source
	Wigan			Multi source
	Nalco	3923	Lawrence Gess lgess@nalco.com 630-305-1658	Multi source
Commercial Storage Electric Domestic Water Heaters	Hesco			Multi source
	Ruud			Multi source
	Bradford White			Multi source
	State	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Multi source
	AO Smith			Multi source
	PVI			Multi source
Commercial, Atmospheric, Gas Domestic Water Heaters	Teledyne Laars			Multi source
	Aerco			Multi source
	Hesco			Multi source
	Bradford White			Multi source

	Patterson Kelly			Multi source
	Lochinvar	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Multi source
	PVI			Multi source
	AO Smith			Multi source
Commercial, Power-Vent, Gas Domestic Water Heaters	Aerco			Multi source
	Hesco			Multi source
	Patterson Kelly			Multi source
	Armstrong			Multi source
Plumbing Fixtures and Drinking Fountains	Symmons	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Zurn			
	Elkay			
Medical Gas Piping System	Elkhart	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Mueller			
	Nibco			
Deionized Water Piping	Enfield	5999	Bettina Dawson Ferguson Enterprises 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	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Multi source
	Siemens	3574	Ed Tambornino ed.tambornino@siemens.com Phone: 615-329-2601	Multi source
	Schneider Electric/ via Graybar	5892	Jeff Eggleston jeff.eggleston@se.com 469-995-1092	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			Multi source
	Armstrong			Multi source
	Bell & Gossett	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Multi source
	Aurora			Multi source
	Paco			Multi source

	Taco			Multi source
	Grundfos			Multi source
	Weinman			Multi source
Steam and Condensate Heating Piping	Ipsco	5999	Bettina Dawson Ferguson Enterprises bettina.dawson@ferguson.com Phone: 615-316-1920	Sole Source
	Borzan			
	Nupri - Niron			
	B-Line			
	FNW			
	Milwaukee			
	Weiss			
	Sarco			
	Weldbend			
	Nibco			
	Anvil			
Sound Alternators	McGill			Multi source
	IAC			Multi source
	Vibro-Acoustics			Multi source
Variable Air Volume (VAV) units	Johnson Controls	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Multi source
	Siemens	3574	Ed Tambornino ed.tambornino@siemens.com Phone: 615-329-2601	Multi source
Air Filters	CamFil	6688	David Blackwell 806-773-8408 Dave.Blackwell@camfil.com	Multi source
	TriDim	6686	Tabatha Henshaw 540-967-5789 t.henshaw@tridim.com	Multi source
	Clarcor	6718	Chuck Lehman clehman@clcair.com 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	Burnham			Multi source
	Cleaver Brooks			Multi source
	Superior Boiler			Multi source
	Industrial Combustion			Multi source
	Lochinvar			Multi source
	Bryan			Multi source
	Aerco			Multi source
	Hurst			Multi source
	Weil-McLane			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 352-318-5139 Justin.leslie@carrier.com	Multi source
	Trane	3572	Craig Elliott craig.elliott@Trane.com Phone: 334-201-7555	Multi source
	Daiken/McQuay	3574	Mark Kearschner mark.kearschner@daikinmcquay.com Phone: 704-340-1520	Multi source
	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Multi source
Centrifugal Water Chiller	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Sole source

Packaged Air Cooled Chiller	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	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	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Sole source
Rooftop Air Handling Unit	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Sole source
Packaged Rooftop Unit	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Sole source
Computer Room Air-Conditioning Unit	Liebert			Multi source
	Airedale			Multi source
	HiRoss			Multi source
	DataAire			Multi source
	Compu-Aire			Multi source
	Schneider			Multi source
	Stultz			Multi source
Split System A/C Units	Carrier	6741	Justin Leslie 352-318-5139 Justin.leslie@carrier.com	Multi source
	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Multi source
	McQuay	3574	Mark Kearschner mark.kearschner@daikinmcquay.com Phone: 704-340-1520	Multi source

	Trane	3572	Craig Elliott craig.elliott@Trane.com Phone: 334-201-7555	Multi source
Duct Heaters	Carrier	6741	Justin Leslie 352-318-5139 Justin.leslie@carrier.com	Multi source
	McQuay	3574	Mark Kearschner mark.kearschner@daikinmcquay.com Phone: 704-340-1520	Multi source
	Trane	3572	Craig Elliott craig.elliott@Trane.com Phone: 334-201-7555	Multi source
	York/JCI	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	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	Square D	5892	Graybar – Nashville Jess Hoover, Charlie Shannon HCA@graybar.com 239-494-2088, 615-743-3226	Sole Source
Generator Synchronizing Switchgear	ASCO	7228	Ron Caprio 770-757-8747 ron.caprio@ascopower.com	Sole Source
Circuit Breaker Distribution Switchboards	Square D	5892	Graybar – Nashville Jess Hoover, Charlie Shannon HCA@graybar.com 239-494-2088, 615-743-3226	Sole Source

Safety Switches	Square D	5892	Graybar – Nashville Jess Hoover, Charlie Shannon HCA@graybar.com 239-494-2088, 615-743-3226	Sole Source
Emergency Standby Engine Generator System	Cummins Crosspoint	6344	Chris Banet HCA@cummins.com Phone: 615-478-2057	Multi source
	Caterpillar	46261	Steve Turner HealthTrust@cat.com Phone: 309-494-5105	Multi source
	Kohler	66551	Keith Kraemer hcasales@nixonpower.com Phone: 615-664-1487	Multi source
	Generac	3489	Mike Evans HCA@essellc.com Phone: 865-806-9435	Multi source
Surge Protective Devices	Square D	5892	Graybar – Nashville Jess Hoover, Charlie Shannon HCA@graybar.com 239-494-2088, 615-743-3226	Sole Source
Modular Headwall Units	BLOX	64799	Amanda Moore amoore@bloxbuilt.com 205-424-3242	Multi source
	Neopod	75807	Michael Miller mmiller@neopodsystems.com 512-987-0097	Multi source
Lighting	Acuity	5892	Graybar – Nashville Jess Hoover, Charlie Shannon HCA@graybar.com 239-494-2088, 615-743-3226	Sole Source
Fire & Life Safety Systems	Johnson Control	3273	Kevin Tolbert BE-HCA@jci.com 478-952-8740	Multi source
	Siemens	3574	Ed Tambornino ed.tambornino@siemens.com Phone: 615-329-2601	Multi source

	Edwards			Multi source
Structured Voice and Data Cabling Infrastructure	Accu-Tech	6715	Tim Flannagan 615-430-0813 Tim.Flannagan@accu-tech.com	Multi source
	Graybar	5892	Graybar – Nashville Jess Hoover, Charlie Shannon HCA@graybar.com 239-494-2088, 615-743-3226	Multi Source
Division 28 - Electronic Safety and Security				
Security System	ADT			Multi source
	Stanley			Multi source
Access Controls	Lenel Systems International, Inc.		Rick Keebler richard.keebler@lenel.com 513-260-1140	Multi source
	Software House / Tyco International		Keg Giles kgiles@tycoint.com 770-595-4719	Multi source
	aptiQ	7702	Gene Jones SSC South / Allegion gene.jones@allegion.com 615-631-8650	Multi source

SECTION 003132- SOIL INVESTIGATION DATA

GEOTECHNICAL REPORT DATED APRIL 29, 2024, FOR 6-STORY HOSPITAL PARKING GARAGE FOLLOWS IN THIS SECTION

GEOTECHNICAL ENGINEERING REPORT

HCA Florida St. Lucie Hospital Parking Garage
1800 SE Tiffany Avenue
Port St. Lucie, Florida

PSI Project No. 0225-2017

PREPARED FOR:

HCA Management Services, L.P.
One Park Plaza, Building 3-2
Nashville, TN 37203

April 29, 2024

BY:

PROFESSIONAL SERVICE INDUSTRIES, INC.
6500 NW 12th Ave, Suite 116
Fort Lauderdale, Florida 33309
Phone: (954) 267-0965
Fax: (954) 267–0944

Professional Service Industries, Inc.
6500 NW 112th Ave, Suite 116
Fort Lauderdale, FL 33309
Office – (954) 267-0965

April 29, 2024

HCA Management Services, L.P.
One Park Plaza, Building 3-2
Nashville, TN 37203

Attn: Mr. Ryan Rohe, RA, NCARB, LEED AP - Sr. Design Manager

Re: Geotechnical Engineering Report
HCA Florida St. Lucie Hospital Parking Garage
1800 SE Tiffany Avenue
Port St. Lucie, Florida
PSI Project No. 0225-2017

Dear Mr. Rohe:

Professional Service Industries, Inc. (PSI), an Intertek company, is pleased to submit this Geotechnical Engineering Report for the above referenced garage project located in Port St. Lucie, Florida. The report includes the results from the field and laboratory evaluation along with recommendations for use in preparation of the appropriate design and construction documents for this project.

PSI appreciates the opportunity to provide this Geotechnical Engineering Report and looks forward to continuing participation during the design and construction phases of this project. PSI also has great interest in providing materials testing and inspection services during the construction of this project and will be glad to meet with you to further discuss how we can be of assistance as the project advances.

If there are questions pertaining to this report, or if PSI may be of further service, please contact us at your convenience.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.
Certificate of Authorization No: 3684

Lucrèce E. Regisme
Staff Engineer – Geotechnical Services
lucrece.regisme@intertek.com

JOSE N. GOMEZ LICENSE No. 78289 STATE OF FLORIDA PROFESSIONAL ENGINEER

This document has been signed and sealed by Jose N. Gomez, P.E., BC.GE. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.
2024.04.29 09:34:04 -04'00'
2024.002.20687

Jose N. Gómez, P.E., BC.GE
Chief Engineer-Geotechnical Services
P.E.78289
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LER/JNG/ler

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APPENDIX A

Figure 1: Site Vicinity Map
Figure 2: Boring Location Plan

APPENDIX B

Key to Terms and Symbols Used on Logs
Boring Logs (**B-1** through **B-6, P-1** and **P-2**)

APPENDIX C

Percolation Test Procedure
Table 1: Summary of Percolation Laboratory Test Result (**P-1** and **P-2**)

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1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Professional Service Industries, Inc. (PSI), an Intertek company, has completed a field exploration and corresponding geotechnical evaluation for the HCA Florida St. Lucie Hospital Parking Garage project that is to be located in Port St. Lucie, Florida. The following table provides the corresponding Project Authorization information.

Table 1.1-1: Project Authorization

Project Name	HCA Florida St. Lucie Hospital Parking Garage
Project Location	1800 SE Tiffany Avenue, Port St. Lucie, FL
PSI Proposal No.	0225-418241
Agreement Signed By	Mr. Ryan Rohe, RA, NCARB, LEED AP - Sr. Design Manager
Authorization Company	HCA Management Services, L.P.
Authorization Date	April 9, 2024
PSI Proposal Contents	Scope of Work, Lump Sum Fee, and PSI's General Conditions

1.2 PROJECT DESCRIPTION

Based on PSI's review of the Proposed Site Plan dated September 28, 2023, drawn by TMPartners, PLLC, and the HCA Florida St. Lucie Hospital Parking Garage RFP letter, dated February 7, 2024, provided by Stanley D. Lindsey and Associates, Ltd, a summary of our understanding of the proposed project is provided below in the following Project Description table.

Table 1.2-1: General Project Description

Project Items	Construction of a six-story, for approximately 670 cars, parking garage at HCA Florida St. Lucie Hospital. The new garage is estimated to be approximately 240,000 square feet. There will also be a small, paved parking lot and associated driveways.
Construction Types	Precast concrete.
Existing Grade Change within Project Site Area	± Two feet estimate (Google Earth Pro).
Finished Floor Elevation	Within two feet ± of current grade.
Anticipated Foundation Type	Shallow foundation, i.e., spread footings, bearing on improved soils.
Design Maximum Column Loads	Anticipated column loads are 1,500 kips.

The geotechnical recommendations presented in this report are based on the available project information, structure locations, indicated structure loads, and the subsurface materials encountered during the field evaluation. If the noted information or structural loads are incorrect, please inform PSI so that the recommendations presented in this report can be amended as necessary prior project construction starts. PSI will not be responsible for the implementation of provided recommendations if not notified of changes in the project.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study is to evaluate the subsurface conditions at the site and develop geotechnical engineering recommendations and guidelines for use in preparing the design and other related construction documents associated with the six-story structure foundations for the proposed HCA Florida St. Lucie Hospital Parking Garage project to be located in Port St. Lucie, FL. The scope of our services included drilling soil borings, performing representative laboratory testing, and preparing this geotechnical engineering report.

This report briefly outlines the available project information, describes the site and subsurface conditions, and presents the recommendations regarding: (1) the six Standard Penetration Test (SPT) soil borings drilled to depths of 50 to 70 feet below existing grades, and (2) the two percolation tests within the proposed parking garage and parking lots footprints.

The scope of services for this geotechnical exploration did not include any environmental, mold nor detailed seismic/fault assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The following table provides a generalized description of the existing site conditions based on visual observations during the field activities, as well as other available information.

Table 2.1-1: Site Description

Site Location	The site is located within the southwest quadrant of the intersection of SE Tiffany Ave and SE Village Green Dr in Port St. Lucie, Florida.
Site History	Google Earth Pro Aerial Photographs from 1995 through 2023 show the project area as occupied with paved parking lot and dry retention pond (see below **Figure 2.2-1**).
Existing Site Ground Cover	Grass and asphalt pavement.
Existing Grade/Elevation Changes	Approximately +/- two feet (Google Earth Pro).
Description of Adjacent Property	North and East boundaries: existing lake South boundary: Existing building. West boundary: SE Tiffany Ave.

2.2 SITE PHOTOS

The following photograph shows the project area for the HCA Florida St. Lucie Hospital Parking Garage project. The soil borings were conducted within the area bounded in red, please see also **Figure 2**, **Appendix A**, for the Boring Location Plan and location of the parking garage and paved parking lot structures.



Figure 2.2-1: Aerial photograph of the project area, Port St. Lucie, FL

2.3 FIELD EXPLORATION

The subsurface conditions were explored with six Standard Penetration Test (SPT) soil borings, and two South Florida Water Management District (SFWMD) open-hole percolation tests, following the provided PSI drilling program. The table below summarizes our exploratory boring program and the table that follows provides the field exploration description. The project site plan/layout is not available at this time.

Table 2.3-1: Field Exploration Summary

Design Element	Number of Borings	Boring Depth (ft)	Drilling Footage (ft)
Proposed Garage Structure (B-1 through B-6)	2	70	140
	4	50	200
Percolation Tests (P1 and P2)	2 - PTs	-	-
		Total:	**340**

The boring locations were provided by the project's structural and civil engineers and located in the field using a recreational-grade GPS system by PSI personnel. Elevations of the ground surface at the boring locations were not provided and should be surveyed by others prior to construction. The references to elevations of various subsurface strata are based on depths below existing grade at the time of drilling. The approximate boring locations are depicted on the Boring Location Plan provided in **Figure 2**, **Appendix A.**

Table 2.3-2: Field Exploration Description

Drilling Equipment	Truck Mounted Drilling Rig
Drilling Method	Mud-Rotary
Drilling Procedure	Applicable **ASTM** and **PSI Safety Manual**
Field Testing	Standard Penetration Test-SPT (**ASTM D1586**)
Sampling Procedure	Soils: **ASTM D1587/D1586**
Sampling Frequency	Continuously (at two-foot intervals) to a depth of 10 feet, and at five-foot Intervals thereafter
Frequency of Groundwater Level Measurements	During Drilling
Boring Backfill Procedures	Grouting

During field activities, the encountered subsurface conditions were observed, logged, and visually classified (in general accordance with **ASTM D2487**). Field notes were maintained to summarize soil types and descriptions, water levels, changes in subsurface conditions, and drilling conditions.

2.4 LABORATORY TESTING PROGRAM

The soil split spoon samples recovered from the soil borings were visually reviewed in the laboratory by a geotechnical engineer to confirm the field classifications. The samples were classified using the Unified Soil Classification System (**USCS**) in general accordance with the American Society of Testing and Materials (**ASTM**) test designation D2487. The soil classification was based on visual observations and laboratory testing and are included in the boring logs (USCS).

2.5 SITE GEOLOGY

The geological formations that usually are encountered from top to bottom within St Lucie County are Beach Ridge and Dune (Qbd) which consist of sand, and Anastasia Formation (Qa) which consist of Coquinoid limestone (coquina).

Qa Anastasia Formation

Qbd Beach ridge and dune

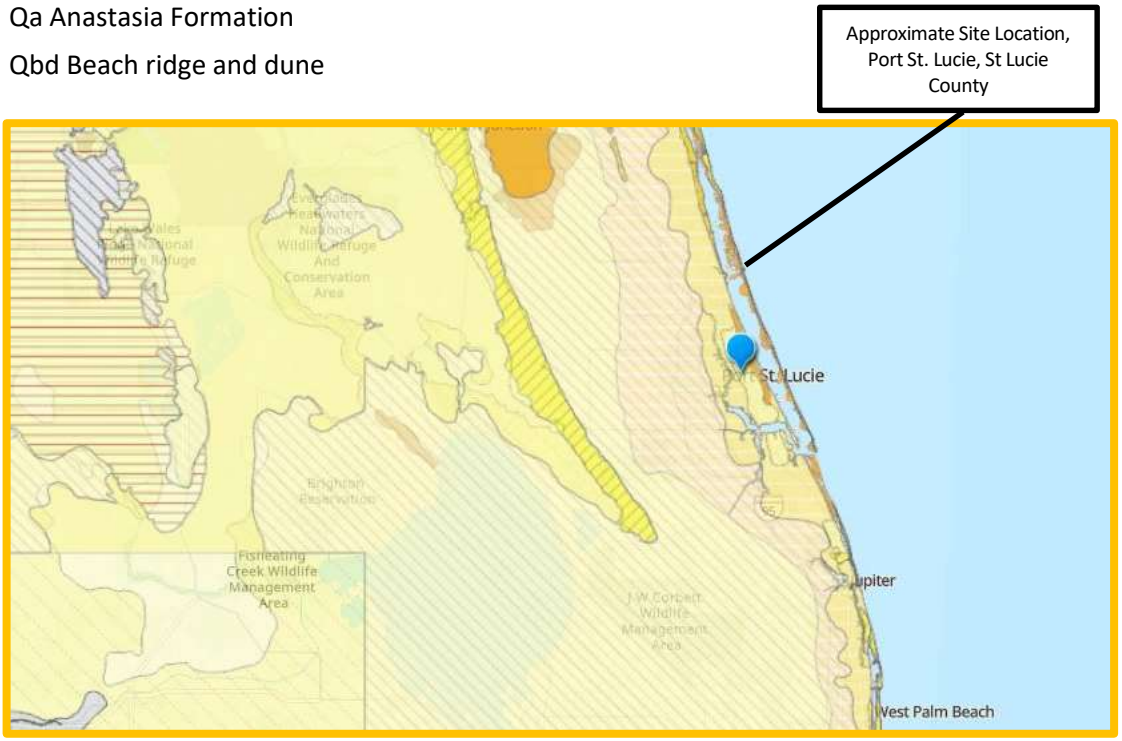


Figure 2.5-1: Geology (*https://ca.dep.state.fl.us*)

2.6 SUBSURFACE CONDITIONS

The results of the field evaluation with the six SPT soil borings and representative laboratory testing campaign have been used to generalize a subsurface profile at the project site. The following subsurface descriptions provide a highlighted generalization of the major subsurface stratification features and material characteristics.

Table 2.6-1: Generalized Soil Profile Description

Stratum	Top (ft)	Bot. (ft)	Soil Type	N* Range	N-Ave	Density
Surface Cover	0.0	0.2	Topsoil (two inches) and Asphalt (two inches)	-	-	-
Fill in Pavement Area	-	-	LIMEROCK (10 inches) in P-1 only	-	-	-
1	0.2	27.5	Fine SAND	6 - 29	13	Loose to Medium Dense
2	27.5	42.5	Fine SAND with Shell Fragments	12 - 40	26	Medium Dense to Dense
3	42.5	70.0	CEMENTED SAND	50 – 50/4”	87	Dense to Very Dense

N=Standard Penetration Test blow count (blows/foot)-See Key to Terms and Symbols Used on Logs, ***Appendix B

See **Figure 2.6-1** below for a summary of the SPT blow-counts encountered within our soil boring logs. The individual boring SPT results are in gray and the average SPT result is in yellow; see complete boring logs included in **Appendix B.**

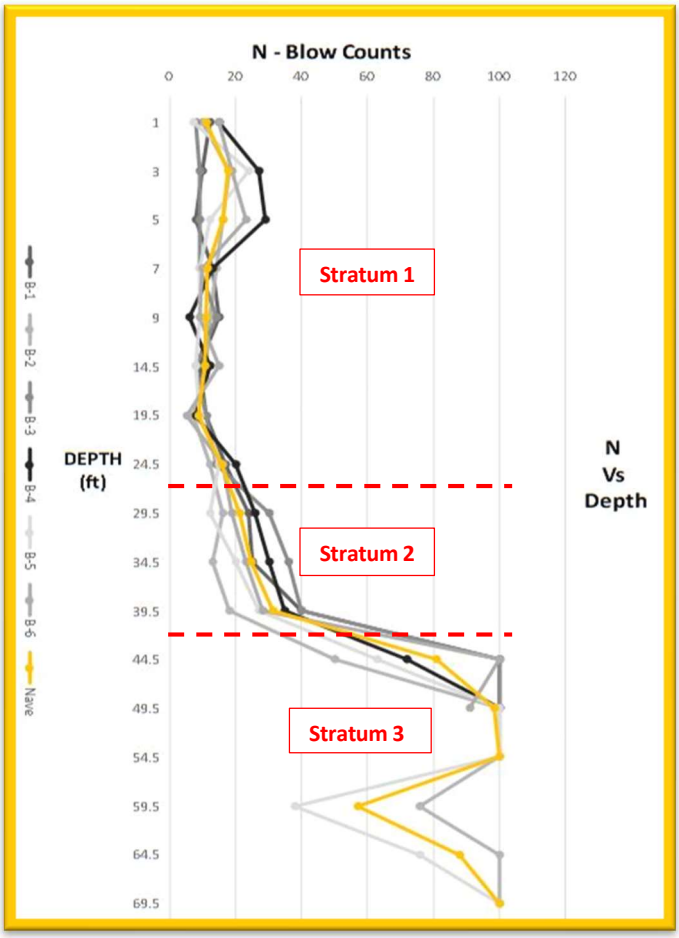


Figure 2.6-1: PSI SPT N-blow Count Summary

The boring logs included in **Appendix B** should be reviewed for specific information at individual boring locations. The boring logs include soil descriptions, stratifications, locations of the samples, and field and laboratory test data. The descriptions provided on the logs only represent the conditions at that actual boring location; the stratifications represent the approximate boundaries between subsurface materials. The actual transitions between strata may be more gradual and less distinct. Variations will occur and should be expected across the site.

2.6.1 GROUNDWATER INFORMATION

Water level measurements were performed during drilling operations. No further water measurements were conducted after drilling was finished. Specific information concerning groundwater is noted on each boring log presented in **Appendix B** of this report.

The groundwater table was measured in the boreholes at a depth of approximately three to six feet below existing grades during the drilling operations conducted in April 2024. Please note that groundwater levels fluctuate seasonally in response to rainfall, local drainage patterns and the infiltration rate of the soil. The rainy season in South Florida is normally between May and October, and usually September is the highest rainfall month. Based upon our interpretation of the SPT boring data, it appears that the seasonal high groundwater level can be found approximately at one and a half to four and a half feet below existing grades. If a detailed water level evaluation is required, observation wells or piezometers can be installed at the site to monitor water levels properly before construction begins.

The groundwater levels presented in this report were measured at the time of PSI field activities in April 2024; the contractor should determine the actual groundwater levels at the site before construction activities.

2.6.2 PERCOLATION TESTING

PSI performed two percolation tests to the depth of 15 feet below existing grades indicated as P-1 and P-2 in **Figure 2** in **Appendix A**. The percolation tests were performed in general accordance with the South Florida Water Management District (**SFWMD**) procedures for the "Usual Condition Constant Head" Percolation Test. The approximate locations of the percolation tests are indicated on **Figure 2** of **Appendix A**.

SPT sampling was performed simultaneously as the boreholes were advanced using a six-inch diameter casing to prevent the boreholes from collapsing. A four-inch diameter perforated PVR pipe was placed in the boreholes prior to retrieving the casing, as shown illustratively in sketch presented in **Appendix C.** Water was then pumped into the boreholes in order to raise the water level as close to the ground surface as possible. Once the inflow equalized with the outflow rate, the average pumping rate and level of the water for the stabilized flow rate was recorded.

The hydraulic conductivity values (K) estimated from the percolation tests are presented in **Table 1** of **Appendix C**. The 'K' values are expressed in units of cubic feet of flow per second, per square foot of seepage area, per foot of head (cfs/ft^2-ft). Hydraulic conductivity rates ranged from 1.66E-04 to 2.00E-04 cfs/ft^2-ft. It should be recognized that the reported 'K' values expressed in **Table 1** are ultimate; therefore, an appropriate factor of safety should be implemented for design. These K values are representative of the project site.

3.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

3.1 GEOTECHNICAL DISCUSSION

The subsurface conditions of the subject property that is to be developed with the proposed structures consist of two inches of topsoil and asphalt surface covers underlain by loose to medium dense fine sand to 27.5 feet below ground surface (bgs), followed by medium dense to dense fine sand with shell fragments to 42.5 feet bgs, and finally dense to very dense cemented sand to boring termination depths of 70 feet bgs (please see **Figure 2.6-1** for PSI SPT N-blow count summary and locations of strata). The expected maximum column design load is 1,500 kips for the proposed six-story parking garage. Due to the magnitude of column load and the presence of loose soils within the upper 27.5 feet (**Stratum 1),** we have recommended optimizing the foundation system to control settlements as presented below in **Section 3.2**.

The following design recommendations have been developed based on the previously described project characteristics, indicated column loads per structure, and subsurface conditions encountered. If there are changes in the project criteria and/or structural loads, PSI should be retained to determine if modifications in the foundation recommendations will be required before project construction starts. The findings of such a review would be presented in a supplemental report. Once final design plans and specifications are available, a general review by PSI is recommended to observe that the conditions considered in the project description are correct and to verify that the earthwork and foundation recommendations are properly interpreted and implemented within the construction documents.

3.2 FOUNDATION RECOMMENDATIONS DISCUSSION

Loose soils encountered within the soil borings were located mostly within the upper 27.5 feet as shown in **Figure 2.6-1**). With the information provided to PSI, information obtained during the field operations, results of the representative laboratory testing, the indicated structural loads for the garage structure, and PSI's experience with similar projects, three technical options are recommended to support the proposed structures depending on column loads and settlement mitigation:

- Shallow foundation system, bearing on the existing granular soils, provided that the subgrade is properly compacted as explain in **Section 3.2.1** below, with total settlement of approximately two inches that mostly will occur during construction.
- shallow foundations bearing on soils improved with Vibro-Replacement (VR).
- shallow foundations bearing on soils improved with Compaction Grouting (low mobility grout).

The final option selection will depend on the cost-benefit analysis to be conducted by the project team of the three options. Depending on the selected option, the bearing capacity and the size of the footings will vary as explained below.

If an alternative foundation type is desired, PSI can provide alternative recommendations in a supplemental letter upon request.

3.2.1 OPTION 1 - SHALLOW FOUNDATION BEARING ON EXISTING SOILS RECOMMENDATIONS

As previously mentioned, the parking garage structure can be supported by continuous wall footings and isolated spread footings, as shown in the illustration and described below; there are no structural connections

considered.

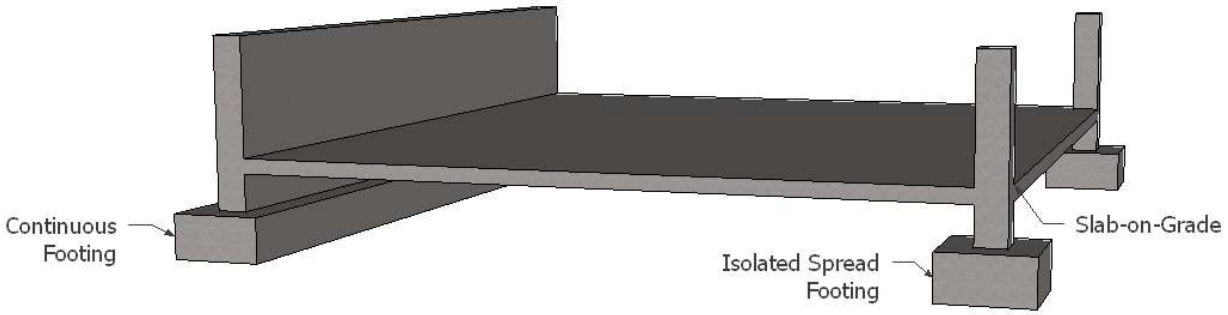


Figure 3.2-1: Spread footing systems

Bearing Capacity

After completion of the site preparation procedures noted in **Section 5.0** of this report, the proposed structure can be supported on shallow foundations that are designed using a maximum net allowable soil bearing capacity of 4,200 pounds per square foot (psf) bearing on the compacted existing near surface granular soils considering a square footing geometry with a width of 19 feet and maximum column load of 1,500 kips.

Based on our analysis of the SPT boring results, we recommend a minimum footing embedment depth of 18 inches below the finished exterior grade. We further recommend that the individual column and continuous wall footings have a minimum width of 24 inches. The purpose of limiting the minimum footing size is to prevent a "punching" shear failure and to reduce the possibility of bearing on an isolated weak zone.

Foundations subject to transient lateral loads will resist these forces through a combination of base shearing resistance mobilized at the footing-subgrade interface and earth pressure acting on the vertical faces of the footings at right angles to the direction of applied load. Base shearing resistance may be determined using a friction factor of 0.5.

Passive earth pressure resistance should be computed using an e equivalent fluid pressure of 330 pounds per square foot per foot of depth, for granular backfill material. Resistance to sliding determined in accordance with the noted parameters should be considered ultimate resistance. Accordingly, the design for sliding resistance should include a factor of safety of at least 1.5 be used.

Settlements

Provided that all topsoil, asphalt or unsuitable material encountered during site preparation have been removed and the site preparation and subgrade compaction recommendations stated in **Section 5.0** of this report are implemented, the potential total settlement of wall and isolated column footings from the applied loads is expected to be two inches or less during the construction phase of the project. Differential settlement between adjacent columns or across approximately 30 feet of continuous footing length is expected to be ½ of the total settlement.

Total and differential settlements of the noted magnitudes are usually considered tolerable for most construction; however, the tolerance of the proposed building structures to the predicted total and differential settlements should be confirmed by the structural engineer/architect. Additionally, our settlement estimates are based on the anticipated foundation loads on the order of magnitude noted in

Section 1.0; any changes on these loads will modify the calculated settlements, as such, PSI must be notified to provide the required report update.

3.2.2 OPTION 2 - VIBRO-REPLACEMENT SOIL IMPROVEMENT RECOMMENDATIONS

Based on the results of the field exploration program and the **Stratum 1** soil characteristics, and our experience on past projects of a similar nature, the use of Vibro-Replacement with stone columns is considered a viable foundation alternative for the support of the proposed structure, as settlement mitigation is carried out. Vibro-Replacement is a proven method of ground modification that reduces foundation settlement and improves bearing capacity, thereby reducing footing size requirements. Shallow foundations after ground improvement by the method described herein using smaller size footings than the prior option, can typically be designed for maximum net allowable bearing pressures of 6,000 to 8,000 pounds per square foot (psf) depending on the subsurface conditions, expected performance and anticipated structural loads. Vibro-Replacement is a proprietary ground improvement technique which is designed and constructed by a specialty contractor.

The Vibro-Replacement program for this project should be developed and completed by a specialty contractor with capabilities of using a down-hole probe and having a proven track record of successfully completing at least ten similar type projects in the past five years.

The Vibro-Replacement (VR) program should consist of densifying the subgrade with stone at every spread footing location and along continuous wall footings, to control total and differential settlement of the completed foundations. The number and spacing of the stone columns should be determined by the specialty contractor. All fieldwork associated with Vibro-Replacement should be monitored by a representative of the project geotechnical engineer. The densification process using VR induces vibrations in the ground that can affect existing structures located approximately within 30 feet of the VR operations. Vibration monitoring during the VR activities should be conducted to confirm that adjacent or nearby structures are not affected. PSI can perform vibration monitoring during ground improving by VR.

The soil improvement criteria for Vibro-Replacement should include densification beneath all column and load bearing wall foundations to provide an allowable soil bearing capacity of 6,000 to 8,000 pounds per square foot (psf) with a maximum of one inch of total settlement or tolerances deemed appropriate by the project structural engineer. The densification by Vibro-Replacement method should be from the bottom of the proposed footing to a minimum depth of 25 to 30 feet, depending on the bearing capacity to be accomplished and the design calculations of the specialty contractor.

The calculations should be based on actual loading, footing dimensions and the ability of the improved ground to perform within acceptable settlement criteria. Additionally, the specialty design should take into consideration the potential for overlapping/cluster effects of adjacent footings, which could otherwise result in localized stress increase (interfering stress bulbs). Depending on the size of the footings and their proximity to one another, evaluating the cluster effect will be critical to the overall settlement performance of the structure.

The adequacy of the densification must be confirmed preferable with cone penetrometer test (CPT) or standard penetration test (SPT) soil borings to confirm actual bearing capacity. The Vibro-Replacement procedures and bearing capacity verification must be observed by a representative of PSI in two phases: when project advances 50 percent, so any VR adjustments can be conducted, and when VR is completed.

The Vibro-Replacement operations should be designed on a performance specification basis by a Professional Engineer licensed in the State of Florida. As noted earlier, the ground improvement work should be carried out on a performance specification basis to provide bearing settlement performance within the limits noted herein.

3.2.3 OPTION 3 - COMPACTION GROUTING (LOW MOBILITY GROUTING) RECOMMENDATIONS

Compaction grouting, also known as Low Mobility Grouting, is a grouting technique with vibration-less and uses a thick grout pumped under high pressure that displaces and densifies loose granular soils, reinforces fine grained soils and stabilizes subsurface voids, by the staged injection of low-slump, low mobility aggregate grout. Typically, an injection pipe is first advanced to the maximum treatment depth. The low mobility grout is then injected as the pipe is slowly extracted in lifts, creating a column of overlapping grout bulbs. The expansion of the low mobility grout bulbs displaces surrounding soils.

When properly performed in granular soil, compaction grouting increases the surrounding soils' density, friction angle and stiffness, reducing unacceptable settlements from occurring. In all soils, the high modulus grout column reinforces the soils within the treatment zone. By sequencing the compaction grouting work from primary to secondary to tertiary locations, the densification process can be performed to achieve significant improvement. Compaction grouting has been used to increase bearing capacity and decrease settlement for planned and existing structures. In karst geologies, compaction grouting has been used to treat existing sinkholes or to reduce the sinkhole potential in sinkhole prone areas.

The soil improvement criteria for compaction grouting should include densification beneath all column and load bearing wall foundations to provide an allowable soil bearing capacity of 5,000 pounds per square foot (psf) with a maximum of one inch of total settlement or tolerances deemed appropriate by the project structural engineer. The densification by compaction grouting method should be from the bottom of the proposed footing to a minimum depth of 25 to 30 feet. Compaction grouting is a proprietary ground improvement technique which is designed and constructed by a specialty contractor.

3.2.4 SHALLOW FOUNDATIONS BEARING ON IMPROVED SOILS RECOMMENDATIONS

Compaction after completion of the soil improvement and site preparation procedures noted in **Section 5.0** of this report, and the proposed structures can be supported on shallow foundations that are designed using a maximum net allowable soil bearing capacity of 6,000 to 8,000 pounds per square foot (psf) bearing on the improved granular soils by Vibro-Replacement or 5,000 psf bearing on improved granular soils by compaction grouting; both of these ground improvement methods require a specialty contractor to conduct the final design and construction.

Please note that following soil improvement activities, the upper soils must be thoroughly compacted and proof roll with a minimum 20-ton vibratory roller to 95 percent of the Modified Proctor maximum dry density near the optimum moisture content, as determined by **ASTM D-1557**, to stabilize the surface prior to placing compacted structural fill to reach final grades. CPT tests must be performed to confirm actual bearing capacity prior to excavation for footing construction.

We recommend a minimum footing embedment depth of 18 inches below the finished exterior grade. We further recommend that the individual column and continuous wall footings have a minimum width of 24 and 18 inches, respectively. Base shearing resistance may be determined using a friction factor of 0.5. Passive earth pressure resistance should be computed using an equivalent fluid pressure of 330 pounds per square foot per foot of depth, for granular backfill material. The design for sliding resistance should include a factor

of safety of at least 1.5 be used. The potential total settlement of wall and isolated column footings from the applied loads is expected to be one inch or less. Maximum differential settlement between adjacent columns or across approximately 30 feet of continuous footing length is expected to be half the total settlement.

3.2.5 FLOOR SLAB

We recommend that the procedures described in **Section 5.0** of this report be used to prepare the floor slab subgrade. Ground floor slabs can bear directly on top of compacted structural fill material. A modulus of subgrade reaction value of 150 pounds per cubic inch (pci) (based on expected results of a one-foot square plate load test) may be used for design assuring that subgrade was properly compacted. The value should be geometrically modified and reduced for larger areas.

The floor slabs should be adequately reinforced to reduce the risk of cracking due to differential settlement. Floor slabs should not be rigidly connected to wall footings. An impervious membrane should be installed between the soil subgrade and bottom of floor slabs to avoid slab moisture problems. An ultimate friction factor of 0.21 should be used for the vapor barrier-soil interface with an appropriate factor of safety. Floor slab design should conform to American Concrete Institute (ACI) design standards and practices.

3.3 SIDEWALKS AND FLATWORK

For sidewalks or other flatwork located adjacent to grade-supported foundations, the undercutting and select fill placement operations for the building should extend beyond the perimeter of the building and pavements to at least the width of the adjacent sidewalk or flatwork.

Any other sidewalks or flatwork not adjacent to buildings should be placed on an improved subgrade meeting or exceeding the pavement subgrade improvement methods previously recommended. A 12-inch-thick layer of material satisfying the requirements of select fill provided in **Section 5.1.3** must be placed below the sidewalk. The material should be compacted to 95 percent or greater than the maximum dry unit weight and contain a moisture content between -one and +three percent optimum moisture content.

Proper drainage around grade-supported sidewalks and flatwork is also very important to reduce potential movements. Elevating the sidewalks where possible and providing rapid, positive drainage away from them will reduce moisture variations within the underlying soils and will therefore provide valuable benefit in reducing the full magnitude of potential movements from being realized.

3.4 RETAINING WALL RECOMMENDATIONS

For Site retaining walls are often constructed from the “bottom-up” and therefore the type of soil used to backfill the wall is chosen or specified by contract. The lateral earth pressures developed behind site retaining walls is a function of the backfill soil type within an approximate 45-degree angle from the base of the wall upward.

Lateral Earth Pressures: Retaining walls should be designed to withstand the lateral earth pressures exerted by the backfill. The pressure diagram is triangular. It is anticipated that retaining walls associated with the building structure will be rigid walls restrained from rotation by the floor slab. For rigid walls, the "At Rest" (k_o) soil condition should be used in the wall design and evaluation. For walls that are free to deflect at their tops, the "Active" (k_a) soil condition should be used in the wall design and evaluation. In the design of these retaining wall structures, the following soil parameters included in the following table can be utilized. These parameters assume that Granular Soils meeting the requirements recommended herein for Retaining Wall

Backfill will comprise the backfill in the Critical Zone. The Critical Zone is defined as the area between the back of the retaining wall structure and an imaginary line projected upward and rearward from the bottom back edge of the wall footing at a 45-degree angle.

Table 3.4-1: Soil Parameters

Retaining Wall Backfill in Critical Zone	Coefficient of Earth Pressure at Rest (K_o)	0.50
	Coefficient of Active Earth Pressure (K_a)	0.33
	Retained Soil Moist Unit Weight (γ)	110 pcf
	Cohesion (C)	0 psf
	Angle of Internal Friction (ϕ)	30°
	Friction Coefficient [Concrete on Soil] (μ)	0.40
	At-rest Equivalent Fluid Pressure	59H (psf)
	Active Equivalent Fluid Pressure	39H (psf)
	Passive equivalent fluid pressure(above ground water table)	300H (psf)

Retaining Wall Backfill: All soils used as backfill within the Critical Zone behind retaining walls should have USCS classifications of SAND (SP) or more granular with a maximum of 10 percent fines (i.e., percent passing No. 200 Sieve size) and minimum angle of internal friction of 30 degrees when compacted to a minimum of 95 percent of its maximum dry density per **ASTM D 1557**. Any existing soils not meeting these criteria should be removed from the Critical Zone of the walls, as determined by PSI personnel at the time of construction.

Foundation Drains: Retaining walls should be provided with a foundation drainage system to relieve hydrostatic pressures which may develop in the wall backfill. This system should consist of weepholes through the wall and/or a four-inch perforated, closed joint drain line located along the backside of the walls above the top of the footing. The drain line should be surrounded by a minimum of six inches of **Size No. 57 Stone** wrapped with an approved non-woven filter fabric, such as **Mirafi 140-N** or equivalent.

4.0 PAVEMENT DESIGN RECOMMENDATIONS

4.1 PAVEMENT DESIGN PARAMETERS

We recommend that the procedures described in **Section 5.0** of this report be used to prepare the subgrade of pavements. Flexible pavement sections in this geographic area typically consist of an asphaltic concrete wearing course, a crushed limestone (limerock) base course and a stabilized subgrade (sub-base). Based on the expected traffic loading and our experience in the area, the minimum pavement section thicknesses noted in **Table 4.1.1** should be acceptable.

The base course materials in the pavements should consist of crushed limestone having a minimum Limerock Bearing Ratio (LBR) of 100. Base materials should meet the requirements presented in the latest revisions of the Florida Department of Transportation "Specifications for Road and Bridge Construction", Section 911 (limestone). The base course should be compacted to at least 98 percent of the material's Maximum dry density (**ASTM D-1557**). The subgrade should be stabilized to a depth of 12 inches to achieve a minimum LBR of 40. This can be obtained by blending base material (limerock) with the existing subgrade soils. The required mixing ratio should be determined by laboratory testing. The stabilized subgrade should be compacted to at least 95 percent of the maximum dry density (ASTM D-1557). The LBR requirement for the subgrade soils is only required for the "flexible" pavement section.

For rigid concrete pavement, a minimum Portland cement concrete pavement thickness of five inches should be used in parking areas (light duty) and six inches in loading areas (heavy duty), if rigid pavements are to be employed. The subgrade soils below concrete pavements should be well-draining granular materials compacted to a minimum density of 98 percent of the modified Proctor Maximum dry density (ASTM D-1557). Fills that may be required to raise grades in pavement areas should be compacted to at least 95 percent of the material's Maximum dry density (ASTM D-1557).

Actual pavement section thicknesses and the reinforcement details for the rigid pavement section should be provided by the Design Civil Engineer based on traffic loads, volume, and the owner's design life requirements. The noted sections represent minimum thicknesses for typical local construction practices and, as such, periodic maintenance should be anticipated. All pavement materials and construction procedures should conform to FDOT, American Concrete Institute (**ACI**), or appropriate city/county requirements.

Table 4.1-1: Mimimum Pavement Section Suggestions

Pavement Type	Layer	Material description	Recommended Minimum Layer Thickness (Inches)	
			Standard Duty	Heavy Duty
Flexible	(A)	Florida DOT Asphalt Type SP	1.5	2
	(B)	Crushed limestone (limerock) with minimum LBR of 100, compacted to 98 percent of the Modified Proctor Maximum dry density	6	8
	(SB)	Stabilized sub-grade (sub-base) fill with a minimum LBR of 40 compacted to 95 percent of the Modified Proctor Maximum dry density	12	12
Rigid	(C)	Florida DOT Portland Cement Concrete	5	6
	Fill	Well-draining Granular Fill compacted to 98 percent of the Modified Proctor Maximum dry density	12	12
(A) = Asphaltic Concrete, (B) = Base Course, (SB) = Stabilized Sub-grade (Sub-base) (C) = Concrete				

5.0 CONSTRUCTION CONSIDERATIONS

Having a Geotechnical Engineer retained to review the earthwork recommendations in the Contract Documents and be an active participant in team meetings near the time of construction can often result in project cost savings. Therefore, PSI recommends that an **AASHTO** accredited 3rd party laboratory with qualified professional engineers who specialize in geotechnical engineering be retained to provide observation and testing of construction activities involved in the foundations, earthwork, pavements and related activities of this project. As the Geotechnical Engineer of Record, PSI's services can be retained as the 3rd party laboratory. PSI's participation would be advantageous to the project flow and value engineering during construction since we are most familiar with the existing soil conditions at the site.

The geotechnical engineer (GER) often does not have available all design information at the time of writing the original report since the report is done very early in the design process. The GER can be of great benefit immediately prior to construction since definitive information regarding the location of the building, surrounding flatwork, planned landscaping, and drainage features is available. The GER can then write supplement letters to the original geotechnical report often resulting in less risk and project cost savings.

PSI cannot accept responsibility for conditions which deviate from those described in this report, nor for the performance of the foundations or pavements if not engaged to also provide construction observation and materials testing for this project. The PSI geotechnical engineer of record must also be engaged by the Design Team, even if periodic on-call testing is contracted with PSI Construction Services.

5.1 INITIAL SITE PREPARATION CONSIDERATIONS

5.1.1 GENERAL

Based on the results of our field exploration, we anticipate site preparation procedures to include the steps listed below. All work should be carried out in accordance with current regulatory criteria. The earthwork, testing, and foundation inspection required herein should be performed under the supervision of PSI personnel.

1. All topsoil, asphalt, unwanted ground cover or other unsuitable materials should be completely removed from the site and properly disposed of.
2. The location of any existing conflicting underground utility lines within the construction area should be established. Provisions should be made to relocate any interfering utility lines within the construction area. Abandoned utilities should be removed or grouted to reduce the possibility of subsurface erosion that could result in future settlement.
3. The cleared exposed subgrade should be densified as specified in **Section 5.1.2.** Densification of the soils should be performed within the Proposed development areas plus a five-foot wide perimeter extending beyond the outside edges, where practical. Densification operations should continue until the subgrade soils are firm and unyielding.
4. Any fill required to raise grades should conform to the recommendations in **Section 5.1.3** of the report.
5. It is mandated by federal regulations that all excavations, whether they be utility trenches, footings/pile caps excavations, be constructed in accordance with the **OSHA** guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

5.1.2 IN-SITU DENSIFICATION

Following initial site preparation and clearing activities, in-situ densification with standard compaction of the subgrade soils or structural fill (**Section 5.1.3**) should be performed in the proposed development areas plus a five-foot-wide perimeter extending beyond the outside edges of the construction areas, where practical. Densification should be accomplished by compaction with a self-propelled vibratory roller which imparts a dynamic force of not less than 20 tons.

To minimize the effects of compaction induced vibrations on adjacent existing structures, the compaction operations should be limited to a distance not closer than 25 feet from existing structures (subject to field adjustment as necessary). The maximum drum roller weight to be used between five to 25 feet from existing structures should be limited to four tons. For distances of less than five feet, a walk behind vibratory sled or roller should be used. Compaction of the bearing surface using this equipment should continue until no further vertical settlement of that surface is visually discernible. Any area of the exposed surface that deflects excessively under the weight of the compaction equipment should be excavated approximately 24 inches and replaced with compacted structural fill.

Density control should be exercised in the upper 12 inches of the compacted subgrade. Soils in this interval should be compacted to at least 95 percent of the Modified Proctor maximum dry density determined per ASTM D-1557. Frequent wetting of the subgrade may be necessary during the rolling operations to prevent drying and loosening of the upper six to 12 inches of soil.

5.1.3 STRUCTURAL FILL AND BACKFILL

Structural fill should be free of organic matter and consist of granular material containing less than 12 percent passing by dry weight the U.S. Standard No. 200 mesh sieve. The fill material may be composed of either clean sands and/or limerock. The fill material should have no particle size in excess of three inches and have a Unified Soil Classification System (**USCS**) designation of GP, GW, GP-GM, GW-GM, SP, SW, SP-SM or SW-SM.

Structural fill should be placed in level lifts not exceeding 12 inches in loose thickness. Each lift should be compacted to at least 95 percent of the Modified Proctor maximum dry density near the optimum moisture content as determined by **ASTM D-1557**. The fill to be compacted with a vibratory plate tamper or a small walk behind vibratory roller should be placed in lifts not exceeding six inches in loose thickness. In place density tests should be performed by a qualified soils technician working under the supervision of a geotechnical engineer in accordance with appropriate **ASTM** procedures. Any fill indicating less than the recommended relative compaction should be recompacted until the required density is obtained prior to the placement of subsequent fill lifts or pouring concrete for substructures.

Structural fill or backfill placed below the water table and to a height of one foot above it should consist of a combination of FDOT No. 57 Stone and structural fill material mixed in an approximate 50 percent proportion by volume. Density testing will not be required within this layer; however, the subgrade preparation work should be observed by a representative from our office to confirm that the material is in a stable and unyielding condition.

The use of commercially available fill material by the name “Cyclone Sand” should not be permitted for the project. Cyclone sand contains large amounts of fines and is therefore very sensitive to moisture. The moisture sensitivity of the material makes it difficult to compact and achieve the desired densities.

5.1.4 GROUNDWATER CONTROL

Groundwater control may be required for construction excavations at this site for either excavation dewatering or removal of temporarily perched water from a rain event, such water can be controlled by pumping from sumps located in ditches or pits. Groundwater should be maintained at the following levels if excavations reach below the ground water table:

1. At least one foot below the bottom of any excavation made during construction operations and
2. At least two feet below the surface of any vibratory compaction operations.

Dewatering with well points might be used for deeper excavations or when required to facilitate construction. Dewatering systems should be designed and operated so as not to impact adjacent construction. Additionally, the discharge from dewatering systems should be handled in accordance with current regulatory criteria as related to the same. The dewatering systems shall be evaluated and designed by a specialty dewatering contractor.

5.2 EXCAVATION OBSERVATIONS

Excavations should be observed by a representative of PSI prior to continuing construction activities in those areas. PSI needs to assess the encountered materials and confirm that site conditions are consistent with those discussed in this report. This is especially important to identify the condition and acceptability of the exposed subgrades under foundations and other structures that are sensitive to movement. Soft or loose soil zones encountered at the bottom of the excavations should be removed to the level of competent soils as directed by the Geotechnical Engineer or their representative. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with compacted select fill or lean concrete.

After opening, excavations should be observed, and concrete should be placed as quickly as possible to avoid exposure to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. Excavations left open for an extended period of time (greater than 24 hours) should be protected to reduce evaporation or entry of moisture.

5.3 DRAINAGE CONSIDERATIONS

Water should not be allowed to collect in foundation excavations, on foundation surfaces, or on prepared subgrades within the construction area during or after construction. Proper drainage around grade supported sidewalks and flatwork is important to reduce potential movements. Excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Providing rapid, positive drainage away from the building reduces moisture variations within the underlying soils and will aid in reducing the magnitude of potential movements.

5.4 EXCAVATIONS AND TRENCHES

It should be noted that excavation equipment capabilities and field conditions may vary. Geologic processes are erratic and large variations can occur in small vertical and/or lateral distances. Details regarding “means and methods” to accomplish the work (such as excavation equipment and technique selection) are the sole responsibility of the project contractor. The comments contained in this report are based on small diameter borehole observations. The performance of large excavations may differ as a result of the differences in excavation sizes.

The Occupational Safety and Health Administration (**OSHA**) Safety and Health Standards (**29 CFR Part 1926**, **October 1989**), require that excavations be constructed in accordance with the current OSHA guidelines. Furthermore, the State of FL requires that detailed plans and specifications meeting OSHA standards be prepared for trench and excavation retention systems used during construction. PSI understands that these regulations are being strictly enforced, and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, State, and Federal safety regulations.

PSI is providing this information as a service to the client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, State, and Federal safety or other regulations. A trench safety plan was beyond the scope of our services for this project.

6.0 REPORT LIMITATIONS

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by **HCA Management Services, L.P** for the proposed garage project. If there are revisions to the plans for this project, changes of the structural loads or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified and retained immediately to determine if changes in the foundation recommendations are required before construction starts or continue. If PSI is not notified of such changes, PSI will not be responsible for the impact of those changes on the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional Geotechnical Engineering practices in the local area. No other warranties are implied or expressed. This report may not be copied without the expressed written permission of PSI.

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that the engineering recommendations have been properly incorporated in the design documents. At this time, it may be necessary to submit supplementary recommendations. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

This report has been prepared for the exclusive use of **HCA Management Services, L.P** for specific application to the proposed three-story building and seven-story parking garage structures, **HCA Florida St. Lucie Hospital Parking Garage** project to be constructed in Port St. Lucie, Florida.

APPENDIX A

SITE VICINITY MAP



Approximate Project Location

FIGURE No.:	1
DRAWN BY:	LER
CHECKED BY:	JNG

GEOTECHNICAL ENGINEERING SERVICES
HCA FL St. Lucie Hospital Parking Garage
1800 SE Tiffany Ave
Port St. Lucie, FL
PSI PROJECT No.: 0225-2017
DATE: 04/25/2024

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BORING LOCATION PLAN



Approximate Percolation Tests Locations

Approximate Borings Locations

FIGURE No.:	2
DRAWN BY:	LER
CHECKED BY:	JNG

GEOTECHNICAL ENGINEERING SERVICES
HCA FL St. Lucie Hospital Parking Garage
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DATE: 04/25/2024

APPENDIX B

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM
FIELD CLASSIFICATION SYSTEM
FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Sand, Gravel and Combinations)

Density

Very Loose	-4 blows/ft. or less
Loose	-5 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

Grain Size Terminology

Soil Fraction	Particle Size	US Standard Sieve Size
Boulders	Larger than 12”	Larger than 12”
Cobbles	3” to12”	3” to 12”
Gravel: Coarse	¾” to 3”	¾” to 3”
Small	4.76mm to ¾”	#4 to ¾”
Sand: Coarse	2.00mm to 4.76mm	#10 to #4
Medium	0.42mm to 2.00mm	#40 to #10
Fine	0.074mm to 0.42mm	#200 to #40
Silt	0.005mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005mm	Smaller than #200

RELATIVE PROPORTIONS FOR NON ORGANIC SOILS

Descriptive Term	%
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

RELATIVE PROPORTIONS FOR ORGANIC CONTENT

Descriptive Term	Organic Content %
Trace	> 1 but < 5
Some	> 5 but < 20
Muck	> 20 but <75
Peat	> 75

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Unconfined Compressive Strength (tons/sq. ft.)	Field Identification (Approx.) SPT Blows/ft.
Very Soft	Less than 0.25	0 - 2
Soft	0.25 – < 0.5	3 - 4
Medium Stiff	0.5 - < 1.0	5 - 8
Stiff	1.0 - < 2.0	9 -15
Very Stiff	2.0 - < 4.0	16 - 30
Hard	Over 4.0	> 30

Classification on logs are made by visual inspection.

Standard Penetration Test - Driving a 2.0” O.D., $1^{3/8}$” I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for **PSI** to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (e.g.- 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.).

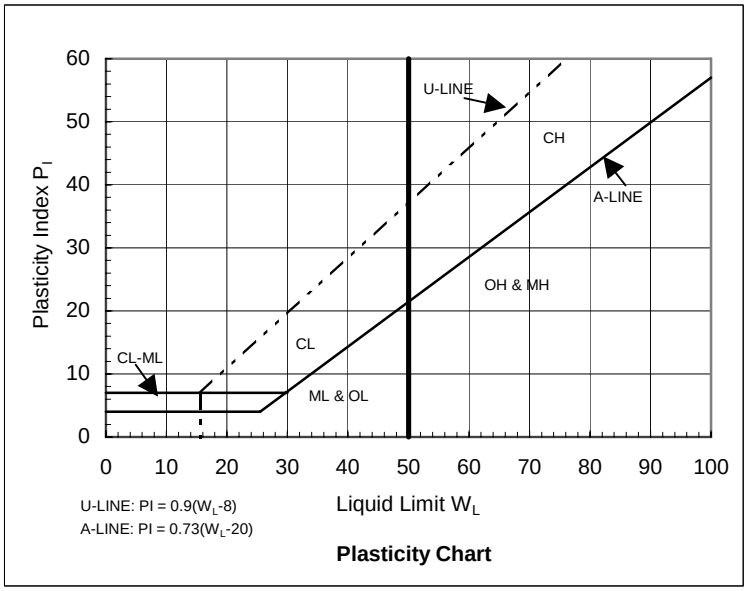
Strata Changes - In the column “Material Description” on the boring logs, the horizontal lines represent approximate transitions between soil types.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

Groundwater symbols: ▽- observed groundwater elevation, encountered while drilling; ▼-observed groundwater elevation upon completion of boring; ⧩ - observed groundwater elevation after a certain amount of time.

Unified Soil Classification System

Major Divisions			Group Symbol	Typical Names	Classification Criteria for Coarse-Grained Soils		
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{D^2_{30}}{D_{10} D_{60}}$
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)		
		Gravels with fines (appreciable amount of fines)	GM (d u)	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Above A line with $4 < P_I < 7$ are borderline cases requiring use of dual symbols	
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above A line or $P_I > 7$		
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_U \geq 6$ $1 \leq C_C \leq 3$	$C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{(D_{30})^2}{D_{10} D_{60}}$
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_c > 3$)		
		Sands with fines (appreciable amount of fines)	SM (d u)	Silty sands, sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Limits plotting in hatched zone with $4 \leq P_I \leq 7$ are borderline cases requiring use of dual symbols	
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above A line with $P_I > 7$		
Fine-grained soils (more than half of material is smaller than No. 200)	Silt and clays (liquid limit <50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain size curve. 2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5% - GW, GP, SW, SP More than 12% - GM, GC, SM, SC 5-12% - Borderline cases requiring dual symbols		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (liquid limit >50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays or high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		PT	Peat and other highly organic soils			



Plasticity Chart

DATE STARTED:	4/13/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/13/24	**DRILLER:**	LR	**LOGGED BY:**	LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION:	N/A	**OFFSET:**	N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-1

Water		
	While Drilling	3.4 feet
	Upon Completion	3.4 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand		3-6-6-5 N=12			
				2				6-6-4-3 N=10			
	5			3				5-4-4-4 N=8			
				4				5-6-7-7 N=13			
				5				7-9-6-6 N=15			
	10										
				6			SP	5-3-6 N=9			
	15										
				7				6-6-5 N=11			
	20										
				8				8-8-9 N=17			
	25										
				9		Gray Sand with Shell Fragments	SP	10-12-12 N=24			
	30										

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Telephone: (954) 267-0965

PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-1

DATE STARTED:	4/13/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/13/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water

While Drilling	3.4 feet
Upon Completion	3.4 feet
Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ Moisture × PL ◪ LL ✚ (0, 25, 50) STRENGTH, tsf Qu ▲ Qp ✳ (0, 2.0, 4.0)	Additional Remarks
	35			10		Gray Sand with Shell Fragments	SP	9-12-13 N=25			
	40			11		Gray Sand	SP	15-17-23 N=40			
	45			12		Gray Cemented Sand		38-50/4" N=50/4"		>>◎	
	50			13		End of Boring		50/5" N=50/5"		>>◎	

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LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

DATE STARTED:	4/18/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/18/24	**DRILLER:** LR	**LOGGED BY:** LR		
COMPLETION DEPTH	70.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG		

REMARKS:

BORING B-2

Water		
	While Drilling	5.0 feet
	Upon Completion	5.0 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand		3-5-5-6 N=10			
				2				6-9-9-7 N=18			
	5			3				7-7-9-10 N=16			
				4				6-7-7-7 N=14			
				5				7-6-6-6 N=12			
	10										
				6				5-6-5 N=11			
	15						SP				
				7				3-3-4 N=7			
	20										
				8				5-6-6 N=12			
	25										
						Gray Sand with Shell Fragments					
				9				6-8-8 N=16			
	30						SP				

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DATE STARTED:	4/18/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/18/24	**DRILLER:**	LR	**LOGGED BY:**	LR
COMPLETION DEPTH	70.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION:	N/A	**OFFSET:**	N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-2

Water		
	While Drilling	5.0 feet
	Upon Completion	5.0 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	35			10		Gray Sand with Shell Fragments	SP	7-7-6 N=13			
	40			11				8-9-9 N=18			
	45			12		Gray Cemented Sand		25-24-26 N=50			
	50			13				28-50/4" N=50/4"		>>	
	55			14				37-50/5" N=50/5"		>>	
	60			15				16-26-50/5" N=76		>>	

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DATE STARTED:	4/18/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/18/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	70.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-2

Water		
	While Drilling	5.0 feet
	Upon Completion	5.0 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	65			16		Gray Cemented Sand		25-50/5" N=50/5"		>>◎	
	70			17		End of Boring		41-50/4" N=50/4"		>>◎	

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DATE STARTED:	4/13/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/13/24	**DRILLER:** LR	**LOGGED BY:** LR		
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG		

REMARKS:

BORING B-3

Water		
	While Drilling	3.0 feet
	Upon Completion	3.0 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand		2-4-4-6 N=8			
				2				4-4-5-5 N=9			
	5			3				5-4-5-4 N=9			
				4				3-5-4-6 N=9			
				5				6-6-8-8 N=14			
	10										
				6			SP	3-4-4 N=8			
	15										
				7				4-5-6 N=11			
	20										
				8				5-7-7 N=14			
	25										
				9		Gray Sand with Shell Fragments	SP	12-15-15 N=30			
	30										

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BORING B-3

DATE STARTED:	4/13/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/13/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water

While Drilling	3.0	feet
Upon Completion	3.0	feet
Delay	N/A	

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	35			10		Gray Sand with Shell Fragments	SP	11-18-18 N=36			
	40			11		Gray Sand	SP	13-13-27 N=40			
	45			12		Gray Cemented Sand		50/5" N=50/5"		>>◎	
	50			13		End of Boring		50/4" N=50/4"		>>◎	

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The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-4

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/15/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water

While Drilling	6.0	feet
Upon Completion	6.0	feet
Delay	N/A	

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand		5-9-6-5 N=15			
				2				8-11-16-16 N=27			
	5			3				11-14-15-12 N=29			
				4				10-7-6-7 N=13			
				5				3-3-3-3 N=6			
	10										
				6				4-6-6 N=12			
	15						SP				
				7				3-4-4 N=8			
	20										
				8				9-10-10 N=20			
	25										
				9				10-13-13 N=26			
	30										

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LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-4

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/15/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water

While Drilling	6.0	feet
Upon Completion	6.0	feet
Delay	N/A	

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	35			10		Gray Sand with Shell Fragments	SP	14-15-15 N=30			
	40			11		Gray Sand	SP	15-16-19 N=35			
	45			12		Gray Cemented Sand		28-32-40 N=72		>>◎	
	50			13		End of Boring		43-50/4" N=50/4"		>>◎	

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Fort Lauderdale, FL 33309
Telephone: (954) 267-0965

PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/15/24	**DRILLER:**	LR	**LOGGED BY:**	LR
COMPLETION DEPTH	70.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION:	N/A	**OFFSET:**	N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-5

Water		
	While Drilling	4.7 feet
	Upon Completion	4.7 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand		1-3-4-4 N=7			
				2				4-12-12-9 N=24			
	5			3				5-5-7-8 N=12			
				4				4-5-4-6 N=9			
				5				4-4-5-5 N=9			
	10										
				6				3-4-4 N=8			
	15						SP				
				7				5-4-5 N=9			
	20										
				8				7-7-8 N=15			
	25					Gray Sand with Shell Fragments					
				9			SP	8-6-6 N=12			
	30										

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LOCATION: 1800 SE Tiffany Ave
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The stratification lines represent approximate boundaries. The transition may be gradual.

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/15/24	**DRILLER:**	LR	**LOGGED BY:**	LR
COMPLETION DEPTH	70.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION:	N/A	**OFFSET:**	N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-5

Water			
	While Drilling	4.7	feet
	Upon Completion	4.7	feet
	Delay	N/A	

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	35			10		Gray Sand with Shell Fragments	SP	9-10-10 N=20			
	40			11				11-13-14 N=27			
	45			12		Gray Cemented Sand		32-29-35 N=63		>>◎	
	50			13				50/5" N=50/5"		>>◎	
	55			14				50/4" N=50/4"		>>◎	
	60			15				12-13-15 N=38			

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PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/15/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	70.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-5

Water		
	While Drilling	4.7 feet
	Upon Completion	4.7 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	65			16		Gray Cemented Sand		39-36-40 N=76		>>◎	
	70			17		End of Boring		50/5" N=50/5"		>>◎	

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PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI		
DATE COMPLETED:	4/15/24	**DRILLER:**	LR	**LOGGED BY:**	LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary		
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24		
LATITUDE:		**HAMMER TYPE:**	Automatic		
LONGITUDE:		**EFFICIENCY**	N/A		
STATION:	N/A	**OFFSET:**	N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

BORING B-6

Water		
	While Drilling	5.7 feet
	Upon Completion	5.7 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand	SP	3-7-8-7 N=15			
				2				6-9-10-12 N=19			
	5			3		Dark Brown Silty Sand	SM	13-11-12-10 N=23			
						Light Brown Sand					
				4				8-5-5-6 N=10			
				5				5-5-4-5 N=9			
	10										
	15			6				7-8-7 N=15			
	20			7			SP	2-3-2 N=5			
	25			8				7-8-8 N=16			
	30			9				8-10-9 N=19			

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PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-6

DATE STARTED:	4/15/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/15/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water

While Drilling	5.7 feet
Upon Completion	5.7 feet
Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	35			10		Gray Sand with Shell Fragments	SP	11-11-12 N=23			
	40			11		Gray Sand	SP	13-13-15 N=28			
	45			12		Gray Cemented Sand		39-50/5" N=50/5"		>>◎	
	50			13		End of Boring		40-41-50/4" N=50/4" N=91		>>◎	

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PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING P-1

DATE STARTED:	4/18/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/18/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water		
	While Drilling	5.1 feet
	Upon Completion	5.1 feet
	Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Asphalt (2 inches)	Asphalt				
				1		Light Brown Limerock	Limerock	11-9-8-10 N=17			
						Brown to Light Brown Sand					
				2				8-8-9-9 N=17			
	5			3				10-8-9-8 N=17			
				4				9-7-6-7 N=13			
							SP				
				5				7-6-6-6 N=12			
	10										
				6				7-6-6 N=12			
	15					End of Boring					

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PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING P-2

DATE STARTED:	4/18/24	**DRILL COMPANY:**	Intertek-PSI
DATE COMPLETED:	4/18/24	**DRILLER:** LR	**LOGGED BY:** LR
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME 55
BENCHMARK:	N/A	**DRILLING METHOD:**	Mud Rotary
ELEVATION:	N/A	**SAMPLING METHOD:**	SS24
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	LER/JNG

REMARKS:

Water

While Drilling	5.1 feet
Upon Completion	5.1 feet
Delay	N/A

BORING LOCATION:
See Figure No. 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (2 inches)	Topsoil				
				1		Brown to Light Brown Sand		7-7-8-7 N=15			
				2				6-8-13-12 N=21			
	5			3				13-11-12-10 N=23			
				4			SP	12-9-8-9 N=17			
				5				5-5-4-5 N=9			
	10										
				6				5-4-4 N=8			
	15					End of Boring					

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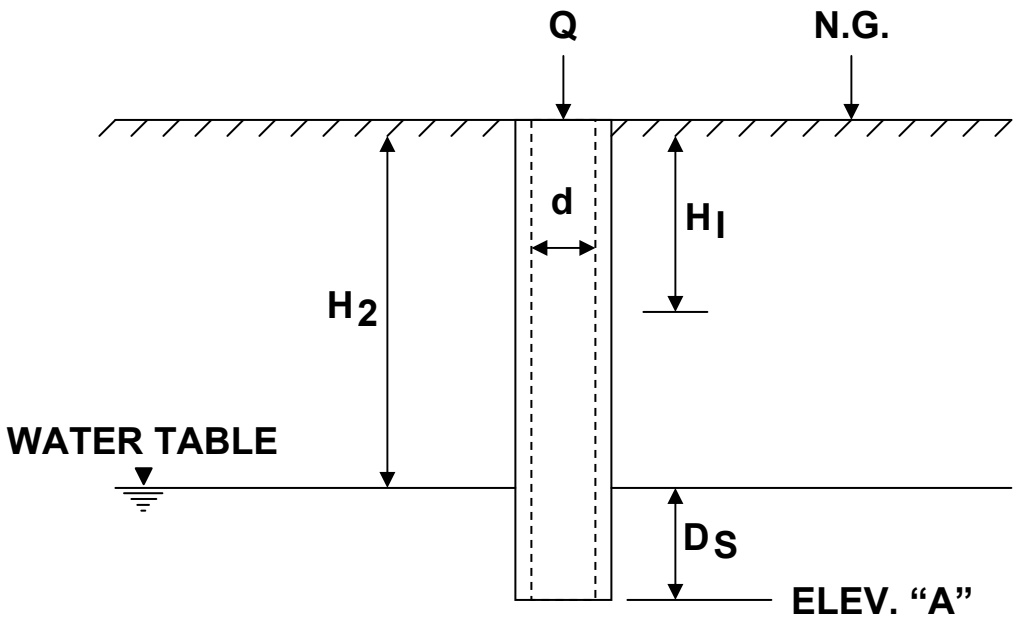
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PROJECT NO.: 0225-2017
PROJECT: HCA FL St. Lucie Hospital Parking Garage
LOCATION: 1800 SE Tiffany Ave
Port St. Lucie, FL

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APPENDIX C

USUAL OPEN – HOLE TEST



$$K = \frac{4Q}{\pi d (2H_2^2 + 4H_2D_S + H_2d)}$$

K= HYDRAULIC CONDUCTIVITY (CFS/FT.^{2} - FT.HEAD)

Q= "STABILIZED" FLOW RATE (CFS)

d= DIAMETER OF TEST HOLE (FEET)

H_2 = DEPTH TO WATER TABLE (FEET)

D_S = SATURATED HOLE DEPTH (FEET)

ELEV. "A"= PROPOSED TRENCH BOTTOM ELEV.

H_I = AVERAGE HEAD ON UNSATURATED HOLE SURFACE (FT.HEAD)

TABLE 1: SUMMARY OF PERCOLATION TEST RESULTS
HCA FL St. Lucie Hospital Parking Garage
1800 SE Tiffany Ave
Port St Lucie, Florida
PSI PROJECT No.: 0225-2017

BORING NO.	DATE PERFORMED	CASING DIAMETER (inches)	PERFORATED PVC DIAMETER (inches)	DEPTH OF HOLE (feet)	DEPTH TO GROUNDWATER LEVEL BELOW GROUND SURFACE (feet)		HYDRAULIC HEAD	SATURATED HOLE DEPTH,	AVERAGE FLOW RATE,	HYDRAULIC CONDUCTIVITY,
					PRIOR TO TEST	DURING TEST	H_2 (feet)	D_S (feet)	Q (gpm)	K (cfs/ft^2-ft)
P-1	4/18/2024	6	4	15.0	5.1	0.0	5.1	9.9	5.0	1.66E-04
P-2	4/18/2024	6	4	15.0	5.1	0.0	5.1	9.9	6.0	2.00E-04

NOTES:

(1) The above hydraulic conductivity values are for a french drain installed to the same depth as the borehole tests. The values represent an ultimate value. The designer should apply the appropriate factor of safety.

(2) The hydraulic conductivity values were calculated based on the South Florida Water Management District's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure as shown on the following page.

(3) A hole diameter of four inches was used in the computation of the Hydraulic Conductivity values presented in the above table.

$$K = \frac{4Q}{\pi d(2H_2^2 + 4H_2D_S + H_2d)}$$

SECTION 005200 - STANDARD FORM OF AGREEMENT

1. The Standard Form of Agreement is to be as follows issued from HCA:

   "Agreement Between Owner and Contractor for Work on a Cost-Plus-Fee Basis with a Guaranteed Maximum Contract Price, Rev-Oct 2007 GC-GMP".

SECTION 007200 - GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.01 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT WILL BE AIA - A201 - 2007 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.

A. Copies are available thru the AIA web site. (www.aia.org/contractdocs/)

END OF SECTION 007200

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed by Owner.
4. Work under Owner's separate contracts.
5. Owner-furnished/Contractor-installed (OFCI) products.
6. Contractor's use of site and premises.
7. Coordination with occupants.

1.3 PROJECT INFORMATION

A. The project consists of a new 6-story parking garage with a precast structure and an exterior of precast panels. The garage will have two stairwells and an elevator bank with two passenger elevators.

1. Project Location: 1800 SE Tiffany Ave., Port St. Lucie, FL 34952
2. Owner: HCA Health Services of Florida, Inc.
dba HCA Florida St. Lucie Hospital
1800 SE Tiffany Ave., Port St. Lucie, FL 34952

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK PERFORMED 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.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: Cooperate fully with Owner's 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 Owner's separate contracts.

1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.
    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limits on 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.

1. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.9 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy Project site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

C. Interim Life-Safety Measures:

1. Implement Interim Life-Safety Measures as outlined by NFPA 241.

2. The Contractor shall participate, with the Owner, in maintaining the following Life Safety provisions:
   a. Ensuring free and unobstructed exits. Personnel receive additional training when alternative exits are designated. Building or areas under construction must maintain escape route 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 non-combustible 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 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. Conduction organization-wide safety education programs to promote awareness of Life Safety Code deficiencies, construction hazards and Interim Life Safety measures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **011000**

SECTION 012300 – ALTERNATES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 “Schedule of Alternates” Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Base Bid:

1. Underground storm water system, sized to meet the stormwater requirements of this construction project. Refer to Civil, Structural, and Vendor Drawings for additional information.

B. Alternate #1:

1. Underground storm water system, sized to exceed the stormwater requirements of this construction project with added capacity for future site growth. Refer to Civil, Structural, and Vendor Drawings for additional information.

C. Alternate #2:

1. Cast-in-place underground storm water vault, sized to meet the stormwater requirements of this construction project. Refer to Civil and Structural drawings for additional information.

D. Alternate #3:

1. Cast-in-place underground storm water vault, sized to meet the stormwater requirements of this construction project with added capacity for future site growth. Refer to Civil and Structural drawings for additional information.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

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 to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form acceptable to Architect.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions 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.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.

h. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
i. Detailed comparison of Contractor's construction schedule using proposed substitutions 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.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. 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.
l. 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.

3. 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 notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

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

1.7 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **012500**

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on web-based Project management software.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

2. Within 14 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
   a. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   b. Include costs of labor and supervision directly attributable to the change.
   c. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

3. Include costs of labor and supervision directly attributable to the change.

4. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

5. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

6. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **012600**

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
      d. List of subcontractors.
      e. Schedule of allowances, if applicable.
      f. List of products.
      g. List of principal suppliers and fabricators.
      h. Schedule of Alternates.

   2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

   1. Identification: Include the following Project identification on the Schedule of Values:

      a. Project name and location.
      b. Name of Architect.

c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Each Progress Payment date is indicated in the Agreement. The period covered by each Application for Payment is indicated in the Agreement.

D. Payment Application Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included at end of this Section.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Web-based Project management software package.
6. Project meetings.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.

2. Preparation of the schedule of values.

3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Preinstallation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.

2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Name of Architect.
4. Architect's Project number.
5. Date.
6. Name of Contractor.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD.
4. Contractor shall execute a data licensing agreement in the form of Agreement form provided by Architect.
    a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
5. The following digital data files will be furnished for each appropriate discipline:
    a. Floor plans.
    b. Reflected ceiling plans.

B. Web-Based Project Management Software Package: Use Architect's web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.

4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **013100**

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.
5. Unusual event reports.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at monthly intervals.

E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Unusual Event Reports: Submit at time of unusual event.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Temporary Facilities: Indicate start and completion dates for the following as applicable:

a. Securing of approvals and permits required for performance of the Work.
b. Temporary facilities.
c. Construction of mock-ups, prototypes and samples.
d. Owner interfaces and furnishing of items.
e. Regulatory agency approvals.
f. Punch list.

2. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

4. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions, including presence of rain or snow.
6. Testing and inspection.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.

13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **013200**

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

3. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Name of subcontractor.
    d. Description of the Work covered.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block, and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.

2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

    1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

    2. Manufacturer and product name, and model number if applicable.

    3. Number and name of room or space.

    4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

    1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.

5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.

6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.

2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

a. Name of evaluation organization.
b. Date of evaluation.
c. Time period when report is in effect.
d. Product and manufacturers' names.
e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

2. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **013300**

SECTION 013324 - STRUCTURAL SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Structural submittals include shop drawings, design calculations, 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.

B. Submittals by the Contractor are not a part of the Contract Documents.

1.2 RELATED SECTIONS

A. Section 013300 - Submittal Procedures.

1.3 SUBMITTAL PROCEDURES

A. Prior to the initial submittal, Contractor shall submit to the Architect/Structural Engineer a completed Submittal Information and Schedules form given in Appendix I.

B. 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.

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

D. The type and number of submittals for each item shall be in accordance with Section 013300.

E. Contractor shall direct specific attention on the submittal to any deviation from the Contract Documents.

F. Electronic submittals shall comply with the following standards:

1. Structural submittals made in electronic format must be in a generally accepted format that can be viewed by Adobe Reader or similar, and capable of receiving comments and notations in Adobe Writer, Blubeam Revu or similar. When creating the file, no permissions should be restricted - All actions should be ALLOWED. Submittals should be issued as a single BOUND set with each page bookmarked with the correct sheet number.

Submittals not formatted in this manner will be returned to the contractor for review and resubmittal.

Send electronic files to the following email address and copy the Structural Engineer: **shopdrawings@sdlal.com**

2. All structural submittals made in electronic format with an original size that is larger than 8½" x 11" ***and exceeding ten (10) sheets*** must be accompanied by one (1) hard copy for review and use by the Structural Engineer.

1.4 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 stamp and sign each sheet of shop drawings and product data, and sign or initial each sample to certify compliance with requirements of Contract 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 Contract 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 Contract 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 Contract Documents.

F. Work requiring shop drawings, whether called for by the Contract Documents or requested by the Contractor, shall not commence until the submission has been reviewed by the Architect/Structural Engineer. 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.

1.5 ARCHITECT/STRUCTURAL ENGINEER REVIEW

A. Architect/Structural Engineer will review submittals with reasonable promptness. **For scheduling purposes, allow ten (10) business days in Structural Engineer's office exclusive of delivery time**.

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 Contract 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 Contract 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.

F. Structural Engineer will return a maximum of three reviewed hard copies for submittals that are not submitted electronically.

1.6 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 Contract Documents.

B. All shop drawings shall list the Contract Documents used in their production (date, title, revision number, etc.).

C. Reproduction of Structural Drawings for shop drawings is not permitted.

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

E. Electronic shop drawings submitted shall meet the requirements of Section 1.3.

F. A copy of the marked structural shop drawings with the Architect/Structural Engineer's review stamp is to be maintained at the job site. If electronic shop drawings are being used, a hard copy with all final markups is to be maintained at the job site.

1.7 PRODUCT DATA

A. Submit only pages which 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 which is not applicable.

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

1.8 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 which 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.

1.9 RESUBMITTALS

A. When submittals are returned to the Contractor with the Architect/Structural Engineer's corrections the Contractor shall make the required corrections. A record copy of one corrected set shall be resubmitted to the Structural Engineer.

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. Only reviewed shop drawings are considered acceptable for use during construction.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 013324

APPENDIX I
SUBMITTAL INFORMATION AND SCHEDULES

PROJECT _____

CONTRACTOR _____

CONTRACTOR'S ADDRESS _____

_____

PROJ. MANAGER _____ PHONE (___) _____ FAX (___) _____

SUPERINTENDENT _____ PHONE (___) _____ FAX (___) _____

MOBILIZATION DATE _____

PROJECTED SUBMITTAL DATES

FOUNDATION, CONCRETE & REINFORCING		STRUCTURAL STEEL		MASONRY	
SUBMITTAL	DATE	SUBMITTAL	DATE	SUBMITTAL	DATE
Site Preparation & Equipment Information		Fabricator / Erector Qualifications		Grout & Mortar Mix	
Concrete Mix Design		Anchor Rod & Embedded Items		Block Prism & Comp. Strength	
Foundation Reinforcing				Reinforcing	
				Written Procedures	
		Deck			
Precast					

Remarks:

COMPLETED BY _____ DATE _____

END OF APPENDIX I

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

E. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

H. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

I. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is 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. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.

2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.

3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

4. Statement of whether conditions, products, and installation will affect warranty.

5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling 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.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.

2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.

3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.

4. Demonstrate the proposed range of aesthetic effects and workmanship.

5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.

6. Promptly correct unsatisfactory conditions noted by Architect’s preliminary review, to the satisfaction of the Architect, before completion of final mockup.

7. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

8. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

9. Demolish and remove mockups when directed, unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

2. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.

3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

4. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

5. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION **014000**

SECTION 014100 - FLORIDA REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. See individual sections for specific reference to requirements of trade associations, reference standards, etc.

1.2 APPLICATION OF CODES:

A. Codes identified below apply to all portions of the Work.

B. Work is also subject to all laws and regulations in effect at the project location, whether or not listed herein.

1.3 CODES AND STANDARDS

A. The following codes & standards were utilized in the design of this Project.

1. NFPA-1 (2018) Uniform Fire Code
2. NFPA-10 (2013) Standard for Portable Fire Extinguishers
3. NFPA-11 (2010) Standard for Low-, Medium-, and High- Expansion Foam
4. NFPA-12 (2011) Standard on Carbon Dioxide Extinguishing Systems
5. NFPA-12A (2009) Standard on Halon 1301 Fire Extinguishing Systems
6. NFPA-13 (2013) Standard for the Installation of Sprinkler Systems
7. NFPA-13D (2013) Standard for the Installation of Sprinkler Systems in One- and Two- Family Dwellings and Manufactured Homes
8. NFPA-13R (2013) Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height
9. NFPA-14 (2013) Standard for the Installation of Standpipe and Hose Systems, except 2-7 shall be omitted
10. NFPA-15 (2012) Standard for Water Spray Fixed Systems for Fire Protection
11. NFPA-16 (2011) Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
12. NFPA-17 (2013) Standard for Dry Chemical Extinguishing Systems
13. NFPA-17A (2013) Standard for Wet Chemical Extinguishing Systems
14. NFPA-20 (2013) Standard for Installation of Stationary Pumps for Fire Protection
15. NFPA-22 (2013) Standards for Water Tanks for Private Fire Protection
16. NFPA-24 (2013) Standards for the Installation of Private Fire Service Mains and Their Appurtenances
17. NFPA 25 (2014) Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, except that quarterly flow tests shall be required for those systems supplied by a municipal water supply.
18. NFPA-30 (2015) Flammable and Combustible Liquids Code

19. NFPA-30A (2015) Code for Motor Fuel Dispensing Facilities and Repair Garages

20. NFPA-30B (2015) Code for the Manufacture and Storage of Aerosol Products

21. NFPA-31 (2011) Standard for the Installation of Oil Burning Equipment

22. NFPA-32 (2011) Standards for Dry Cleaning Plants

23. NFPA-33 (2011) Standard for Spray Application Using Flammable and Combustible Materials

24. NFPA-34 (2011) Standards for Dipping and Coating Processes Using Flammable or Combustible Liquids

25. NFPA-35 (2011) Standard for the Manufacture of Organic Coatings

26. NFPA-36 (2013) Standard for Solvent Extraction Plants

27. NFPA-37 (2015) Standard for Installation and Use of Stationary Combustible Engines and Gas Turbines

28. NFPA-40 (2011) Standard for the Storage and Handling of Cellulose Nitrate film

29. NFPA-45 (2011) Standard on Fire Protection for Laboratories Using Chemicals

30. NFPA-51 (2013) Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes

31. NFPA-51A (2012) Standard for Acetylene Cylinder Charging Plants

32. NFPA-51B (2014) Standard for Fire Prevention During Welding, Cutting and Other Hot Work

33. NFPA-52 (2013)Vehicular Fuel Systems Code

34. NFPA-54 (2015) National Fuel Gas Code

35. NFPA-55 (2013) Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders and Tanks

36. NFPA-58 (2014) Liquefied Petroleum Gas Code

37. NFPA-59 (2015) Utility LP-Gas Plant Code

38. NFPA-59A (2013) Standard for the Production, Storage and Handling of Liquefied Natural Gas

39. NFPA-61 (2013) Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities

40. NFPA-68 (2013) Standard on Explosion Protection by Deflagration Venting

41. NFPA-69 (2014) Standard for Explosion Prevention Systems

42. NFPA-70 (2014) National Electrical Code

43. NFPA-72 (2013) National Fire Alarm Code

44. NFPA-75 (2013) Standard for the Protection of Information Technology Equipment

45. NFPA-80 (2013) Standard for Fire Doors and Fire Windows

46. NFPA-80A (2013) Recommended Practice for Protection of Buildings from Exterior Fire Exposures

47. NFPA-82 (2014) Standard on Incinerators and Waste and Linen Handling Systems and Equipment

48. NFPA-85 (2011) Boiler and Combustion Systems Hazard Code

49. NFPA-86 (2015) Standard for Ovens and Furnaces

50. NFPA-88A (2015) Standard for Parking Structures

51. NFPA-90A (2015) Standard for the Installation of Air Conditioning and Ventilating Systems

52. NFPA-90B (2015) Standard for the Installation of Warm Air Heating and Air Conditioning Systems

53. NFPA-91 (2010) Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids

54. NFPA-92 (2012) Standard for Smoke-Control Systems

55. NFPA-96 (2014) Standard for Ventilation Control and Fire Prevention of Commercial Cooking Operations. Subdivision 10-2.3 of NFPA 96 applies prospectively only. Existing installations are permitted to remain in place subject to the approval of the Authority Having Jurisdiction.

56. NFPA-99 (2015) Health Care Facilities

57. NFPA-99B (2015) Standard for Hypobaric Facilities

58. NFPA-101 (2018) Life Safety Code (AHCA)

59. NFPA-101A (2013) Guide on Alternative Approaches to Life Safety

60. NFPA-102 (2011) Standard for Grandstands, Folding and Telescoping Seating, Tents and Membrane Structures

61. NFPA-105 (2013) Recommended Practice for the Installation of Smoke-Control Door Assemblies

62. NFPA-110 (2013) Standard for Emergency and Standby Power Systems

63. NFPA-111 (2013) Standard on Stored Electrical Energy Emergency and Standby Power Systems

64. NFPA-120 (2010) Standard for Fire Prevention and Control in Coal Mines

65. NFPA-122 (2010) Standard for Fire Prevention and Control in Metal/Non-metal Mining and Metal Mineral Processing Facilities

66. NFPA-130 (2014) Standard for Fixed Guideway Transit and Passenger Rail Systems

67. NFPA-140 (2013) Standard for Motion Picture and Television Production Studio Soundstages and Approved Production Facilities

68. NFPA-150 (2013) Standard on Fire and Life Safety in Animal Housing Facilities

69. NFPA-160 (2011) Standard for Flame Effects Before an Audience

70. NFPA-170 (2012) Standard for Fire Safety and Emergency Symbols

71. NFPA-204 (2012) Standard for Smoke and Heat Venting

72. NFPA-211 (2013) Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

73. NFPA-214 (2011) Standard on Water-Cooling Towers

74. NFPA-221 (2015) Standard for High Challenge Fire Walls, Fire Walls and Fire Barrier Walls

75. NFPA-232 (2012) Standard for the Protection of Records

76. NFPA-241 (2013) Standard for Safeguarding Construction, Alteration and Demolition Operations

77. NFPA-252 (2012) Standard Methods of Fire Tests of Door Assemblies

78. NFPA-253 (2011) Standard Method of Test for Critical Flux of Floor Covering Systems Using a Radiant Heat Energy Source

79. NFPA-257 (2012) Standard for Fire Tests for Window and Glass Block Assemblies

80. NFPA-259 (2013) Standard Test Method for Potential Heat of Building Materials

81. NFPA-260 (2013) Standard Method of Test and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture are permitted to remain in place subject to the approval of the Authority Having Jurisdiction.

82. NFPA-261 (2013) Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes

83. NFPA-265 (2011) Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on full Height Panel and Walls

84. NFPA-286 (2011) Standard Method of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

85. NFPA-288 (2012) Standard Methods of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire Resistance – Rated Floor Assemblies.

86. NFPA-289 (2012) Standard Method of Fire test for Individual Fuel Packages.

87. NFPA-302 (2015) Fire Protection Standard for Pleasure and Commercial Motor Craft.

88. NFPA-303 (2011) Fire Protection Standards for Marinas and Boat Yards

89. Terminals, Piers and Wharves

90. NFPA-312 (2011) Standard for Fire Protection of Vessels During Construction, Repair and Lay-Up

91. NFPA-318 (2015) Standard for the Protection of Semiconductor Fabrication Facilities

92. NFPA-326 (2010) Standard for the Safe Guarding of Tanks and Containers for Entry, Cleaning or Repair.

93. NFPA-385 (2012) Standard for Tank Vehicles for Flammable and Combustible Liquids

94. NFPA-400 (2013) Hazardous Material Code

95. NFPA-407 (2012) Standard for Aircraft Fuel Servicing

96. NFPA-409 (2011) Standard on Aircraft Hangars

97. NFPA-410 (2010) Standard on Aircraft Maintenance

98. NFPA-415 (2013) Standard on Airport Terminal Buildings, Fueling Ramp Drainage and Loading Walkways

99. NFPA-418 (2011) Standard for Heliports

100. NFPA-430 (2004) Code for Storage of Liquid and Solid Oxidizers

101. NFPA-484 (2015) Standard for Combustible Metals

102. NFPA-495 (2013) Explosive Materials Code

103. NFPA-498 (2013) Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives

104. NFPA-501 (2013) Standard on Manufactured Housing

105. NFPA-501A (2013) Standard for Fire Safety Criteria for Manufactured Home Installations, Sites and Communities

106. NFPA-505 (2013) Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation

107. NFPA-601 (2010) Standard for Security Services in Fire Loss Prevention

108. NFPA-654 (2013) Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids

109. NFPA-664 (2012) Standard for the Prevention of Fires and Explosives in Wood Processing and Woodworking Facilities

110. NFPA-701 (2010) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

111. NFPA-703 (2015) Standard for Fire-Retardant Treated Wood and Fire- Retardant Coatings for Building Materials

112. NFPA-704 (2012) Standard System for the Identification of the Fire Hazards of Materials for Emergency Response

113. NFPA-720 (2012) Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment

114. NFPA-750 (2015) Standard on Water Mist Fire Protection Systems

115. NFPA-780 (2014) Installation of Lightning Protection Systems

116. NFPA-909 (2013) Standard for the Protection of Cultural Resources Properties– Museums, Libraries, and Places of Worship

117. NFPA-914 (2010) Code for Fire Protection of Historic Structures

118. NFPA-1122 (2013) Code for Model Rocketry

119. NFPA-1123 (2010) Code for Fireworks Display

120. NFPA-1124 (2006) Code for the Manufacture, Transportation, Storage and Retail Sale of Fireworks and Pyrotechnic Articles

121. NFPA-1125 (2012) Code for the Manufacture of Model Rocket and High Power Rocket Motors

122. NFPA-1126 (2011) Standard for the Use of Pyrotechnics Before a Proximate Audience

123. NFPA-1127 (2013) Code for High Power Rocketry

124. NFPA-1142 (2012) Standard for Water Supplies for Suburban and Rural Fire Fighting

125. NFPA-1144 (2013) Standard for Reducing Structure Ignition Hazards from Wildland Fire

126. NFPA-1192 (2015) Standard on Recreational Vehicles

127. NFPA-1194 (2014) Standard for Recreation Vehicle Parks and Campgrounds

128. NFPA-1221 (2016) Standard for the Installation, Maintenance, and Use of Communication Emergency Services

129. NFPA-1963 (2014) Standards for Fire Hose Connections

130. NFPA-2001 (2012) Standard on Clean Agent Fire Extinguishing Systems

131. The portions of 49 Code of Federal Regulations, Parts 100-177 which are referenced in Compressed Gas Association CGA C-1-1996, Methods for Hydrostatic Testing of Compressed Gas Cylinders, Compressed Gas Association CGA C-6-1993, Standards for Visual Inspection of Steel Compressed Gas Cylinders, Seventh Edition, Reaffirmed 1995, Compressed Gas Association CGA C-6.1-1995, Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders, and Compressed Gas Association CGA C-6.3-1999 Guidelines for Visual Inspection and Requalification of Low pressure Aluminum Compressed Gas Cylinders, Second Edition, and which pertain to low pressure and high pressure cylinders.

132. The portions of 29 Code of Federal Regulations, Parts 1900-1910 which are referenced in Compressed Gas Association CGA C-1-1996, Methods for Hydrostatic Testing of Compressed Gas Cylinders, Compressed Gas Association CGA C-6-1993, Standards for Visual Inspection of Steel Compressed Gas Cylinders, Seventh Edition, Reaffirmed 1995, Compressed Gas Association CGA C-6.1-1995, Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders, and Compressed Gas Association CGA C-6.3-1999 Guidelines for Visual Inspection and

Requalification of Low Pressure Aluminum Compressed Gas Cylinders, Second Edition, and which pertain to low pressure and high pressure cylinders.

133. Compressed Gas Association CGA C-1-1996, Methods for Hydrostatic Testing of Compressed Gas Cylinders.

134. Compressed Gas Association CGA C-6-1993, Standards for Visual Inspection of Steel Compressed Gas Cylinders, Seventh Edition, Reaffirmed 1995.

135. Compressed Gas Association CGA C-6.1-1995, Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders.

136. Compressed Gas Association CGA C-6.3-1999, Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders, Second Edition.

B. The Following rules and standards shall also be utilized by projects as required.

1. Chapter 59A-3, F.A.C. Hospital Licensure

2. Chapter 59A-4, F.A.C. Nursing Homes and Related Facilities

3. Chapter 59A-5, F.A.C. Ambulatory Surgical Centers

C. The following codes and editions have been adopted by the State of Florida by the State Fire Marshal's Rule 69A-3.012 F.A.C.

1. Florida Building Code (2020) – Chapter 4, Section 449 Hospitals, 450 Nursing Homes and 451 Ambulatory Surgical Center

2. Florida Building Code Test Protocols for High Velocity Hurricane Zones (2020)

3. Florida Building Code Fuel Gas (2020)

4. Florida Building Code Mechanical (2020)

5. Florida Building Code Plumbing (2020)

6. National Electrical Code (2017)

7. Florida Existing Building Code (2020)

8. Florida Accessibility Code. 2020 6th Edition

9. State of Florida Administrative Code No. 69A-60

10. Guidelines for the Design and Construction of Health Care Facilities. 2018 Edition.

D. This Specification Section shall be supplemented by any more stringent applicable federal, state, and local building codes, guidelines, regulations, standards and manufacturer recommendations; Owner's insurance rating organization; including all other Authorities Having Jurisdiction.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. The work and materials for all equipment and systems furnished by the Contractor on this project shall conform to the applicable requirements of the following codes, standards and regulations:

1. American Society of Testing Materials: ASTM

2. American National Standard Institute: ANSI

3. National Fire Protection Association: NFPA

4. American Welding Society: AWS

5. American Iron and Steel Institute: AISI

6. American Institute of Steel Construction: AISC

7. Underwriters Laboratories: UL

8. American Society of Mechanical Engineers: ASME

B. In all cases, the standards referred to herein shall be the latest bulletins, etc., that are in effect at the date of the contract specification or at the date of any addendum thereto.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION 014100

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 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.

1.2 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.

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

D. "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."

E. "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.

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

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

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

I. "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.

1.3 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.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10. AF&PA - American Forest & Paper Association; www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction; www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22. APA - APA - The Engineered Wood Association; www.apawood.org.
23. APA - Architectural Precast Association; www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The); www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.
41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.

46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
48. CDA - Copper Development Association; www.copper.org.
49. CEA - Canadian Electricity Association; www.electricity.ca.
50. CEA - Consumer Electronics Association; www.ce.org.
51. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
52. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
53. CGA - Compressed Gas Association; www.cganet.com.
54. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
55. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
56. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
57. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
58. CPA - Composite Panel Association; www.pbmdf.com.
59. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
60. CRRC - Cool Roof Rating Council; www.coolroofs.org.
61. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
62. CSA - Canadian Standards Association; www.csa.ca.
63. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
64. CSI - Construction Specifications Institute (The); www.csinet.org.
65. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
66. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
67. CWC - Composite Wood Council; (See CPA).
68. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
69. DHI - Door and Hardware Institute; www.dhi.org.
70. ECA - Electronic Components Association; (See ECIA).
71. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
72. ECIA ? Electronic Components Industry Association; www.eciaonline.org
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.
75. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association; (See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - F?d?ration Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - F?d?ration Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America; www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Accreditation Service; www.iasonline.org.
96. IAS - International Approval Services; (See CSA).
97. ICBO - International Conference of Building Officials; (See ICC).
98. ICC - International Code Council; www.iccsafe.org.
99. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
100. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
101. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.

102. IEC - International Electrotechnical Commission; www.iec.ch.
103. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
104. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
105. IESNA - Illuminating Engineering Society of North America; (See IES).
106. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
107. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
108. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
109. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
110. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
111. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
112. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
113. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
114. ISO - International Organization for Standardization; www.iso.org.
115. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
116. ITU - International Telecommunication Union; www.itu.int/home.
117. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
118. LMA - Laminating Materials Association; (See CPA).
119. LPI - Lightning Protection Institute; www.lightning.org.
120. MBMA - Metal Building Manufacturers Association; www.mbma.com.
121. MCA - Metal Construction Association; www.metalconstruction.org.
122. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
123. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
124. MHIA - Material Handling Industry of America; www.mhia.org.
125. MIA - Marble Institute of America; www.marble-institute.com.
126. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
127. MPI - Master Painters Institute; www.paintinfo.com.
128. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
129. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
130. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
131. NADCA - National Air Duct Cleaners Association; www.nadca.com.
132. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
133. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
134. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
135. NCMA - National Concrete Masonry Association; www.ncma.org.
136. NEBB - National Environmental Balancing Bureau; www.nebb.org.
137. NECA - National Electrical Contractors Association; www.necanet.org.
138. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
139. NEMA - National Electrical Manufacturers Association; www.nema.org.
140. NETA - InterNational Electrical Testing Association; www.netaworld.org.
141. NFHS - National Federation of State High School Associations; www.nfhs.org.
142. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
143. NFPA - NFPA International; (See NFPA).
144. NFRC - National Fenestration Rating Council; www.nfrc.org.
145. NHLA - National Hardwood Lumber Association; www.nhla.com.
146. NLGA - National Lumber Grades Authority; www.nlga.org.
147. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
148. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
149. NRCA - National Roofing Contractors Association; www.nrca.net.
150. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
151. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
152. NSPE - National Society of Professional Engineers; www.nspe.org.
153. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
154. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
155. NWFA - National Wood Flooring Association; www.nwfa.org.
156. PCI - Precast/Prestressed Concrete Institute; www.pci.org.

157. PDI - Plumbing & Drainage Institute; www.pdionline.org.
158. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
159. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
160. RFCI - Resilient Floor Covering Institute; www.rfci.com.
161. RIS - Redwood Inspection Service; www.redwoodinspection.com.
162. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
163. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
164. SDI - Steel Deck Institute; www.sdi.org.
165. SDI - Steel Door Institute; www.steeldoor.org.
166. SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
167. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
168. SIA - Security Industry Association; www.siaonline.org.
169. SJI - Steel Joist Institute; www.steeljoist.org.
170. SMA - Screen Manufacturers Association; www.smainfo.org.
171. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
172. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
173. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
174. SPIB - Southern Pine Inspection Bureau; www.spib.org.
175. SPRI - Single Ply Roofing Industry; www.spri.org.
176. SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
177. SSINA - Specialty Steel Industry of North America; www.ssina.com.
178. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
179. STI - Steel Tank Institute; www.steeltank.com.
180. SWI - Steel Window Institute; www.steelwindows.com.
181. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
182. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
183. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
184. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
185. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
186. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrasssod.org.
190. TRI - Tile Roofing Institute; (Formerly: National Tile Roofing Manufacturing Association); www.tileroofing.org.
191. UBC - Uniform Building Code; (See ICC).
192. UL - Underwriters Laboratories Inc.; www.ul.com.
193. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
194. USAV - USA Volleyball; www.usavolleyball.org.
195. USGBC - U.S. Green Building Council; www.usgbc.org.
196. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
197. WASTEC - Waste Equipment Technology Association; www.wastec.org.
198. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
199. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
200. WDMA - Window & Door Manufacturers Association; www.wdma.com.
201. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
202. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; http://dodssp.daps.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.

5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas Forest Service; Forest Resource Development and Sustainable Forestry; http://txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014524 - STRUCTURAL TESTING/INSPECTION AGENCY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section summarizes the responsibility of the Contractor and the Structural Testing/Inspection Agency in the performance of the testing/inspection specified in the Contract Documents.

B. Neither the observation of the Architect/Structural Engineer in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, 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 Contract Documents.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014000 - Quality Requirements.

1.3 REFERENCES

A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. American Council of Independent Laboratories - Recommended Requirements for Independent Laboratories Qualifications.

1.4 SELECTION AND PAYMENT

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

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

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

1.5 ADMINISTRATION

A. Stanley D. Lindsey and Associates, Ltd., Consulting Engineers, 750 Old Hickory Blvd, Building One, Suite 175 Brentwood, TN 37027 will administer the work of the Structural Testing/Inspection Agency.

1.6 STRUCTURAL TESTING/INSPECTION REQUIREMENT SUMMARY

A. Specific structural testing/inspection requirements are given in the following specification sections:

Section 312310 - Excavating, Backfilling, and Compacting for Structures
Section 032000 - Concrete Reinforcement
Section 033000 - Cast-in-Place Concrete
Section 034100 - Precast Concrete Structural System
Section 036200 - Non-Shrink Grout
Section 042200 - Structural Concrete Masonry
Section 051200 - Structural Steel
Section 051500 - Barrier Cables
Section 053000 - Steel Decking

1.7 STRUCTURAL TESTING/INSPECTION AGENCY'S QUALIFICATIONS

A. Provide personnel with a minimum of two years' experience and qualified to perform the structural testing/inspection required by the Contract Documents.

B. Comply with the American Council of Independent Laboratories' recommended requirements.

C. Comply with ASTM E329.

D. Maintain properly calibrated equipment; calibrated within the past 12 months with devices of accuracy traceable to either National Bureau of Standards (NBS) Standards or accepted values of natural physical constants.

PART 2 - MATERIALS

Not Used.

PART 3 - EXECUTION

3.1 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, Structural Testing/Inspection Agency, appropriate subcontractors, suppliers, and detailers.

3.2 STRUCTURAL TESTING/INSPECTION AGENCY'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 Contract Documents, the applicable codes, and as directed by the Structural Engineer.

E. Report work and materials not complying with Contract Documents immediately 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 Contract 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. Copies of the reports for this project will be furnished to the Owner, Contractor, Architect, Structural Engineer, and the Local Building Authorities.

H. Structural Testing/Inspection Agency shall not alter requirements of Contract Documents, approve or reject any portion of the work, or perform duties of the Contractor.

I. If providing special inspections, reports shall include all items as required by the Florida Threshold Inspection Plan provided by the Structural Engineer.

3.3 CONTRACTOR'S RESPONSIBILITIES

A. Provide copy of Contract Documents to the Structural Testing/Inspection Agency.

B. Arrange the preconstruction meeting to discuss quality issues.

C. Notify the Structural Testing/Inspection Agency sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.

D. Cooperate with Structural Testing/Inspection Agency 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 Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples.

H. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections.

3.4 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 014524

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

3. Indicate methods to be used to avoid trapping water in finished work.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.

2. HVAC system isolation schematic drawing.

3. Location of proposed air-filtration system discharge.

4. Waste-handling procedures.

5. Other dust-control measures.

F. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.

2. Concrete cutting method(s) to be used.

3. Location of construction devices on the site.

4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.

5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.

6. Indicate locations of sensitive patient areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.5 QUALITY ASSURANCE

A. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

B. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.

3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.

2. Utilize designated area within existing building for temporary field offices.

3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.

2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Storage and Staging: Use designated areas of Project site for storage and staging needs.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.

2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

3. Maintain and touch up signs, so they are legible at all times.

F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.

3. Insulate partitions to control noise transmission to occupied areas.

4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

5. Protect air-handling equipment.

6. Provide walk-off mats at each entrance through temporary partition.

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION **015000**

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 012500 "Substitution Procedures" for requests for substitutions.
3. Section 017700 "Closeout Procedures" for submitting warranties.

1.3 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, 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. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

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 or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.

2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 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.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.

4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

1.7 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 standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to 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 in the Project Manual, prepare a written document, using indicated form properly executed.

3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."

1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."

2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION **016000**

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.
6. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished products, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 078400 "Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 INFORMATIONAL SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Fire separation assemblies.
    b. Air or smoke barriers.
    c. Fire-suppression systems.
    d. Plumbing piping systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Electrical wiring systems.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Sprayed fire-resistive material.
    d. Equipment supports.
    e. Piping, ductwork, vessels, and equipment.
    f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.

2. List of detrimental conditions, including substrates.

3. List of unacceptable installation tolerances.

4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.4 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION **017300**

SECTION 017419 – CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

1.1 POLICY

A. HCA's policy is to apply sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy the Contractor shall: (1) practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction and demolition waste from landfills and incinerators and to facilitate their recycling or reuse. HCA's goal is zero waste, however, we realize that some waste will occur on a project building site that cannot be reduced or recycled. Therefore, contractors shall divert 95% of total project waste from the landfill.

1.2 REFERENCES

A. HCA's policy requires a minimum landfill diversion of 95% of all construction and demolition debris. For additional references to diversion from landfills see www.usgbc.org, Materials and Resources, Credit 2. Contractor should become familiar with LEED reporting requirements in the event that HCA chooses to pursue LEED certification for an individual project.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 1609 (2001) Development and Implementation of a Pollution Prevention Program

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED (2002; R 2005; 2009) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

A.3 DEFINITIONS

A. Comingled vs Source Separated C&D Debris: Comingled debris is material that mixes all types of construction and demolition material in one container. Source separated, keeps several or all materials segregated from each other. Benefits of comingling include reduced labor and no need for education, and space saving. Benefits of source separation are higher value material due to lack of contamination, opportunity to involve labor and ability to use materials such as gypsum, masonry and rock product on site.

B. Construction and Demolition Debris: uncontaminated solid waste resulting from the construction, remodeling, repair and demolition of utilities, structures and roads; and uncontaminated solid waste resulting from land clearing. Such waste includes, but is not limited to bricks, concrete and other masonry materials, soil, rock, wood (including painted, treated and coated wood and wood products), land clearing debris, wall coverings, plaster, drywall, plumbing fixtures, non-asbestos insulation, roofing shingles and other roof coverings, asphaltic pavement, glass, plastics that are not sealed in a manner that conceals other wastes, empty buckets ten gallons or less in size and having no more than one inch of residue remaining on the bottom, electrical wiring and components containing no hazardous liquids, and pipe and metals that are incidental to any of the above. Solid waste that is not C&D debris (even if resulting from the construction, remodeling, repair and demolition of utilities, structures and roads and land clearing) includes, but is not limited to asbestos waste, garbage, any item containing hazardous materials such as fluorescent light ballasts or transformers, fluorescent lights, tires, drums, containers greater than ten gallons in size, any containers having more than one inch of residue remaining on the bottom and fuel tanks. Specifically excluded from the definition of construction and demolition debris is solid waste (including what otherwise would be construction and demolition debris) resulting from any processing technique that renders individual waste components unrecognizable, such as pulverizing or shredding.

C. Debris Management Coordinator (DMC): The contractor must appoint a DMC to oversee the activities relating to managing C&D debris on the site. The DMC will complete and submit the Waste Management Plan (form B) and collect records and data supporting disposal and diversion amounts.

D. Land Clearing Debris: Is vegetative matter, soil and rock resulting from activities such as land clearing and grubbing, utility line maintenance or seasonal or storm-related cleanup such as trees, stumps, brush and leaves and including wood chips generated from these materials. *Land clearing debris* does not include yard waste that has been collected at the curb.

E. Landfill Diversion: Means keeping material out of the landfill by reducing the amount of waste produced, reusing material, recycling, composting, incineration, or other mean.

F. Recycle: To process materials so that they may be used again. They can be used for their original purpose or another. Recycling is less preferable than reduction or reuse because often the processing takes up to 60% of the energy to transport and remake the new item. Example: pulverizing drywall as a soil amendment.

G. Reuse: Using an item again for the same purpose. Example: reusable pallets

H. Source Reduction – The act of decreasing waste or the toxicity of waste. Examples: Waste reduction - Ordering wallboard to the correct height and using cutoffs to fill holes. Reduced toxicity - paint that contains no VOCs.

I. Waste prevention: Not creating waste through concepts such as source reduction, recycling, composting and reuse.

J. The following is a partial list of C&D debris materials. The project waste may include but is not limited to these materials.

1. Asphalt
2. Bricks
3. Carpet and carpet pad
4. Corrugated cardboard
5. Clean dimensional wood
6. Wood[1]
7. Concrete and rock[2]
8. Concrete masonry units (CMU), slump stone (decorative concrete blocks)
9. Dirt[2]
10. Doors
11. Excavated Dirt & Rock[2]
12. Ferrous & nonferrous metals such as banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
13. Fluorescent lamps and ballasts[1]
14. Gypsum wallboard (drywall)
15. Land clearing debris & green materials (i.e. tree trimmings) [2]
16. Paint[1]
17. Plastic wrap, buckets, PVC
18. Roofing shingles
19. Used beverage containers

NOTE 1: Several common debris materials may be considered toxic, hazardous, or not easily recycled with other C&D debris. In these instances, follow appropriate disposal methods. These materials include but are not limited to:

1. Magnetic ballasts
2. Older fluorescent lamps containing polychlorinated biphenyls (PCBs)
3. All fluorescent lamps that may contain mercury
4. Treated wood
5. Painted wood that may contain lead-based paint
6. Unused paint

NOTE 2: Excavated materials and land clearing debris should be diverted from landfills. If the project is pursuing LEED certification this type of debris must be kept separate and cannot be counted toward LEED diversion rates.

1.4 SUMMARY

A. The following document outlines waste management criteria for all HCA construction and demolition projects. Guidelines established in Section 01 74 19 are intended for the use of contractor and contractor's affiliates.

B. Materials subject to the diversion requirements of this contract are the materials that are generated within the construction limits of this project, to include any materials associated with meeting the terms of this contract.

1.5 WASTE DIVERSION GOALS

A. HCA has established that this Project shall generate the least amount of waste possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

B. Acknowledging that Construction and Demolition waste will be generated, HCA requires that the maximum quantity of waste as is economically feasible shall be minimized on the front end and diverted from the landfill. HCA will request an estimate of the project's diversion rate and an explanation for diversion rates that are not 95%.

1.6 MANAGEMENT

A. With regard to these goals, the Contractor shall develop a Waste Management Plan (WMP) for HCA's review. Once this plan undergoes review by HCA, Contractor will be notified of project award or project denial. HCA will base project award on a number of factors included in the "best value evaluation" model. The WMP is a critical component of project award. This plan shall describe and document each of the following diversion and non-diversion activities:

1. Salvage
2. Reuse
3. Source Separation Construction and Demolition Debris Recycling
4. Co-mingled Construction and Demolition Debris Recycling
5. Landfill Disposal

B. Develop and implement a waste management plan as specified in this section. Take a proactive, responsible role in the management of construction and demolition waste and require all subcontractors, vendors, and suppliers to participate in program.

C. The Debris Management Coordinator (DMC) shall be responsible for instructing workers and overseeing and documenting the results of the Waste Management Plan (WMP).

D. Construction and demolition waste includes products of demolition and construction, excess of unusable C&D materials, packaging materials for construction products, and other materials generated during the construction process but not incorporated into the work.

E. In the management of waste, consideration shall be given to the availability of viable markets, the condition of the materials, the ability to provide the material in suitable condition, and in a quality acceptable to available markets.

1.7 SUBMITTALS

A. The following submittals are required to be approved by HCA:
1. Waste Management Plan (WMP Forms A & B) to indicate how waste will be diverted from landfills.

2. Closeout submittal including weight verification of all construction and demolition material. The percent diversion shall be documented in this submittal. This spreadsheet shall be submitted with the final closeout package submitted to HCA.

PART 2 - PRODUCTS

2.1 WASTE MANGEMENT PLAN (WMP):

A. The complete Waste Management Plan (WMP) consists of two sequential documents: WMP-Form A and WMP-Form B. Contractor must complete WMP- Form A prior to commencement of debris management activities. Once awarded project, the Debris Management Coordinator (DMC) must assume debris management responsibilities including the submission of WMP- Form B and records and data to support disposal and diversion percentages.

B. WMP- Form A (submit with proposal): WMP- Form A must be submitted with bid documents and is a prerequisite of project award. This document should describe planned C&D debris management activities. HCA may require Contractor to revise and resubmit the plan and does not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement.

C. WMP- Form B: Once the WMP- Form A is submitted, reviewed, and approved, DMC contractor must submit WMP- Form B on a monthly basis. Form B documents actual diversion percentages. Additionally, Contractor must submit records and data that verify:

1. Total waste generated
2. Total waste diverted by recycling, reuse, or salvage
3. The type of waste generated/diverted

D. The quantity of waste materials shall be by weight (tons). Landfill records and materials receipts shall be submitted as a formal material submittal.

2.2 WMP-FORM A – Estimate of Percent Reduction Contractor Will Attain During Project

A. Contractor will complete and submit the general WMP documents with the Contractor’s proposal for HCA review. If approved, this WMP will serve as the basis for the monthly records and data submittals and WMP–Form B. Contractor must submit initial WMP with project proposal to avoid disqualification. This plan should include separate sections for demolition and construction projects. See Appendix A for the WMP forms and corresponding instructions for completing the form. Contractor has the option of completing the WMP forms in Appendix A or creating his own. If he creates his own, the plan must contain the following:

1. Name of individuals on the Contractor's staff responsible for waste prevention and management.
2. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
3. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of wastes.
4. Characterization, including estimated types and quantities, of the waste to be generated.
5. List of specific waste materials that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Recycling facilities that will be used shall be identified by name, location, and phone number, including a copy of the permit or license for each facility.
6. Identification of materials that cannot be recycled/reused with an explanation or justification, to be approved by HCA.
7. Description of the means by which any recyclable materials identified in item (E) above will be protected from contamination.

2.3 WMP-FORM B - Actual Percentage Reduction Contractor Attains During Project

A. WMP-Form B will account for all construction and demolition waste management activity from project commencement to termination. This form must be completed and submitted on a monthly basis. Failure to meet the 95% diversion requirement must be addressed with a written explanation of disparities along with WMP-Form B. Contractor has the option of completing the WMP forms in Appendix A or creating his own. If he creates his own, the plan must contain the following:

1. Waste Characterization: Document the waste to be generated, including types and quantities by weight.
2. Diversion Options: List each material to be salvaged, reused, or recycled during the course of the Project, the proposed local market for each material, and the estimated net cost savings/ additional costs from diversion. "Net" means that the following have been subtracted from the cost of separating and recycling: (a) revenue from the sale of recycled or salvaged materials and (b) landfill tipping fees saved due to diversion of materials from the landfill.
3. Waste Reduction Calculations: Calculated end-of-project rates as a percentage of total waste.
4. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals/organizations. Indicate whether organization is tax exempt.
5. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
6. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight, tickets, receipts, and invoices.
7. LEED Submittal (If applicable): LEED letter template for Credit MR 2.1, signed by Contractor, indicating total waste material, quantities diverted and means by which it is diverted and a statement that requirements for the credit have been met.
8. Landfill Options: Include landfill contact information and costs. Provide the name of the landfill(s), respective tipping fee(s), and the total projected cost of landfill disposal.
9. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
10. Timeline: Submit a timeline of project commencement and termination in addition to a plan for periodic onsite updates of C&D debris handling.
11. Meetings: Describe the regular meetings to be held to address how to manage waste. At a minimum, discuss waste management goals and issues at pre-construction meetings and regularly scheduled job-site meetings.
12. Handling and Transportation: Describe methods of separation including the use of containers, their location, and labeling system used to identify the different materials. Describe transportation/hauling procedures, which may include but are not limited to contracting a recycling hauler, arranging transportation with the local market to be used and various means of self-transportation.
13. Negotiated approval of the Contractor WMP must be obtained prior to the commencement of waste management activities. Once notified of WMP approval, Contractor may begin WMP implementation.

PART 3 EXECUTION

3.0 WASTE MANAGEMENT PLAN (WMP) EXECUTION

1. Debris Management Coordinator (DMC): The Contractor shall designate an on site party (or parties) responsible for waste management instruction, oversight and documentation for the entire project.
2. Depending on the size and complexity of the project, Contractor may either designate a full time DMC or assign responsibility to the job supervisor or appropriate personnel.
3. Distribution: The Contractor shall distribute copies of the WMP and other pertinent information to the Job Site Foreman and to each Subcontractor.
4. Instruction: The Contractor shall provide on-site instruction of correct separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
5. Source Separation: The Contractor shall identify and clearly label a specific area to facilitate separation of materials for diversion activities. Recycling and waste bin areas are to be kept neat, clean and clearly marked in order to avoid contamination of materials.

6. If hazardous materials are found at anytime, the contractor shall halt work and inform HCA. The following is a list of appropriate source separation procedures:

    a) Separate recyclable materials from construction and demolition debris to the maximum extent possible. Separate recyclable materials by type.
    b) Provide containers, clearly labeled, by type of separated materials or provide other storage method for managing recyclable materials until they are removed from Project site.
    c) Stockpile processed materials on-site without mixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
    d) Stockpile materials away from demolition area. Do not store within drip line of remaining trees.
    e) Store components off the ground and protect from weather.

7. Construction and Demolition Debris Removal:

    a) Buildings and their appetencies are property of the Contractor. Revenues and savings from recycling, salvage, and reuse shall accrue to the Contractor.
    b) Remove construction and demolition debris from project site on a regular basis. Do not allow construction and demolition debris to accumulate on-site.
    c) Transport construction and demolition debris from property and dispose of it legally.
    d) Burning of construction and demolition debris is not permitted.

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 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: _____

HCA Waste Management Plan - Form B

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**	**Actual**	**Actual**	**Actual**	**Actual**
	(tons)		**%**	**%**	**%**	**%**	**%**	**%**	**(tons)**	**(E+G)**	**$/Ton**	**$%**	**$**	**$**
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									0.00	0.00	$0.00	$0	0	$0

TOTAL PROJECT SAVINGS $ _____

* 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 amount and type of materials kept out of the landfill to date.
sale.

Contractor Signature: _____ Date: _____ Affidavit: _____

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 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 testing, adjusting, and balancing records.

5. 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 and deliver 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 video recordings specified in Section 017900 "Demonstration and Training."

6. Advise Owner of changeover in utility services.

7. 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.

1.8 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 in accordance with Section 012900 "Payment Procedures."

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.

1.9 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order listed by room or space number.

2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

4. Submit list of incomplete items in the following format:

a. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by uploading to web-based project software site.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION **017700**

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Systems and equipment operation manuals.
3. Systems and equipment maintenance manuals.
4. Product maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.

2. Table of contents.

3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.

2. Name and address of Project.

3. Name and address of Owner.

4. Date of submittal.

5. Name and contact information for Contractor.

6. Name and contact information for Architect.

7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.

8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.

2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.

2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

3. Identification and nomenclature of parts and components.

4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.

2. Troubleshooting guide.

3. Precautions against improper maintenance.

4. Disassembly; component removal, repair, and replacement; and reassembly instructions.

5. Aligning, adjusting, and checking instructions.

6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.

2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.

2. Manufacturer's name.

3. Color, pattern, and texture.

4. Material and chemical composition.

5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.

2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.

4. Schedule for routine cleaning and maintenance.

5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **017823**

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Format: Annotated PDF electronic file with comment function enabled.

3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION **017839**

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.

2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit one copy within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Contractor.
e. Date of video recording.

2. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode.

1. Submit video recordings on CD-ROM or thumb drive.

2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.

3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

a. Name of Contractor/Installer.
b. Business address.
c. Business phone number.
d. Point of contact.
e. Email address.

B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

C. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

D. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION **017900**

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Work under this Section is subject to requirements of the Contract Documents including Divisions 00 and 01.

1.2 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.

1.3 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

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications.

1.5 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.

1.6 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.

1.7 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.

1.8 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

2.1 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

3.1 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.

3.2 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. Chilled Water System including chillers, cooling towers, pumps, and ancillary equipment.

3. Steam System and components serving HVAC system.

4. Heating Hot Water System including boilers, convertors, pumps and ancillary equipment.

5. Building Automation System

B. Plumbing: Domestic Hot Water Recirculation System

C. Electrical: Emergency Generator

3.3 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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. 019113A_Ductless Split Unit Pre Functional Checklist

2. 019113B Piping and Ductwork Pre Functional Checklist

Q. Functional Performance Test Procedures:

1. 019113C BAS Graphics Programmers' Guide

END OF SECTION 019113

[Insert Your Logo Here] [Vendor Logo Here]

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	

Notes		**Date**
1		
2		
3		
4		
5		
6		
7		

Approvals

Mechanical Contractor / Signature **Company:**

General Contractor / Signature **Company:**

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[Insert Your Logo Here] [Vendor Logo Here]

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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[Insert Your Logo Here] [Vendor Logo Here]

Piping and Ductwork Pre-Functional Checklist

Notes		Date
1		
2		
3		
4		
5		
6		
7		

Approvals

Mechanical Contractor / Signature **Company:**

General Contractor / Signature **Company:**

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Appendix B-8: BAS Graphics Programmers' Guide



HCA | FACILITIGROUP Infrastructure Solutions SM

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	???? ????	???? ????

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

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
?? ?? ??
??

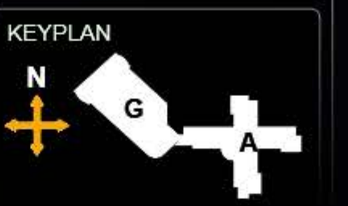
Third Floor



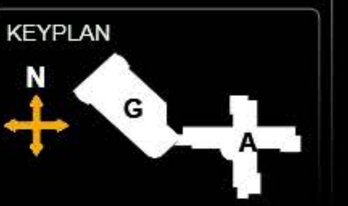
Section A - AHU-06,07,08,09,10,11
Section A - C-Section

Third Floor-Zone A
?? ?? ??
??

Fourth Floor



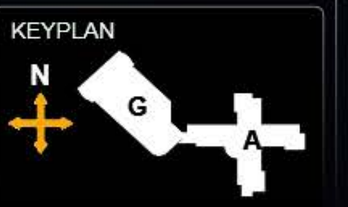
Fifth Floor



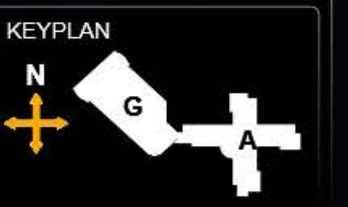
Sixth Floor



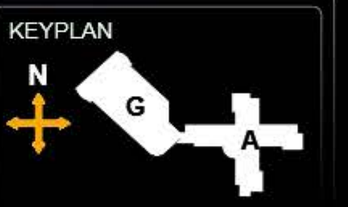
Seventh Floor



Eighth Floor



Ninth Floor



Section A - AHU-12,13

Roof



Facility Name - Floor Plan

???? ????
???? ????

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
???? ????

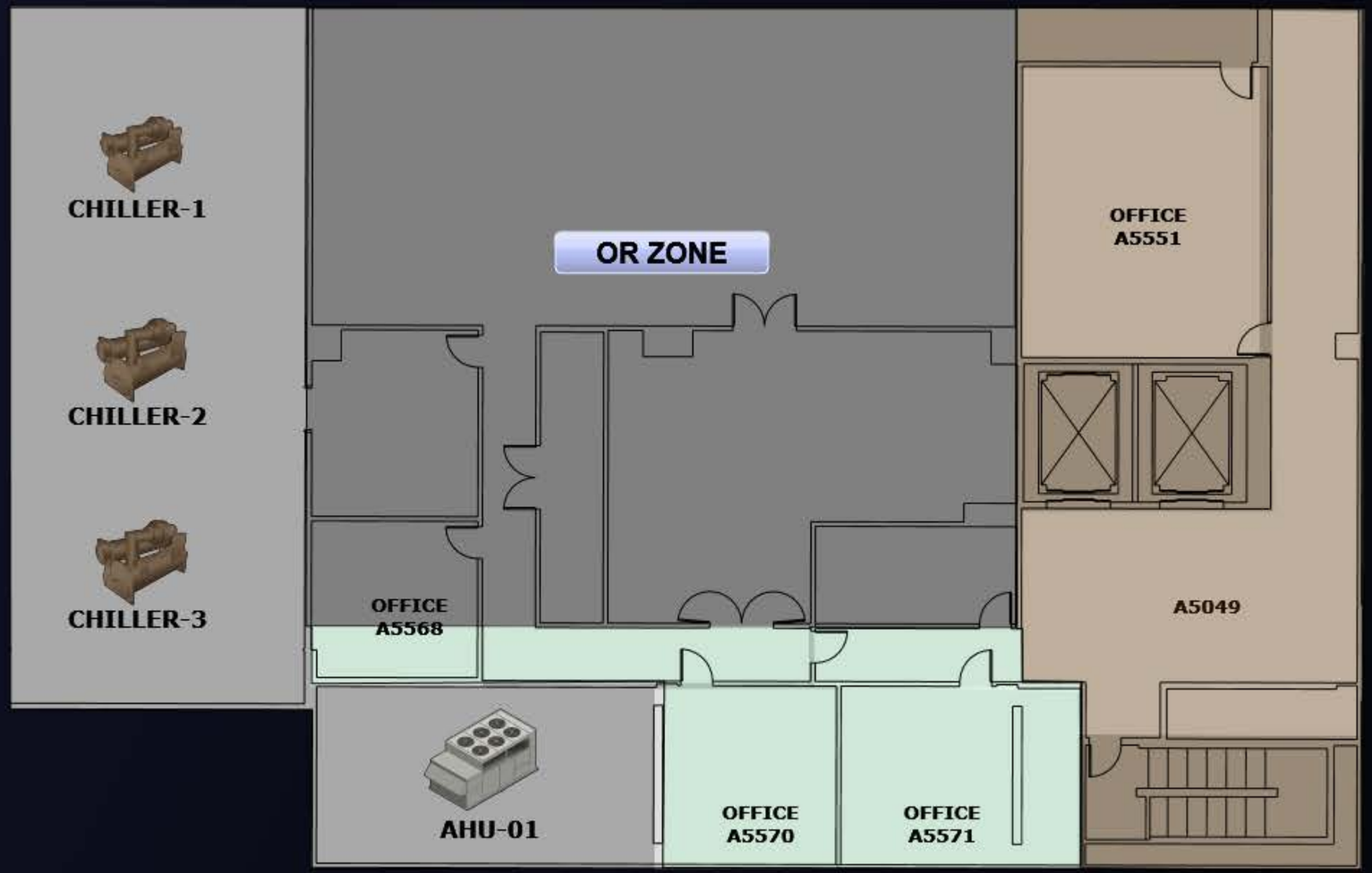
System Mode
???? ????

Unit Enable Mode
???? ????

Discharge Temp
???? ????

Heating Output
???? ????





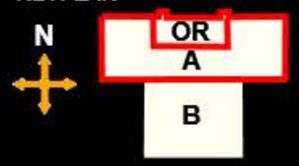
AHU 01

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

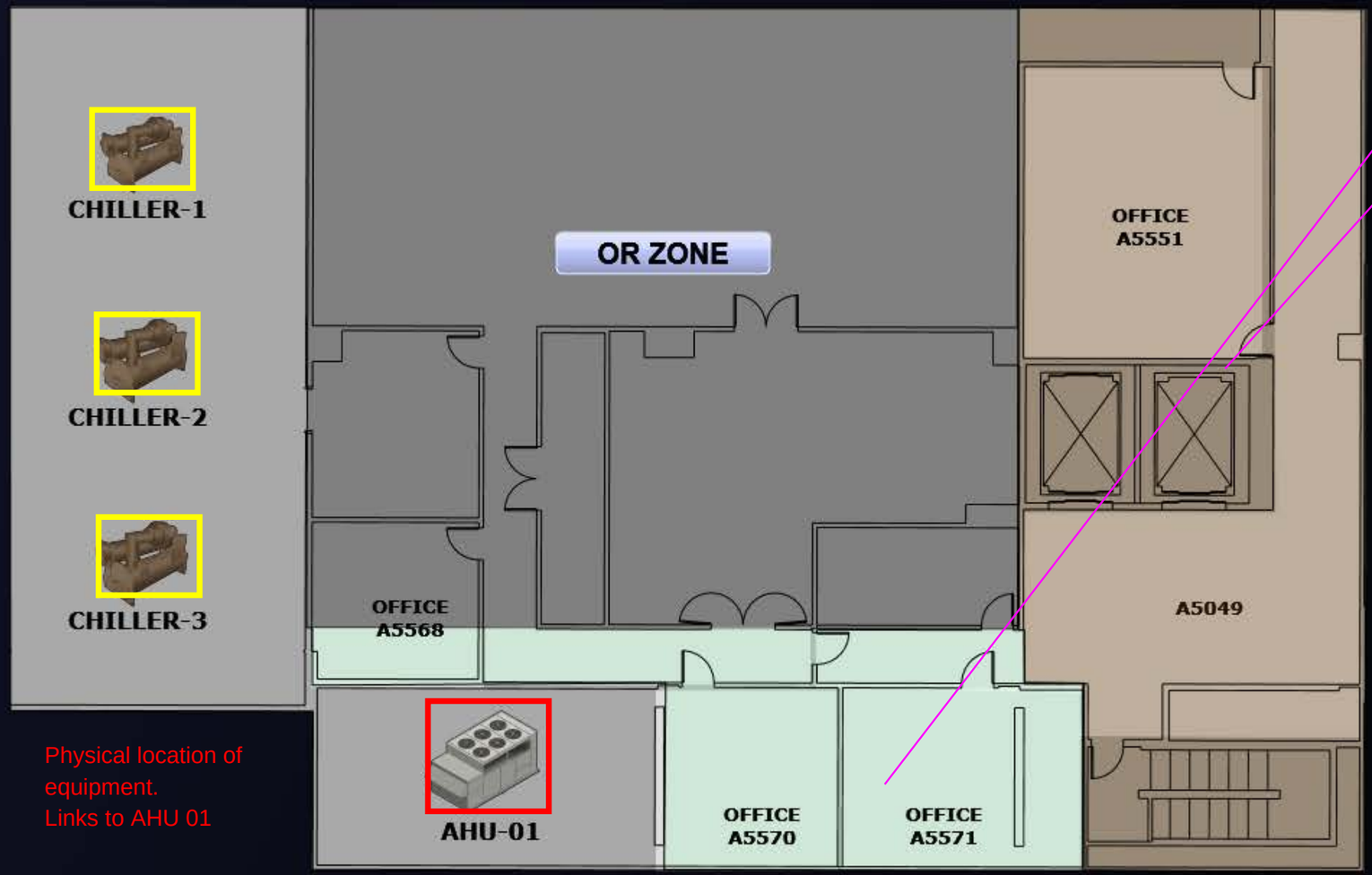
FACILITIGROUP

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

Facility Name - OR Zone

???? ????
???? ????

Room Control Module

????
????

Zone Setpoint
???? ????

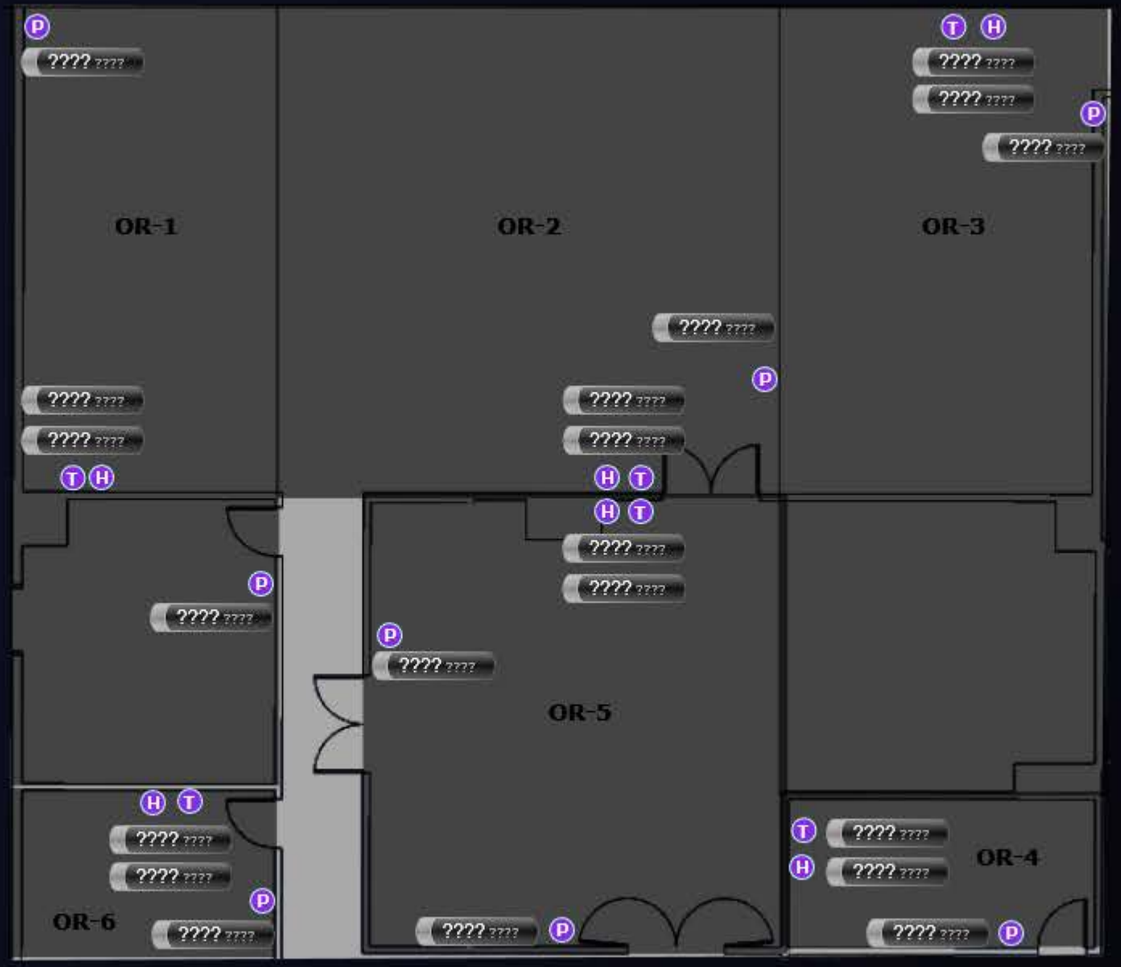
System Mode
???? ????

Unit Enable Mode
???? ????

Discharge Temp
???? ????

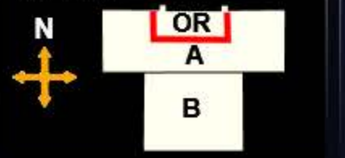
Heating Output
???? ????





Offline | Low Alarm | Low Warning | Below Setpoint | Normal | Above Setpoint | High Warning | High Alarm | Overridden

KEYPLAN

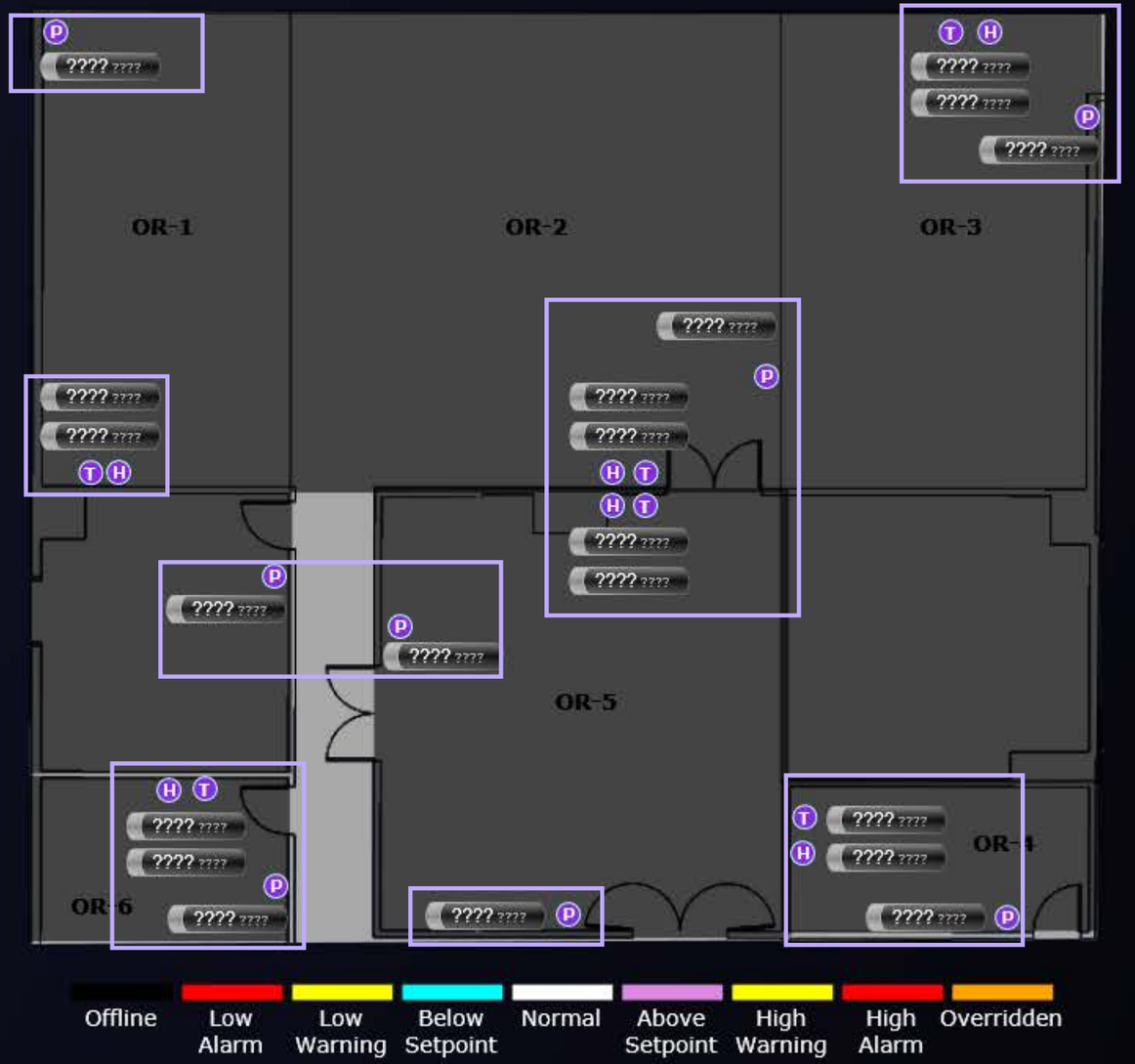


TriStar Skyline MEDICAL CENTER

FLOOR | CHW | HW | STEAM | AHU | ENERGY | EPSS | ALARMS | AUX | LEGEND

FACILITIGROUP Infrastructure Solutions





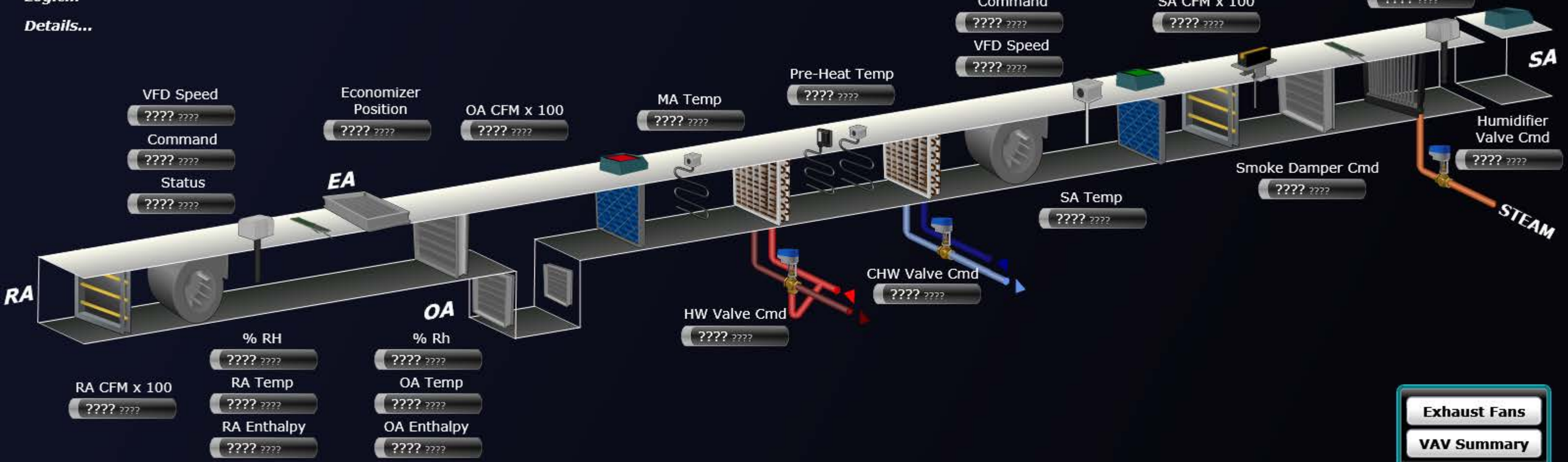
Temperature, Humidity, and Pressure sensors for the OR Zone should be located on this floor plan in the same location as the facility.



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

???? ????
???? ????

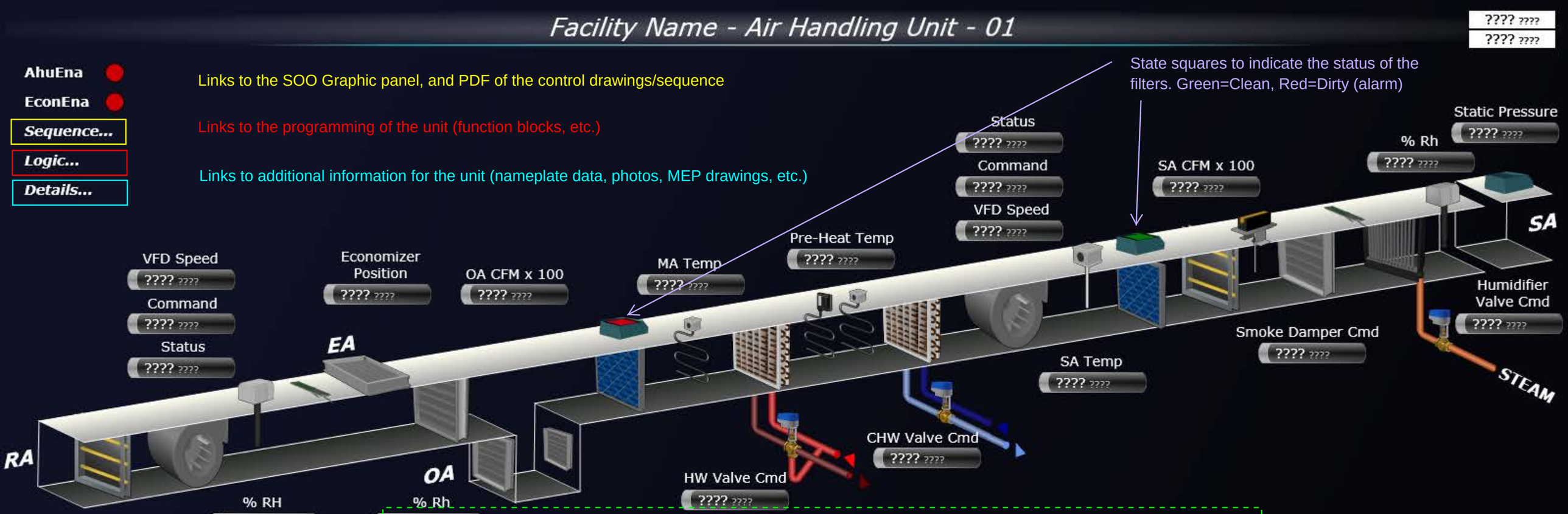
AhuEna
EconEna
Sequence...
Logic...
Details...

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)



Exhaust Fans
VAV Summary

Upon a right-click > View Trend, the trend viewer window will pop up here for any point that is trended

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

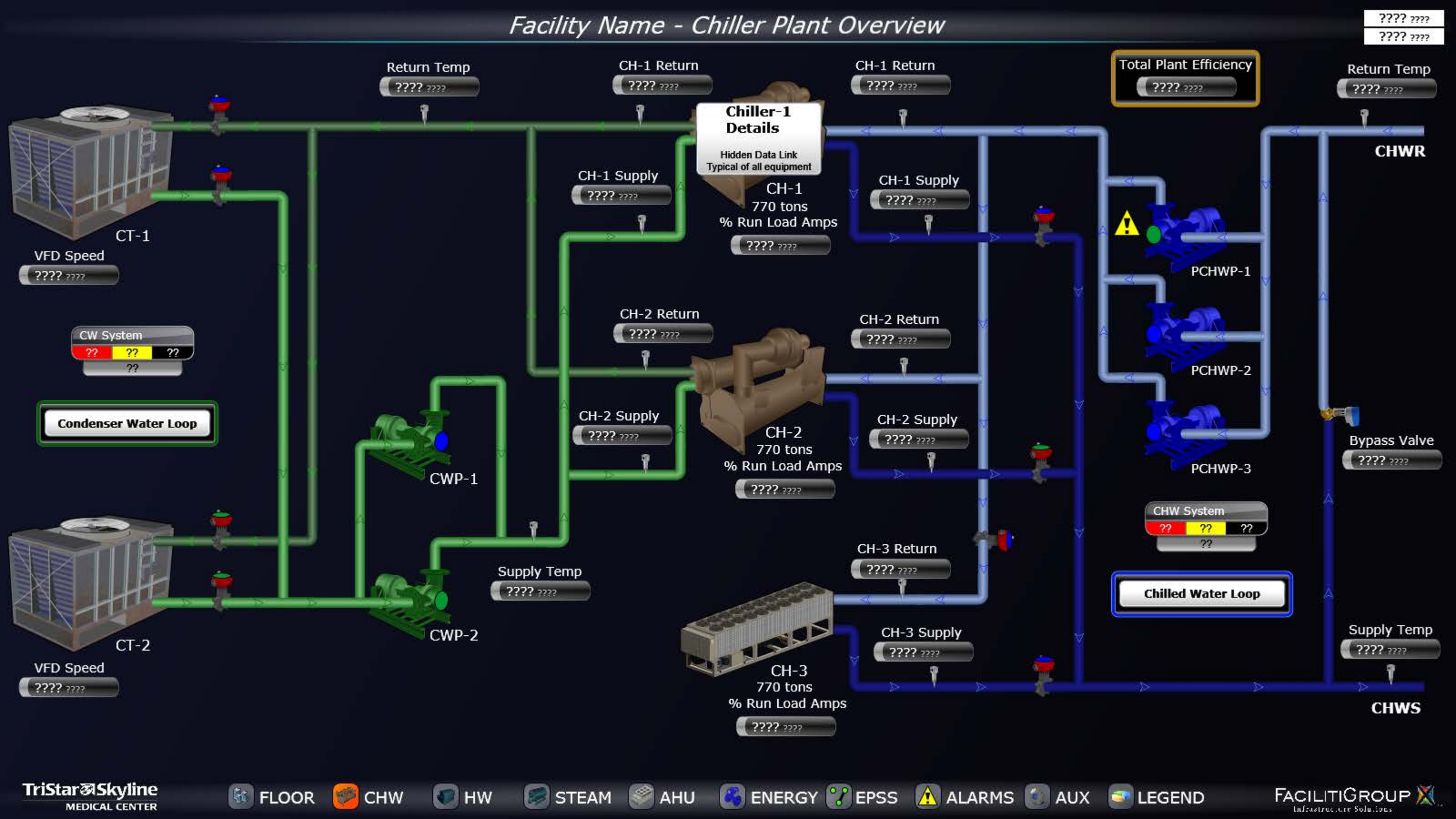
Remove unused columns

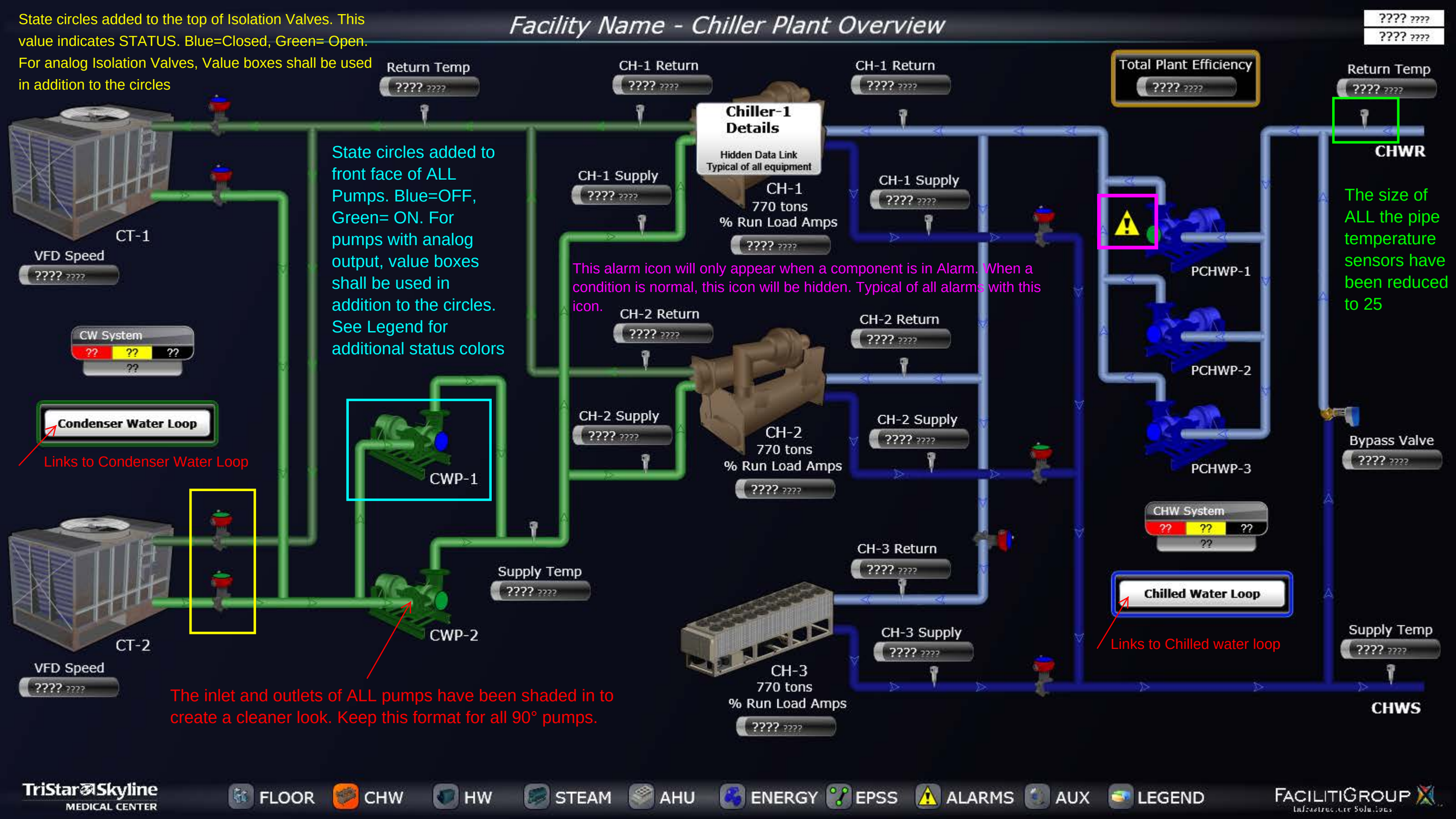
Equipment	Mode	ZnTmp deg F	ZnTmpSpt deg F	ZnRh % RH	ZnRhSpt % RH	ReHtVlv % Open	DaCFM CFM	DaCFMSpt CFM	DmprPos % Open	Door Sensor	ZnPress in wc			
OR 01 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
OR 02 - VV 01-101	????	????	????	????	????	????	????	????	????	????	????	????	????	????
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	????	????	????	????	????	????	????	????	????	????	????	????	????	????

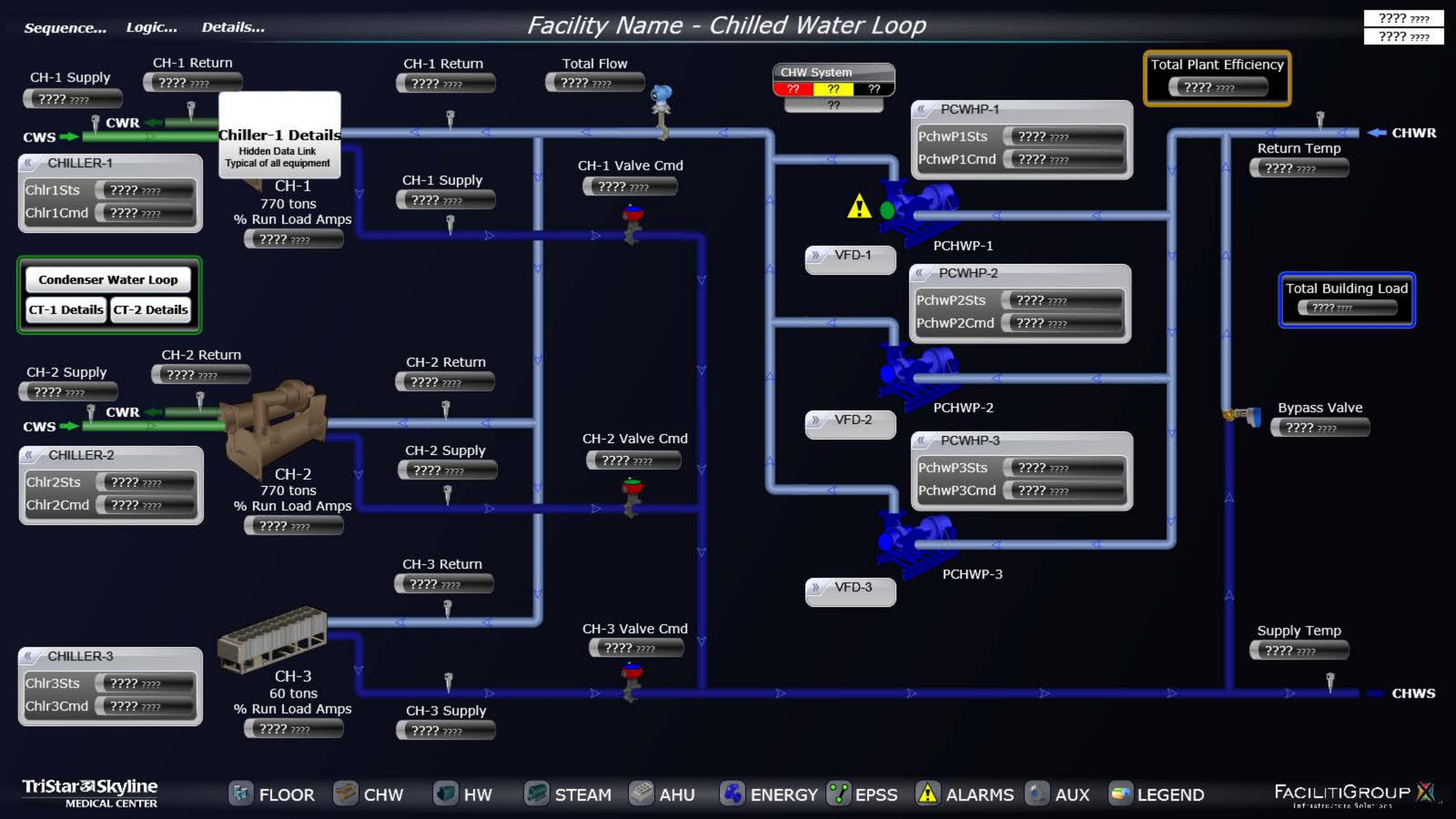
< Previous

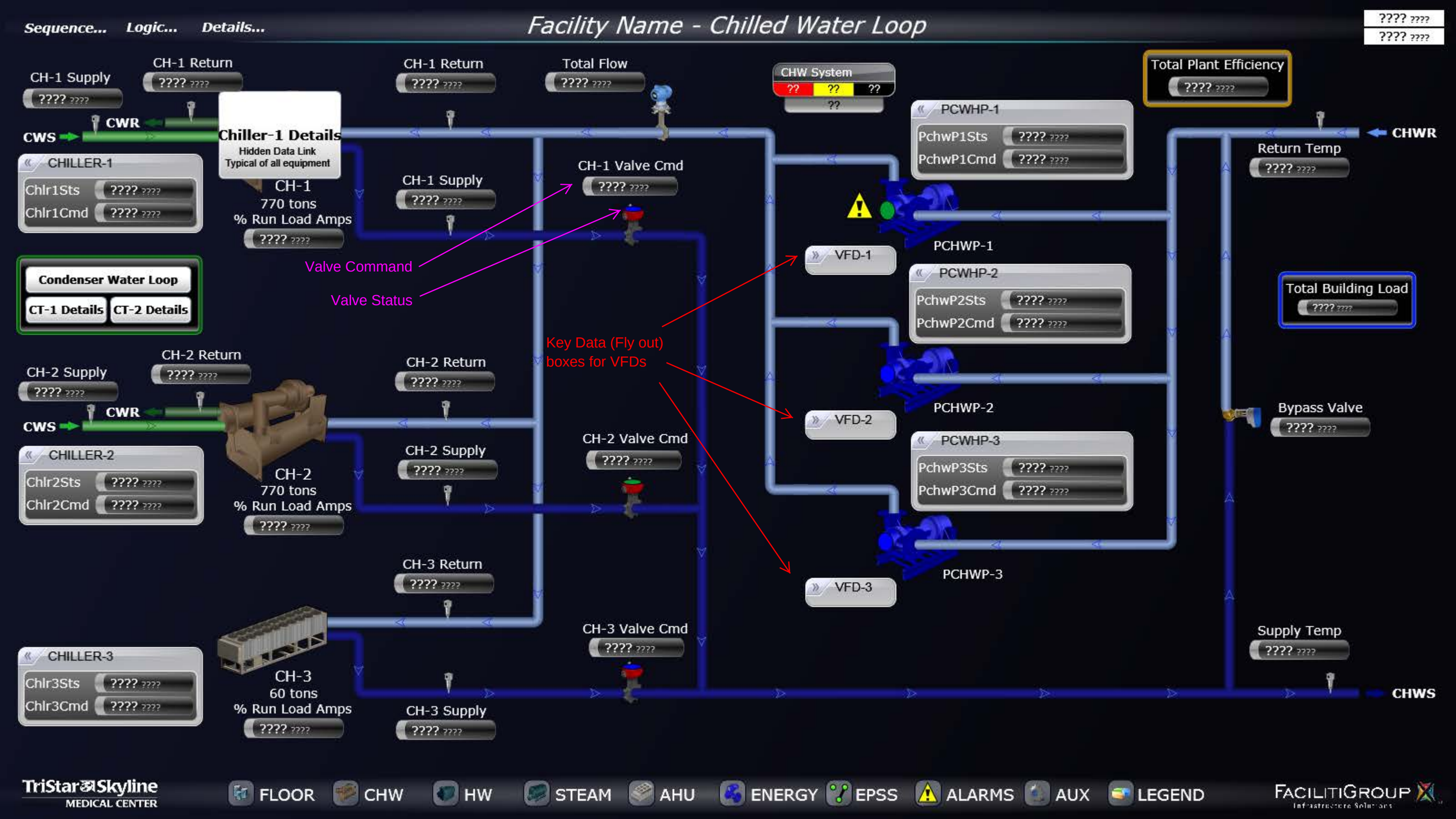
Links to 2nd panel for additional ORs

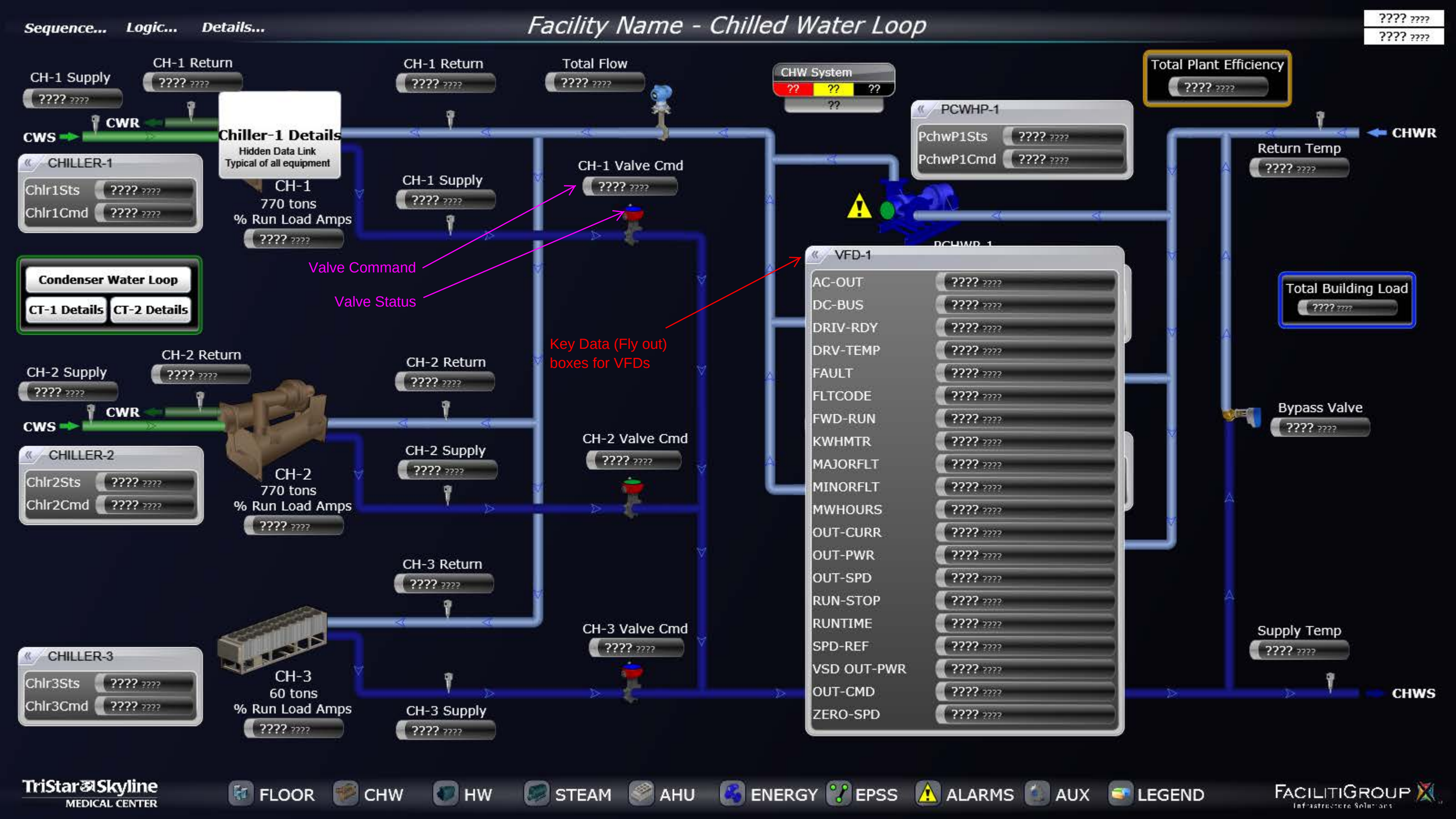
Next >


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 Supply
???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Supply
???? ????
PCHWP-3
Bypass Valve
???? ????
CWP-1
CHW System
?? ?? ??
??
CH-3 Return
???? ????
Supply Temp
???? ????
Chilled Water Loop
CT-2
VFD Speed
???? ????
CWP-2
CH-3 Supply
???? ????
Supply Temp
???? ????
CH-3
770 tons
% Run Load Amps
???? ????
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.
The size of ALL the pipe temperature sensors have been reduced to 25
PCHWP-1
PCHWP-2
PCHWP-3
CW System
?? ?? ??
??
CH-2 Return
???? ????
CH-2 Return
???? ????
Condenser Water Loop
Links to Condenser Water Loop
CH-2 Supply
???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Supply
???? ????
Bypass Valve
???? ????
CWP-1
CH-3 Return
???? ????
CHW System
?? ?? ??
??
Chilled Water Loop
Supply Temp
???? ????
CT-2
VFD Speed
???? ????
CWP-2
CH-3 Supply
???? ????
Links to Chilled water loop
Supply Temp
???? ????
CH-3
770 tons
% Run Load Amps
???? ????
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
CH-1 Return
???? ????
Total Flow
???? ????
CHW System
?? ?? ??
??
Total Plant Efficiency
???? ????
CHILLER-1
Chlr1Sts ???? ????
Chlr1Cmd ???? ????
CH-1
770 tons
% Run Load Amps
???? ????
CH-1 Supply
???? ????
CH-1 Valve Cmd
???? ????
PCWHP-1
PchwP1Sts ???? ????
PchwP1Cmd ???? ????
CHWR
Return Temp
???? ????
Valve Command
Valve Status
Condenser Water Loop
CT-1 Details
CT-2 Details
VFD-1
PCHWP-1
PCWHP-2
PchwP2Sts ???? ????
PchwP2Cmd ???? ????
Total Building Load
???? ????
Key Data (Fly out)
boxes for VFDs
CH-2 Supply
???? ????
CH-2 Return
???? ????
CWR
CWS
CH-2 Return
???? ????
CHILLER-2
Chlr2Sts ???? ????
Chlr2Cmd ???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Supply
???? ????
CH-2 Valve Cmd
???? ????
VFD-2
PCHWP-2
Bypass Valve
???? ????
PCWHP-3
PchwP3Sts ???? ????
PchwP3Cmd ???? ????
CH-3 Return
???? ????
VFD-3
PCHWP-3
CHILLER-3
Chlr3Sts ???? ????
Chlr3Cmd ???? ????
CH-3
60 tons
% Run Load Amps
???? ????
CH-3 Valve Cmd
???? ????
Supply Temp
???? ????
CH-3 Supply
???? ????
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
???? ????
CH-2 Supply
???? ????
CH-2 Return
???? ????
CWR
CWS
CH-2 Return
???? ????
CHILLER-2
Chlr2Sts ???? ????
Chlr2Cmd ???? ????
CH-2
770 tons
% Run Load Amps
???? ????
CH-2 Supply
???? ????
CH-2 Valve Cmd
???? ????
Bypass Valve
???? ????
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

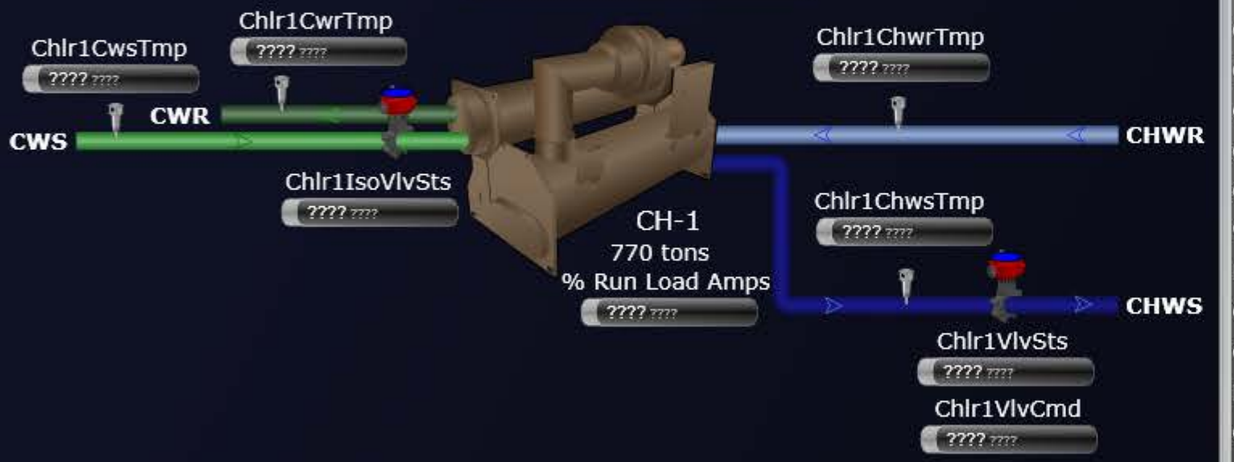
Serial Number -
Model Number -
Installation Date -

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

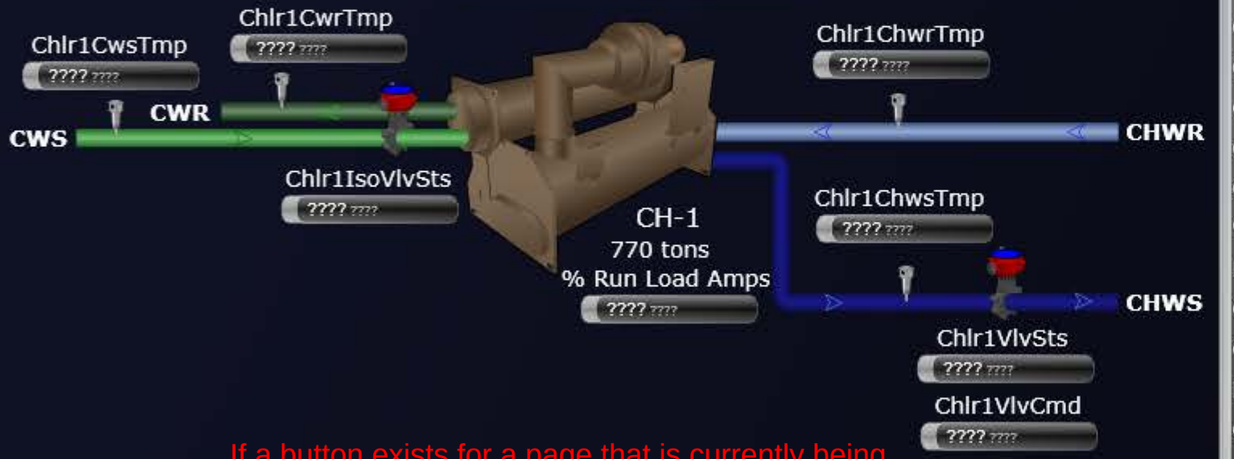
???? ????
???? ????

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 -

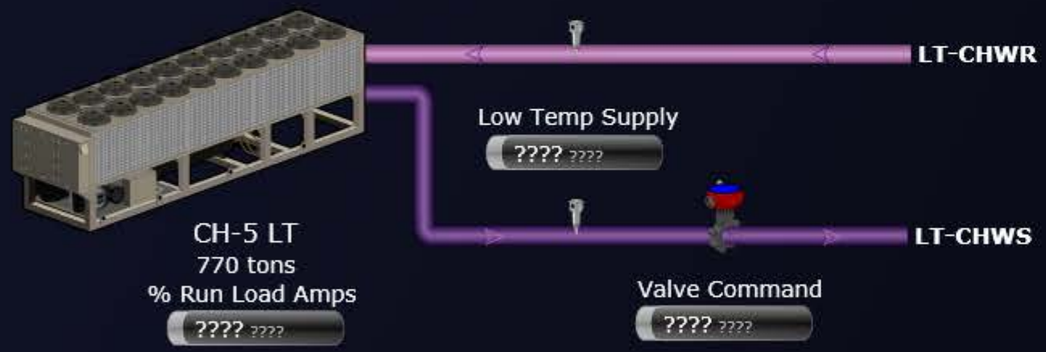
Model Number -

Installation Date -

Chiller 5 - Low Temperature

Chlr05-LTSts	???? ????
Chlr05-LTCmd	???? ????

Chiller 5 Efficiency: ???? ????



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

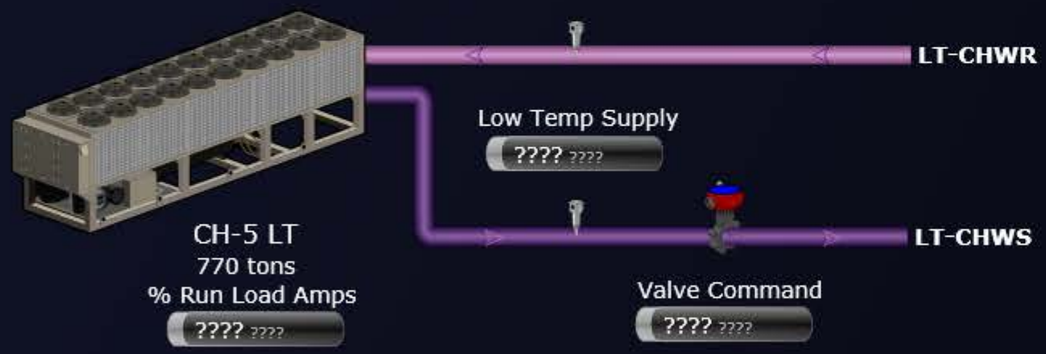
Serial Number -
Model Number -
Installation Date -

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

TriStar Skyline MEDICAL CENTER

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

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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)

Boiler 1 Detail
Hidden Data Link
Typical of all equipment

Steam Flow ???? ????

Pressure ???? ????

Natural Gas ???? ????

BLR-1
400 BHP
% Firing Range
???? ????

Feed Water ???? ????

BLR-1
400 BHP
% Firing Range
???? ????

Feed Water ???? ????

Make Up Water ???? ????

FWP1
FWP2
FWP3

FW Pump-1
Sts ???? ????
Cmd ???? ????

FW Pump-2
Sts ???? ????
Cmd ???? ????

FW Pump-3
Sts ???? ????
Cmd ???? ????

DA Tank

From Condensate Return Unit

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.

Steam Plant Efficiency ???? ????

1/3 Vlv Output ???? ????

2/3 Vlv Output ???? ????

HX Detail

HX-1

HWP - 1
HWP - 2

HWR

PFHX-1 Parameters
HwsTmp ???? ????
HwrTmp ???? ????
Hw GPM ???? ????
Load ???? ????

To Consensate Return Unit

HWS

1/3 Vlv Output ???? ????

2/3 Vlv Output ???? ????

HX-2

HWP - 3
HWP - 4

HWR

PFHX-2 Parameters
HwsTmp ???? ????
HwrTmp ???? ????
Hw GPM ???? ????
Load ???? ????

To Consensate Return Unit

HWS

STM

HX Details

This is the preferred way to show the continuation of a pipe

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
???? ????
???? ????
???? ????
???? ????
???? ????

Vs1
Vs2
Hzs1
Hzs2

ATS 02
???? A
Equipment
???? ????
???? ????
???? ????
???? ????
???? ????

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
???? ????
???? ????
???? ????
???? ????

TriStar Skyline MEDICAL CENTER

FLOOR CHW HW STEAM AHU ENERGY EPSS ALARMS AUX LEGEND

FACILITIGROUP Infrastructure Solutions

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	????	????	????	????	????	????	????

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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	????

SECTION 024116 – DEMOLITION

PART 1 - GENERAL

1.1 WORK INCLUDED
- A. Removal and disposal of designated pavements, concrete, curbs, culverts, utilities and other structures.

1.2 RELATED WORK
- A. Section 31 11 00: Clearing and Grubbing
- B. Section 31 22 13: Site Excavation

1.3 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.

1.4 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

1.5 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

3.1 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.

3.2 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.

3.3 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 024116

SECTION 030505 - UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 031000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 033000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 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; 2011.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit samples of underslab vapor barrier if not specified material.

D. 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, maximum.
   2. Complying with ASTM E1745 Class A.
   3. Thickness: 15 mils.
   4. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
      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.

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.

END OF SECTION 030505

SECTION 031000 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes the design and erection of formwork, shoring and reshoring for cast-in-place concrete and accessories.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 032000 - Concrete Reinforcement.

C. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Standard Specifications for Structural Concrete.

C. ACI 318 - Building Code Requirements for Structural Concrete.

D. ACI 347 - Recommended Practice for Concrete Formwork.

E. ASME A17.1 - Safety Code for Elevators and Escalators.

F. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

G. ASTM D6817 - Standard Specification for Rigid Cellular Polystyrene Geofoam.

H. ASTM D7174-05 - Standard Specification for Preformed Closed-Cell Polyolefin Expansion Joint Fillers for Concrete Paving and Structural Construction.

I. ASTM E1643-09 - Standard Practice For Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact With Earth or Granular Fill Under Concrete Slabs.

J. ASTM E1745-09 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

1.4 SUBMITTALS

A. Submit locations of construction joints for approval.

B. Submit manufacturer's data for waterstops.

C. Submit plan and elevation drawings denoting dimensioned locations and sizes of penetrations through concrete framing. These shop drawings shall indicate sleeves and openings required for, but not limited to, plumbing, mechanical, electrical, and fire protection trades. Shop drawings shall be submitted in CAD/BIM/IFC and pdf format prior to concrete reinforcement shop drawing submission.

1.5 DESIGN OF FORMWORK

A. Design of formwork, shoring, and reshoring and its removal is the sole responsibility of the Contractor.

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. The formwork engineer shall verify adequate structural stability exists for intermediate pours on a given floor when developing a re-shoring plan. Any unstable areas must remain fully shored until the total elevated floor area has been completed and achieved required concrete strength (tendons fully stressed as well if PT slab/beam system).

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Construct forms with wood, plywood, metal, fiberglass or a combination of these.

B. Form materials shall have sufficient strength to prevent distortion.

2.2 FORMWORK ACCESSORIES

A. Formwork accessories that are embedded in concrete, including ties and hangers, shall be commercially manufactured products. Do not use nonfabricated wire form ties.

2.3 FORM RELEASE AGENT

A. Form release agent shall not bond with, stain, nor adversely affect concrete surfaces.

2.4 WATERSTOPS

A. Waterstops at construction joints and control joints indicated by the Drawings shall be sized to suit the joints.

B. Unless specified elsewhere, waterstops shall be preformed plastic adhesive waterstops as manufactured by SYNKO-FLEX Products or approved equal.

C. Non-swelling, Preformed Joint Sealant Waterstops (for concrete walls 8” or less in thickness, where waterstop is to be placed in keyway, or locations where water stop is subjected to standing water): Self-sealing adhesive compound, extruded in a square cross-section between two quick-release protective wrappers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Henry; Synko-Flex Waterstop.

2.5 DOVETAIL ANCHORS

A. Dovetail anchors shall consist of 24 gage galvanized steel dovetail anchoring slots with filler strips and 16 gage galvanized dovetail anchors, unless otherwise noted on Drawings.

2.6 VAPOR RETARDER

A. Vapor retarder shall consist of a material having a permeance rating of 0.100 perm or less, when tested in accordance with ASTM E1745, and not less than ten mils thick.

2.7 PREFORMED EXPANSION JOINT FILLER

A. Asphalt impregnated premolded fiberboard expansion joint filler shall conform with ASTM D1751 and be 1/2-inch thick by full thickness of slab or joint, unless indicated otherwise on the Drawings.

1. Do not use asphalt impregnated joint filler in locations subject to liquid oxygen spillage.

2.8 CONSTRUCTION JOINTS

A. Provide key type steel forms by Vulcan screed joints, Burke Keyed Kold joint form or approved equal.

2.9 EMBEDDED PLATE ASSEMBLIES

A. Embedded steel plates, angles, and channels shall conform to ASTM A36, 36 ksi minimum yield strength, unless noted otherwise on the contract drawings.

B. Headed steel studs and their attachment to steel shall conform to the requirements of AWS D1.1.

C. Provide 3/4-inch diameter headed steel studs with 6-inch minimum embedment, unless noted otherwise.

D. Provide heat-resistant ceramic arc shields with studs.

PART 3 - EXECUTION

3.1 GENERAL

A. Erect formwork in accordance with ACI 301, ACI 318, and ACI 347.

B. Maintain formwork and shoring to support loads until such loads can be supported by concrete structure.

3.2 TOLERANCES

A. Finished work shall comply with ACI 117 tolerances.

B. Construct and align formwork for elevator hoistway in accordance with ASME A17.1.

3.3 SURFACE PREPARATION

A. For concrete exposed to view, seal form joints to prevent leakage.

B. 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.

3.4 CHAMFERS

A. Provide 3/4-inch chamfer at all formed corners.

B. Chamfers are not required for concrete tie-beams and tie-columns embedded in CMU walls.

3.5 FOUNDATION ELEMENTS

A. Form foundation elements if soil or other conditions are such that earth trench forms are unsuitable.

B. Sides of exterior grade beams, foundation walls, and turned-down slabs shall be formed.

C. Maintain minimum coverage of reinforcing steel as indicated on Structural Drawings.

3.6 EMBEDS

A. Set and secure embedded plates, bearing plates, and anchor bolts in accordance with approved setting drawings and in such a manner to prevent displacement during placement of concrete.

3.7 DOVETAILS

A. Install continuous vertical dovetail anchoring slots with filler strips at intersections of concrete and masonry walls unless indicated otherwise by the Drawings.

3.8 VAPOR RETARDER

A. Install Vapor Retarder to resist the transmission of water vapor through the exterior envelope.

B. Where indicated on Drawings, place vapor retarder over sewer and piping, but below conduits and ducts, and behind insulation and expansion joints at sidewalls.

C. Place, protect and repair vapor retarder in accordance with ASTM E1643. Lap vapor retarder six inches minimum at splices, sealing joints as required by the manufacturer with adhesive or pressure sensitive tape or both.

D. Do not puncture vapor retarder.

E. Vapor Retarder shall be installed above granular sub-base.

3.9 FORM REMOVAL

A. Remove forms carefully in such manner and at such time as to ensure complete safety of structure. Do not remove forms shoring, or reshoring until members have acquired sufficient strength to support their weight and the load thereon safely.

3.10 PROVISIONS FOR OTHER TRADES

A. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings and recesses from trades providing such items.

B. Accurately place and securely support items built into forms. Obtain approval for openings not shown on Drawings.

3.11 CLEANING

A. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed.

3.12 FORM SURFACES

A. Coat contact surfaces of forms with a formcoating compound before reinforcement is placed. Apply in accordance with manufacturer's recommendations. Rust-stained steel formwork is not acceptable.

3.13 CONSTRUCTION JOINTS

A. Provide construction joints in accordance with ACI 318.

B. Obtain Architect/Structural Engineer's prior approval for use and location of joints.

C. Unless noted otherwise on the structural drawings, provide 1-1/2 inch deep key type construction joints at end of each placement for slabs, beams, walls, and footings. Bevel forms for easy removal.

D. Remove loose particles and latency from surface prior to placing the next lift. Chip the surface to a depth sufficient to expose sound concrete.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

C. Section 031000 - Concrete Formwork.

D. Section 033000 - Cast-in-Place Concrete.

E. Section 042200 - Structural Concrete Masonry.

1.2 REFERENCES

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Standard Specifications for Structural Concrete.

C. ACI 315 - Details and Detailing of Concrete Reinforcement.

D. ACI 318 - Building Code Requirements for Structural Concrete.

E. ACI MNL-66 - ACI Detailing Manual.

F. ASTM A36 - Standard Specification for Carbon Structural Steel.

G. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

H. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

I. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

J. AWS D1.4 - Structural Weld Code - Reinforcing Steel.

K. CRSI (DA4) - Manual of Standard Practice.

L. CRSI (P1) - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Submit shop drawings as follows:

1. Notify Structural Engineer prior to detailing reinforcing steel shop drawings.

2. Indicate size, spacings, locations 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. Plans, details, and manufacturer data for splicers, headed shear stud reinforcement, and plate dowels as applicable to the project. Submit dowel adhesive unless already approved in the structural documents.

4. Written description of reinforcement without adequate sections, elevations, and details is not acceptable.

5. Reproduction of Structural Drawings for shop drawings is not permitted.

B. Submit, for information only, a certification from each manufacturer or supplier stating that materials meet the requirements of the ASTM and ACI standards referenced.

C. Submit, for information only, mill test reports.

D. Submit manufacturer's data for tensile and compressive splicers.

1.4 QUALITY ASSURANCE

A. Coordinate and schedule in a timely manner with the Structural Testing/Inspection Agency the following quality related items:

1. Verify reinforcing steel for quantity, size, location, and support.

2. Verify proper reinforcing steel concrete coverage.

1.5 STORAGE AND PROTECTING

A. Store reinforcing steel above ground so that it remains clean. Maintain steel surfaces free from materials and coatings which might impair bond.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deformed reinforcing steel shall conform to ASTM A615, refer to Structural Drawings for grade (Grade 60 minimum).

B. Welded steel wire fabric shall conform to ASTM A1064.

2.2 ACCESSORY MATERIALS

A. Annealed steel tie wire shall be 16 gage minimum.

B. Bar supports shall be 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.

2.3 SPLICERS

A. Tensile splicers shall be capable of developing 125% of the reinforcing steel ASTM specified minimum yield strength.

B. Compression splicers shall be the mechanical type such that the compression stress is transmitted by end bearing held in concentric contact.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate 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 by Structural Engineer and checked by Testing and Inspection Agency for cracks.

C. Weld only as indicated. Perform welding in accordance with AWS D12.1 and or AWS D1.4.

D. Tag reinforcing steel for easy identification.

3.2 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 fabric 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.

3.3 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 specifications.

3.4 DOWELS IN EXISTING CONCRETE

A. Install dowels and dowel adhesive in accordance with manufacturer’s recommendations.

B. Minimum embedment length shall be 12 bar diameters, unless noted otherwise.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes cast-in-place concrete work indicated in the Contract Documents or otherwise required for proper completion of the work.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

C. Section 031000 - Concrete Formwork.

D. Section 032000 - Concrete Reinforcement.

E. Section 036200 - Non-Shrink Grout.

F. Section 051200 - Structural Steel.

1.3 REFERENCES

A. ACI 117 - Specification for Tolerances for Concrete Construction.

B. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.

C. ACI 224.3R - Joints in Concrete Construction.

D. ACI 233R - Ground Granulated Blast-Furnace Slag as a Cementitious Constituent in Concrete.

E. ACI 301 - Specifications for Structural Concrete for Buildings.

F. ACI 302.1 - Guide for Concrete Floor and Slab Construction.

G. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.

H. ACI 305 - Guide to Hot Weather Concreting.

I. ACI 306 - Guide to Cold Weather Concreting.

J. ACI 308 - Standard Practice for Curing Concrete.

K. ACI 309 - Guide for Consolidation of Concrete.

L. ACI 318 - Building Code Requirements for Structural Concrete.

M. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

N. ASTM C33 - Standard Specification for Concrete Aggregates.

O. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

P. ASTM C78 - 08 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).

Q. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

R. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

S. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

T. ASTM C150 - Standard Specification for Portland Cement.

U. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

V. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

W. ASTM C230 - Standard Specification for Flow Table or Use in Tests of Hydraulic Cement.

X. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

Y. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

Z. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

AA. ASTM C495 - Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.

BB. ASTM C618 - Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

CC. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.

DD. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

EE. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.4 NOTICE

A. Notify Architect/Structural Engineer and Structural Testing/Inspection Agency not less than 48 hours prior to placing concrete.

1.5 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Examine concrete in truck to verify that concrete appears properly mixed.

2. Perform a slump test as deemed necessary for each concrete load. Record if water or admixtures are added to the concrete at the job site. Perform additional slump tests after job site adjustments.

3. Casting and curing of test specimens shall be in accordance with ASTM C31.

4. Mold specimen sets for compressive strength testing in accordance with below table. Mold one set for each 75 cubic yards of each mix design placed in any one day. At a minimum, one set of specimens must be taken every day and one set for every 5,000 square feet of surface area for slabs or walls. For each set molded, record:

   a. Slump
   b. Air content
   c. Unit weight
   d. Temperature, ambient and concrete
   e. Location of placement
   f. Any pertinent information, such as addition of water, addition of admixtures, etc.

   Perform cylinder breaks in accordance with below table. The spare cylinders are to be broken as directed by the Structural Engineer if compressive strength does not appear adequate. The average of the concrete cylinders broken at either 28 days (for 28 day specified concrete) or 56 days (for 56 day specified concrete) shall be used to verify that the concrete has obtained the specified strength. For post-tensioned (P.T.) concrete, the average of the two cylinders broken prior to stressing shall be used to verify that the concrete has obtained the specified strength. 56-day concrete that is used for concrete column puddle applications in Post-Tensioned floor concrete shall be tested in accordance with the 56 day table with P.T. indicated as yes.

   The strength level shall be considered satisfactory for a class of concrete if both of the following are met: Every average of any three consecutive tests equals or exceeds f'c AND no strength test falls below f'c by more than 500 psi (or by more than 0.10 f'c when f'c is more than 5,000 psi). Tests shall be as defined in Chapter 26 of ACI318-14.

Strength Age	P.T.	Cylinder Size	No. Cylinders & Test Age
28 Days	No	6x12	1@ 7 Days 2 @ 28 Days 1 Spare
28 Days	No	4x8	1@ 7 Days 3 @ 28 Days 2 Spare
28 Days	Yes	6x12	2@ Stressing (note 1) 2 @ 28 Days 1 Spare
28 Days	Yes	4x8	2@ Stressing (note 1) 3 @ 28 Days 2 Spare
56 Days	No	6x12	1@ 7 Days 1@ 14 Days 2 @ 28 Days 2 @ 56 Days 1 Spare
56 Days	No	4x8	1@ 7 Days 1@ 14 Days 2 @ 28 Days 3 @ 56 Days 2 Spare
56 Days	Yes	6x12	2@ Stressing (note 1) 2 @ 28 Days 2 @ 56 Days 1 Spare
56 Days	Yes	4x8	2@ Stressing (note 1) 2 @ 28 Days 3 @ 56 Days 2 Spare

note 1: field cured cylinders.

5. Report in writing, as directed by the Architect/Structural Engineer, on the same day that tests are performed. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing agency, concrete design compressive strength, location of concrete placement in structure, concrete mix proportions and materials, compressive breaking strength and type of break.

B. The ready-mixed concrete plant shall be certified for conformance with the requirements of the State Department of Transportation or the National Ready Mix Concrete Association.

1.6 EXPOSURE CATEGORIES AND CLASSES

A. Concrete elements are classified by exposure in accordance with Table 19.3.1.1 of ACI 318-14. Refer to drawings for classes and strengths of concrete required.

1.7 CONCRETE MIX DESIGN

A. Establish concrete mix design proportions in accordance with ACI 318-14, Chapter 19 and 26.

B. Submit concrete mix designs. Include the following:

1. Type and quantities of materials.

2. Slump.

3. Air content.

4. Fresh unit weight.

5. Aggregates sieve analysis.

6. Design compressive strength.

7. Location of placement in structure.

8. Method of placement.

9. Method of curing.

10. Expected minimum strengths of the concrete at the specified testing frequencies (7, 14, 28, 56 days) noted in section 1.5 A 4.

C. Concrete supplier shall submit certifications that the materials used meet applicable ASTM Specifications. Mix designs not conforming to the above will be rejected.

1.8 SLUMP

A. Design concrete with a maximum slump of five inches.

B. If a slump greater than five inches is desired it shall be achieved with a high-range water reducer. The maximum slump after high-range water reducers are added shall be eight inches.

1.9 FRESH UNIT WEIGHT

A. Normal weight concrete shall have a fresh unit weight of 140 to 152 pcf.

1.10 AIR CONTENT

A. Tolerance

1. Air content includes both entrained and entrapped air and shall be within +/- 1.5% of the values indicated below.

B. Normal Weight Concrete

1. Normal weight concrete does not require any air content unless the concrete is in Exposure Class F1, F2, or F3.

2. Normal weight concrete in Exposure Class F1, F2, or F3 shall have air content in accordance with Section 19.3.3.1 of ACI318-14.

1.11 WATER/CEMENT RATIO

A. Concrete elements are classified by exposure in accordance with Table 19.3.1.1 of ACI 318-14. See Structural Notes for specific classifications and associated Water/Cement Ratios for the subject project.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials designated by specific manufacturer's trade names are approved, subject to compliance with the quality and performance indicated by the manufacturer. Instructions and specifications published by the manufacturer of such materials are included in and are a part of these specifications. Upon request, provide certification from manufacturer or supplier that materials designated by reference to ASTM and ACI standards meet the requirements of these standards.

2.2 CONCRETE STRENGTH

A. Provide concrete strengths indicated on the Structural Drawings.

2.3 CEMENT

A. Portland cement shall conform to ASTM C150. Use one brand only.

B. For concrete in Exposure Class S0, use Type I, unless noted otherwise.

C. For concrete in Exposure Class S1, use Type II with moderate sulfate resistance, unless noted otherwise.

D. For concrete in Exposure Class S2, use Type V, unless noted otherwise.

E. For concrete in Exposure Class S3, use Type V combined with either pozzolan or slag, unless noted otherwise.

F. In mass concrete, use Type IV or II, unless noted otherwise.

2.4 AGGREGATE

A. Fine aggregate shall conform to ASTM C33.

B. Coarse aggregate of gravel or crushed stone shall conform to ASTM C33. Size coarse aggregate in accordance with ACI 318 and within the limitations set forth in the Structural Drawings.

C. See Structural Drawings for specific classifications and associated maximum aggregate size for the subject project.

2.5 WATER

A. Water shall be potable and free of deleterious substances in accordance with ACI 318.

2.6 AIR ENTRAINING AGENT

A. Air entraining agent shall conform to ASTM C260.

2.7 WATER REDUCER

A. Water reducing agent shall conform to ASTM C494.

2.8 HIGH-RANGE WATER REDUCER

A. High-range water reducers (superplasticizers) shall conform to ASTM C494.

2.9 CURING COMPOUND

A. An acrylic, water based, “odorless” cure compound may be used at the Contractor's option in accordance with ASTM C309 or ASTM C1315, and in compliance with these specifications.

2.10 FLY ASH

A. Fly ash shall be Class F fly ash with a loss on ignition of less than five percent or Class C fly ash with a loss on ignition of less than one percent in accordance with ASTM C618.

B. Maximum fly ash content shall be limited to 20% of the total cementitious material weight.

2.11 GROUND GRANULATED BLAST-FURNACE SLAG (GGBFS)

A. Ground Granulated Blast-Furnace Slag (GGBFS) shall conform to ASTM C989 and ACI 233.

B. Maximum GGBFS content shall be limited to 50% of the total cementitious material weight. Maximum total combined GGBFS plus Fly ash shall be limited to 50% of the total cementitious material weight.

2.12 SILICA FUME

A. Silica Fume shall conform to ASTM C1240.

B. Maximum Silica Fume content shall be limited to 10% of the total cementitious material weight. Maximum total combined Silica Fume, GGBFS, and Fly ash shall be limited to 50% of the total cementitious material weight.

2.13 ACCELERATORS

A. Non-chloride accelerators shall conform to ASTM C494.

2.14 RETARDERS

A. Retarders shall conform to ASTM C494.

2.15 PENETRATING SEALER

A. Penetrating sealer (silane, siloxane) shall have a minimum of 40 percent solids and a warranty of at least five years.

2.16 CONTRACTION JOINT SEALANT

A. Semi-rigid, epoxy joint filler. Sealer must be compatible with Division 9 flooring installation preparation.

2.17 FLOOR OVERLAY

A. A cementitious based overlay product that protects the concrete slab against tracked vehicles. Hardeners shall be either UCrete supplied by BASF, Super Euco Top supplied by Euclid Chemical Company, or approved equal.

2.18 CALCIUM CHLORIDE AND CHLORIDE ION CONTENT

A. Calcium chloride or admixtures containing more than 0.5% chloride ions by weight of the admixture are not permitted.

B. The maximum water soluble chloride ion concentration in hardened concrete at ages from 28 to 42 days contributed from all ingredients including water, aggregates, cementitious materials, and admixtures shall not exceed the limits specified in Table 19.3.2.1 of ACI 318-14. Water-soluble chloride ion tests shall conform to ASTM C 1218. One test shall be run for each class of concrete before the mix design submittal and each time a change is made to the mix design (such as change in aggregate type or source).

C. The Concrete Supplier shall certify on the Mix Design Submittal Form that the chloride ion content in all concrete mix designs used on the project does not exceed the limits stated above.

PART 3 - EXECUTION

3.1 HIGH-RANGE WATER REDUCERS

A. High-range 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 high-range water reducers are added. Do not permit fresh concrete containing superplasticizers to come in contact with fresh concrete not containing superplasticizers.

3.2 COARSE LIGHTWEIGHT AGGREGATE

A. Presoak coarse lightweight aggregate prior to batching. Maintain the moisture content indicated by the five day saturated weight.

3.3 ADDITION OF WATER AT JOB SITE

A. Water may be added to the batch only if neither the maximum permissible water/cement ratio nor the maximum slump is exceeded.

B. The superintendent or his designated representative may only add water to the concrete batch if the batching plant has noted on the trip ticket the maximum amount of water that may be added on site.

3.4 PLACEMENT OF CONCRETE

A. Deposit concrete as near as practical to final position. Maximum free fall shall be six feet.

B. Do no flowing of concrete with vibrators.

C. Place floors and slabs in accordance with ACI 302.

D. Place thickened slabs for partitions integral with floor slabs.

3.5 TIME LIMIT

A. Deposit concrete within one and one-half hours after batching.

3.6 VIBRATION

A. Consolidate concrete in accordance with ACI 301 and ACI 309.

3.7 CURING

A. Begin curing procedures immediately following the commencement of the finishing operation.

B. Cure concrete in accordance with ACI 308. Keep the concrete surface moist. Moist cure slabs with a clear, polyethylene vapor barrier to maintain a moist surface. Do not over wet concrete surface. For vertical surfaces, elevated slabs, and slabs on grade that do not receive a finished floor an acrylic curing compound is used, apply in accordance with manufacturer's recommendations to surfaces of concrete not protected for five days by formwork. Do not use curing compounds in areas to receive material that does not adhere to concrete cured with a curing compound unless the curing compound is water soluble.

3.8 SLAB ON GROUND

A. Concrete used in slabs on ground shall exhibit ultimate shrinkage strain no more than 0.05 percent. If tests were required to meet this criteria, concrete shrinkage tests shall be performed in accordance with ASTM C 157 on specimens moist-cured for one day. Tests shall be performed by an ACI certified technician in an ACI certified laboratory.

3.9 ENVIRONMENTAL PROVISIONS

A. Perform cold weather concreting in accordance with ACI 306.

B. Perform hot weather concreting in accordance with ACI 305.

C. Protect concrete from drying and excessive temperature for the first seven days.

D. Protect fresh concrete from wind.

3.10 CONTRACTION JOINTS

A. Obtain Architect/Structural Engineer's approval for location of contraction joints.

B. Do not place contraction joints in framed floors or composite slabs.

C. Place contraction joints in slabs-on-grade as indicated on the Drawings.

D. Provide contraction joints in concrete walls at approximately 20-foot centers; coordinate location with Architect and Engineer. Contraction joints shall be formed as a **V**-groove on both faces of the wall, 3/4-inch minimum depth.

E. Provide a handtooled **V-**shaped contraction joint, 1-inch deep, 1/2-inch wide at the top, with a 1/8-inch radius edge at the driving surface over each precast double tee flange joint. Fill joint with a joint sealant to provide watertightness.

F. 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. Coordinate sealant installation with the application of the flooring and Division 9 specifications.

3.11 CUTTING CONCRETE

A. Obtain Architect/Structural Engineer's written approval prior to cutting concrete for installation of other work.

3.12 PATCHWORK AND REPAIRS

A. Notify Architect/Structural Engineer of any defective areas in concrete to be patched or repaired. Repair and patch defective areas with non-shrink grout. Cut out defective areas over two inches in diameter to solid concrete, but not less than a depth of one inch. Make edges of cuts perpendicular to the concrete surface.

3.13 DEFICIENT CONCRETE COMPRESSIVE STRENGTH

A. In the event that concrete tests indicate a 3-day, 7-day, or 28-day strength below that which was expected or specified, the Contractor with the agreement of the Architect/Engineer shall have the mix adjusted so that subsequent concrete will comply with the minimum strength requirements. The Owner may require core specimens to be taken and tested, at the Contractor’s expense. If core tests fall below minimum requirements, as determined by the Architect/Engineer, the concrete in place will be deemed to be defective. This concrete shall be removed and replaced or strengthened in a manner acceptable to the Owner and Architect/ Engineer, at the Contractor’s expense. Any demolition or repair of other materials or systems as a result of repair or replacement of defective concrete shall be at the Contractor’s expense.

END OF SECTION 033000

SECTION 034100 - PRECAST CONCRETE STRUCTURAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes performance requirements, design criteria, material specifications, and related information pertaining to the design and construction of precast concrete structural systems and constituent elements.

B. This is a performance based specification: the Design/Build Contractor will be responsible for all aspects of the design, fabrication, and erection of precast concrete structural systems described in the design intent documents.

C. Design intent documents are schematic in nature and are an outline of criteria and performance requirements.

1. These performance specifications are intended to establish minimum conditions for the design of precast structural systems, minimum material qualities, and minimum performance requirements.

2. The Project Structural Engineer will review the design and periodically observe the construction to verify that the design intent is achieved. Review of the precast structural system design by the Project Structural Engineer does not relieve the Precast Engineer of Record of responsibility for ensuring that the design conforms to the requirements of the design intent documents, the governing building code, and all relevant state laws and local ordinances.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

1.3 REFERENCES

Referenced standards refer to the latest revision adopted at the time of bid or the revision adopted by reference into the governing building code.

A. American Association of State Highway and Transportation Officials (AASHTO)

1. Standard Specifications for Highway Bridges.

B. American Concrete Institute (ACI)

1. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.

2. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

3. ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

4. ACI 301, Standard Specifications for Structural Concrete.

5. ACI 302.1R, Guide for Concrete Floor and Slab Construction.

6. ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete.

7. ACI 305R, Hot Weather Concreting.

8. ACI 306R, Cold Weather Concreting.

9. ACI 318/318R, Building Code Requirements for Reinforced Concrete and Commentary.

10. ACI 362.1R, Guide for the Design of Durable Parking Structures.

11. ACI 550R, Design Recommendations for Precast Concrete Structures.

C. American Society for Testing and Materials (ASTM)

1. ASTM A 36, Standard Specification for Carbon Structural Steel.

2. ASTM A 47, Standard Specification for Ferritic Malleable Iron Castings.

3. ASTM A 53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

4. ASTM A 82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

5. ASTM A 123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A 153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. ASTM A 185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

8. ASTM A 283, Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

9. ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

10. ASTM A 325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/125 ksi Minimum Tensile Strength.

11. ASTM A 416, Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.

12. ASTM A 490, Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.

13. ASTM A 496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.

14. ASTM A 497, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.

15. ASTM A 500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

16. ASTM A 501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

17. ASTM A 572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

18. ASTM A 615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

19. ASTM A 666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

20. ASTM A 706, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

21. ASTM A 767, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

22. ASTM A 775, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

23. ASTM A 884, Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

24. ASTM A 992, Standard Specification for Steel for Structural Shapes For Use in Building Framing.

25. ASTM B 633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

26. ASTM B 695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

27. ASTM C 33, Standard Specification for Concrete Aggregates.

28. ASTM C 42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

29. ASTM C 150, Standard Specification for Portland Cement.

30. ASTM C 260, Standard Specification for Air-Entraining Admixtures for Concrete.

31. ASTM C 330, Standard Specification for Lightweight Aggregates for Structural Concrete.

32. ASTM C 404, Standard Specifications for Aggregates for Masonry Grout.

33. ASTM C 494, Standard Specification for Chemical Admixtures for Concrete.

34. ASTM C 567, Standard Test Method for Density of Structural Lightweight Concrete.

35. ASTM C 618, Standard Specification for Coal Fly Ash and Raw Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

36. ASTM C 881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

37. ASTM C 989, Standard Specification for Ground Blast-Furnace Slag for Use in Concrete and Mortars.

38. ASTM C 1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

39. ASTM C 1240, Standard Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout.

40. ASTM F 436, Standard Specification for Hardened Steel Washers.

D. American Welding Society (AWS)

1. AWS D1.1, Structural Welding Code: Steel.

2. AWS D1.4, Structural Welding Code: Reinforcing Steel.

E. Concrete Steel Reinforcing Institute (CRSI)

1. Manual of Standard Practice.

F. Precast/Prestressed Concrete Institute (PCI)

1. PCI MNL-116, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products.

2. PCI MNL-117, Manual for Quality Control for Plants and Production of Precast Architectural Precast Concrete.

3. PCI MNL-120, Design Handbook: Precast and Prestressed Concrete.

4. PCI MNL-123, Manual on Design and Typical Details of Connections for Precast Prestressed Concrete.

5. PCI MNL-127, Erectors' Manual: Standards and Guidelines for the Erection of Precast Concrete Products.

6. PCI MNL-129, Precast Prestressed Parking Structures: Recommended Practice for Design and Construction.

7. PCI MNL-135, Tolerance Manual for Precast and Prestressed Concrete Construction.

1.4 DEFINITIONS

A. Terms used in this section are as defined in the references.

1.5 PERFORMANCE RESPONSIBILITY

A. Precast Concrete Structural Systems:

1. Provide all necessary material, equipment, labor, and engineering services, required to design and build the precast concrete structural systems in accordance with the criteria and standards identified in the design intent documents.

2. Provide completed precast structural systems that meet the performance requirements, possesses the physical and aesthetic characteristics, and achieve the functionality set forth in the design intent documents.

3. Design the precast structural systems in accordance with the design criteria set forth in the design intent documents. Employ and pay for a Precast Structural Engineer of Record

to provide required structural design services relating to the precast structural systems. The Precast Structural Engineer of Record will be responsible for the design of the precast concrete structural systems, components, and connections, including design of the foundation anchorages.

1.6 PERFORMANCE REQUIREMENTS

A. Precast structural systems and elements shall conform to all relevant provisions of the governing building code, the design references, and this section.

B. Precast structural systems and elements shall be designed to resist the design loads without signs of distress or excessive deflection. Deflection of precast structural members supporting architectural elements shall not exceed the recommendations of the limiting component manufacturer. The deflection of precast structural elements supporting brick shall be limited to L/600 of the clear span but not more than 0.3 in. under the combined superimposed dead and live loads.

C. Precast structural systems and elements shall not exhibit excessive or physically disturbing vibrations during routine use.

D. Precast structural systems shall accommodate anticipated movements without distress to elements, connections, or jointing material.

E. Precast structural systems and elements shall be designed to resist deterioration due to the prevailing climate at the project location.

F. Structural design and details shall conform to the physical and aesthetic requirements set forth in the design intent documents.

G. Structural design and details shall support the functional design of the completed structure as detailed in the design intent documents.

1.7 DESIGN CRITERIA

A. Design Loads:

1. Gravity and lateral loads shall be derived in accordance with the procedures and requirements of the applicable building code, the recommendations of the design references, and industry recognized standards. The design loads shall meet or exceed any loading requirements specified in the design intent documents.

2. Seismic design coefficients shall be as specified in the design intent documents.

3. Loads and load effects from handling, storage, transportation and erection shall be considered in the design of the precast elements.

B. The structural lateral load resisting system and constituent elements shall be designed and detailed to resist the design lateral forces in accordance with the requirements of the governing building code, the references, and current industry practices. The lateral deflection of precast structural systems due to service level wind loads shall be limited to h/400, where h is the height of the structure.

C. The structural systems, constituent elements, and connections shall be designed to resist the gravity and lateral loads, in accordance with the requirements of the governing building code, the references, and recognized industry standards, without impacting the serviceability or functionality of the structure.

D. Precast structural systems, constituent elements, and connections supporting mechanical equipment shall be designed to meet the minimum design criteria of this specification and any specific requirements of the equipment manufacturer or supplier.

E. Structural analysis and design methodologies, models, and procedures shall conform to the requirements of the governing building code, the recommendations of the references, and recognized industry standards. Structural system and component models, sub-models, and assumptions, utilized for analysis and design, shall form a logically consistent and compatible system for the transfer of gravity and lateral loads to the foundation elements. Analysis and design assumptions shall be applied consistently and uniformly throughout the entire structure.

1.8 QUALITY ASSURANCE

A. Fabricator (Manufacturer) Qualifications

1. Fabricator shall have a minimum of five years of successful experience in the fabrication of precast units of quality and scope required on this project. Fabricating plant shall engage primarily in the manufacturing of similar precast concrete units.

2. The precast concrete manufacturing plant shall be certified by the Prestressed Concrete Institute Plant Certification Program in product group C and Category C4. Manufacturer shall submit proof of certification prior to the start of production.

3. Fabricator not certified by the Prestressed Concrete Institute Plant Certification Program in product group C and category C4 shall, at his expense, meet the following requirements:

a. Retain an independent testing or consulting firm approved by the Architect/Project Structural Engineer and Owner to inspect production.

b. The basis of inspection shall be PCI MNL-116.

c. The independent testing or consulting firm shall inspect the precast plant at two-week intervals during production and issue a report, signed by a registered Professional Engineer, verifying that materials, methods, products, and quality control meet the requirements of the specifications, drawings, and MNL-116.

d. Products manufactured during any period of non-compliance to the stated requirements shall, at manufacturer's expense, be inspected by the Owner's agent. These products shall be subject to replacement at the manufacturer's expense.

B. Erector Qualifications

1. Erector shall have a minimum of five years successful experience in erecting precast concrete structural systems similar in material, design, and extent to the requirements of this Project and with a record of in-service performance.

C. Precast Structural Engineer of Record

1. Design of precast concrete structural systems, elements, and connections shall be performed by a qualified Engineer licensed in the project State.

2. The Precast Structural Engineer of Record shall be experienced in the design and installation of precast, prestressed concrete units for projects of a similar size and scope, as evidenced by at least 5 years of applicable experience and the completion of at least 10 similar projects.

D. Design Standards

Comply with the Following:

1. ACI 301, Standard Specifications for Structural Concrete.

2. ACI 318/318R, Building Code Requirements for Reinforced Concrete and Commentary.

3. ACI-550R, Design Recommendations for Precast Concrete Structures.

4. MNL-120, PCI Design Handbook: Precast and Prestressed Concrete.

5. MNL-129, Precast Prestressed Parking Structures: Recommended Practice for Design and Construction (if applicable).

E. Fabrication and Erection

1. Comply with the requirements of PCI MNL-116 including, manufacturing procedures and testing requirements, quality control recommendations, and dimensional tolerances for types of units required.

2. Coordinate and schedule, in a timely manner with the Owner's Testing and Inspection Agency, inspection of fabrication and erection of the precast prestressed concrete units.

3. Execute work in accordance with local, state, and federal regulations, codes, and the requirements of regulatory agencies having jurisdiction over the work.

4. Comply with applicable provisions of AWS D1.1 and AWS D1.4.

1.9 SUBMITTALS

A. Submit structural drawings, stamped and sealed by the Precast Engineer of Record, showing, in sufficient scale and detail, all information necessary for the construction of the precast concrete structural system, including: member locations, sizes, tolerances, reinforcing, and connections.

B. Submit a certification letter, stamped and sealed by the Precast Engineer of Record that the design of the precast concrete structural system conforms to the requirements of this section.

C. Submit design calculations, stamped and sealed by the Precast Engineer of Record.

D. Submit column loads and any other necessary foundation design information, in a timely manner, to the Architect/Project Structural Engineer. The Project Structural Engineer will be paid by the Owner and will be responsible for the foundation and retaining wall design. Design of anchor bolts and embedded connection plates shall be the responsibility of the Precast Structural Engineer of Record; coordinate any special requirements with the Project Structural Engineer.

E. Shop Drawings:

1. Shop drawings shall be signed and sealed by a registered structural engineer licensed in the State in which the project is located.

2. Shop drawings shall be complete and shall include a layout plan, fabrication details, estimated camber, connections and anchorage details, and member identification marks. The identification marks shall appear on the manufactured units to facilitate correct field placement.

3. Shop drawings shall provide design and details of lifting devices, embedments, and related reinforcement required to resist temporary loads from handling, storage,

transportation and erection. The design of these items is delegated to the Precast Engineer of Record.

4. Shop drawings shall illustrate all temporary erection connections, bracing and shoring as well as sequencing of the removal of these items. The responsibility for means and methods of construction shall remain with the Design/Build Contractor.

5. Original design intent/construction documents shall not be duplicated for use as shop drawings.

F. Design Calculations:

1. The fabrication plant shall employ a full-time in-house structural engineer, registered in the State in which the project is located, who shall have at least two (2) years experience in the design, fabrication, and erection of the prestressed concrete structural members of the type and scope required on the project. Design calculations shall be furnished to the Architect/Project Structural Engineer along with the shop drawings.

G. Submit concrete mix designs including aggregate analysis and confirmation cylinders to the Architect/Project Structural Engineer.

H. Submit concrete test reports to the Architect/Project Structural Engineer. Concrete test reports shall be complete and show all information required by PCI MNL-116.

I. Submit tensioning records, concrete records, and calibration records for jacking equipment to the Architect/Project Structural Engineer.

PART 2 - PRODUCTS

2.1 PRECAST PRESTRESSED UNITS

A. Furnish precast prestressed units in accordance with PCI MNL-116.

B. Design units according to referenced design standards.

C. Minimum depth of precast, prestressed double tees used in parking garages shall be 28 inches.

D. Precast prestressed units used as floor members in parking garages shall receive a field topping in accordance with the recommendations of PCI MNL-129. Minimum topping thickness to be 2 in. or as governed by fire ratings or other requirements.

2.2 FORMWORK

A. Provide forms and, where required, form facing materials of metal, plastic, wood, or another acceptable material that is non-reactive with concrete and will produce the required surface finish.

2.3 REINFORCING MATERIALS

A. All bars used as reinforcement and wire shall conform to the requirements of ACI 301 and ACI 318.

B. Comply with the following minimum material qualities

1. Bars:

a. Deformed billet-steel: ASTM A 615.

b. Deformed low-alloy steel: ASTM A 706.

c. Galvanized reinforcing bars: ASTM A 767.

d. Epoxy coated reinforcing bars: ASTM A 775.

2. Wire:

a. Plain: ASTM A 82.

b. Deformed: ASTM A 496.

3. Welded Wire Fabric:

a. Welded plain steel: ASTM A 185.

b. Welded deformed steel: ASTM A 497.

4. Coatings:

a. Epoxy bars: ASTM A 775.

b. Galvanized bars: ASTM A 767.

c. Epoxy welded wire reinforcement: ASTM A 884.

C. Supports for Reinforcement:

1. Provide supports for reinforcement, including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing, complying with the CRSI “Manual of Standard Practice”.

2. For concrete surfaces exposed to view, where legs of supports are in contact with forms, provide supports with legs that are protected with plastic (CRSI, Class I) or stainless steel (CRSI Class II).

2.4 PRESTRESSING TENDONS

A. Comply with the following minimum material qualities:

1. Uncoated, seven-wire strand: ASTM A 416, Grade 250 or 270.

2.5 CONCRETE MATERIALS

A. All material used in structural concrete, including cementitious material, cementitious or pozzolanic mineral admixtures, aggregates, water and ice, and admixtures, shall conform to the requirements of ACI 301 and ACI 318.

B. Comply with the following minimum material qualities:

1. Portland cement: ASTM C 150- Type I or III.

2. Other cementitious materials:

a. Fly ash or natural pozzolans: ASTM C 618.

b. Ground granulated blast furnace slag: ASTM C 989.

c. Silica Fume: ASTM C 1240.

3. Admixtures:

a. Air-entraining admixtures: ASTM C 260.

b. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C 494 or C 1017.

c. Calcium Chloride or admixtures containing chlorides shall not be used.

4. Aggregates: ASTM C 33 or C 330.

5. Water: Water shall be potable and free of substance deleterious to concrete or reinforcement.

2.6 CONNECTION MATERIALS AND FINISHES

A. Comply with the following minimum material qualities:

1. Miscellaneous channels, angles, plates and bars: ASTM A 36, Grade 36.

2. Structural steel; W, S, M, HP Shapes and Tees: ASTM A 992 or ASTM A 572, Grade 50.

3. Square or Rectangular hollow structural steel (HSS) sections: ASTM A 500, Grade B.

4. Round hollow structural steel (HSS) sections: ASTM A 501, 36 ksi minimum yield strength; or ASTM A 53, Grade B, 35 ksi minimum yield strength.

5. Malleable iron castings: ASTM A 47.

6. Stainless steel: ASTM A 666, type 304.

7. Carbon steel plate: ASTM A 283.

8. Anchor rods: ASTM A 307, Grade A: or ASTM A 36.

9. Fasteners: ASTM A 307, Grade A.

10. High strength fasteners: ASTM A 325 or ASTM A 490.

11. Hardened steel washers: ASTM F 436.

12. Welded headed studs: AWS D1.1, Type B.

13. Welding electrodes: Comply with AWS standards.

B. Expansion anchors shall be Hilt Kwik Bolt anchors supplied by Hilti Fastening Systems, Trubolt Wedge Anchors supplied by ITW Ramset/Red Head, Power-Stud anchors manufactured by Powers Fastening, or approved equal.

C. Adhesive anchors shall consist of:

1. An all-thread steel anchor conforming to A 307, Grade A or ASTM A 36, zinc plated in accordance with ASTM B 633.

2. An adhesive conforming to HIT HY150 injection adhesive supplied by Hilti Fastening Systems EPCON System Ceramic 6 epoxy adhesive supplied by ITW Ramset/Red Head, Power-Fast epoxy injection gel supplied by Powers Fastening, or approved equal.

D. Accessories: Provide all clips, hangers, shims, and other accessories required for installation of precast concrete units and for support of subsequent construction or finishes.

E. All steel connections shall be comprised of stainless steel components or have a galvanized finish in accordance with this specification.

F. Hot-dipped galvanized finish for steel: Zinc coating by the hot-dip process, complying with the following requirements:

1. Rolled, pressed, and forged shapes, plates, and bars: ASTM A 123.

2. Bolts, nuts, washers, and other steel hardware: ASTM A 153.

3. Expansion or adhesive anchors: ASTM B 695, Class 65, Type I.

G. Galvanizing repair paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.7 BEARING PADS

A. Comply with the following minimum material qualities:

1. Elastomeric: AASHTO-grade chloroprene (neoprene) pads conforming to Division II, Sect. 18. AASHTO “Standard Specifications for Highway Bridges, Division II, Sect. 18.

2. Random oriented fiber (ROF) reinforced: Random oriented fiber and rubber composition pads capable of supporting a compressive stress of 3000 psi with no cracking, splitting or delaminating in the internal portions of the pads; such as “MASTICORD” by JVI, Inc. or equivalent. Minimum thickness to be ½” or as required by design, whichever is greater.

3. Duck layer reinforced: Conform to Division II, Sect. 18.10.2 of AASHTO, “Standard Specifications for Highway Bridges” or Military Specification MIL-C-882D.

4. Tetrafluoroethylene (TFE): Reinforced with glass fibers and applied to stainless or structural steel plates; such as type CSA or type CSB “Con-Slide Slide Bearings” manufactured by Con-Slide Support Bearing Systems, or equivalent.

5. Plastic: Multi-monomer, plastic strips shall be non-leaching and capable of supporting construction loads with no visible overall expansion.

2.8 GROUT

A. Comply with the following minimum material qualities

1. Cement grout: Portland cement and sand conforming to ASTM C 150 Type I and ASTM C 404, respectively, and water sufficient for placement and hydration.

2. Non-shrink grout: Premixed, packaged ferrous and non-ferrous aggregate shrink-resistant grout.

3. Epoxy-resin grout: Two component mineral-filled epoxy-resin conforming to ASTM C 881 or FS MMM-A-001993.

2.9 CURING MATERIALS

A. Comply with the following minimum material qualities:

1. Liquid Membrane Forming Curing Compounds: ASTM C 309.

2.10 CONCRETE MIXES

A. All structural concrete mixes shall conform to the requirements of ACI 301 and ACI 318/318R.

B. Prepare design mixes for each type of concrete required. Limit fly ash or other pozzolans and silica fume to no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

C. Design mixes shall be prepared by a qualified independent testing agency or by the fabricator.

D. Normal-Weight Concrete:

1. Proportion mixes by either laboratory trial batch or field test data methods, in accordance with ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:

a. 28 day compressive strength: As required by the design, but not less than 4500 psi.

b. Maximum water-cement ratio (measured at point of placement): 0.45.

c. Maximum water-cementitious materials ratio (measured at point of placement: 0.45.

d. Air content as recommended by ACI 211.1 for moderate exposure.

E. Lightweight Concrete:

1. Proportion mixes by either laboratory trial batch or field test data methods, according to ACI 211.2 and ACI 301 to provide lightweight concrete with the following properties:

a. 28 Day compressive strength: As required by the design, but not less than 4500 psi.

b. Air-dry unit weight not exceeding 115 lb/cu. ft. as determined by ASTM C 567.

c. Air content as recommended by ACI 211.2 for moderate exposure.

PART 3 - EXECUTION

3.1 FABRICATION

A. Manufacturing procedures shall be in compliance with PCI MNL 116.

B. Camber:

1. The fabricator shall verify, by computations, the camber to be expected and shall provide calculations of the approximate magnitude of the expected in-serviced deflections.

C. Transfer of Prestress:

1. Prior to transfer, the concrete shall attain adequate strength to control stresses at release, but not less than 70 percent of the design strength, determined by test cylinders.

D. Reinforcement:

1. Comply with the requirements of the CRSI Manual of Standard Practice for fabricating, placing, and supporting reinforcement.

E. Concrete Placement:

1. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast units. In general, comply with the requirements of ACI 304.

2. Comply with ACI 306R for cold weather concrete placement.

3. Comply with ACI 305R for hot weather concrete placement.

F. Openings:

1. The manufacturer shall provide for all openings 10 in. round or square or larger. Smaller openings may be field drilled or cut after the precast, prestressed concrete products have been erected. Openings shall be approved by the Architect/Project Structural Engineer prior to drilling or cutting.

G. Patching:

1. Patching shall be acceptable provided that the structural adequacy of the product and the appearance are not impaired.

H. Fasteners:

1. Manufacturer shall cast in structural inserts, bolts and plates as detailed or required.

I. Tolerances:

1. Provide units with tolerances in general compliance with ACI 117 and within the limits recommended in PCI MNL-116 and 120.

J. Finishes

1. Finish concrete in accordance with ACI 301 and the finishes listed below, unless specified otherwise.

2. Standard Underside: Resulting from casting against approved forms using good industry practice in cleaning of forms, design of concrete mix, placing and curing. Small surface holes caused by air bubbles, normal color variations, normal form joint marks, and minor chips and spalls shall be tolerated, but no major or unsightly imperfections, honeycomb, or other defects shall be permitted.

3. Standard Top: Resulting from vibrating screed and additional hand finishing at projections. Normal color variations, minor indentations, minor chips and spalls shall be permitted. No major imperfections, honeycomb, or defects shall be permitted.

4. Vertical Ends: When exposed to view, strands shall be recessed a minimum ½ in., the holes filled with grout and the ends of the member shall receive sacked finish.

5. Coordinate finish of units exposed to view with Architect.

6. Roughen surfaces of precast units specified to receive composite toppings by transversely raking or brooming.

7. Where ends of strands will not be enclosed or covered, cut strands flush and cover with a high strength mortar bonded to unit with epoxy-resin bonding agent.

8. Include cast-in weld plates where required.

K. Quality Control

1. Comply with the requirements of PCI MNL-116, including, manufacturing procedures and testing requirements, quality control recommendations, and dimensional tolerances for types of units required.

2. The Owner may employ an independent testing and inspection agency to evaluate the precast fabricator's quality control and testing procedures. Allow the Owner's testing and inspection agency access to material storage areas, concrete production equipment, and concrete placement and curing facilities. Coordinate with Owner's testing and inspection agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

3. Deficiencies:

a. Strength of precast concrete units will be considered potentially deficient when precast concrete units fail to comply with requirements, including:

1. Concrete test strength fails to meet compressive strength requirements.

2. Reinforcement or prestressing tendons do not conform to requirements.

3. Concrete curing does not conform to requirements or precast units are inadequately protected against extremes.

4. Precast units are damaged during handling.

b. Precast units having dimensions smaller or greater than required and not meeting tolerance limits may be rejected if the appearance or function of the structure is adversely affected or if the units interfere with other construction.

c. Precast units that do not conform to requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that meet requirements.

4. Testing:

a. When there is evidence that the strength of precast concrete units may be deficient or may not meet requirements, the Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength. Cores shall be obtained, tested, and evaluated in accordance with the provisions of ACI 301 and ASTM C 42.

b. Test results will be made in writing on the same day that tests are made, with copies to Owner, Architect/Project Engineer, Contractor, and Fabricator. Test reports will include: Project identification name and number; date; name of precast concrete fabricator; name of concrete testing and inspection agency; type(s) and designation(s) of precast unit(s) represented by core test; design compressive strength; compressive strength at break and type of break,

corrected for length-diameter ratio; and direction of applied load to core with respect to horizontal plane of concrete as placed.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and handling:

1. Precast concrete members shall be lifted and supported during manufacturing, stockpiling, transporting and erection operations only at the lifting or supporting points, as shown on the shop drawings, and with suitable lifting devices. Lifting inserts shall have a minimum safety factor of 4. Reusable lifting hardware and rigging shall have a minimum safety factor of 5.

2. Transportation, site handling, and erection shall be performed with acceptable equipment and methods, and by qualified personnel. Handle at all times in a manner to prevent structural and surface damages. Protect all members from surface contaminants that will prevent bonding or application of applied finishes.

B. Storage:

1. Store units off ground.

2. Place stored units so that identification marks are discernable.

3. Separate stacked members by battens across full width of each bearing point.

4. Stack so that lifting devices are accessible and undamaged.

5. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

3.3 PREPARATION

A. Installer must examine all parts of the supporting structure and the conditions under which the precast concrete work is to be erected. Notify the Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Verify dimensions of supporting structures at the project site and adjust final shop drawings to reflect actual field dimensions.

C. Provide bearing areas sufficient to prevent excessive bearing stresses. Provide bearing length of four inches minimum unless otherwise approved.

D. Do not erect units until supporting members are completely in place. Locate units on supporting construction to provide a minimum end bearing unless otherwise shown on the drawings.

3.4 INSTALLATION

A. Installation of precast, prestressed concrete shall be performed by the manufacturer or a competent erector. Members shall be lifted by means of suitable lifting devices at points provided by the manufacturer. Design, adequacy, and safety of temporary shoring or bracing, if necessary, is the sole responsibility of the erector.

B. Members shall be properly aligned and leveled as required by the approved shop drawings. Variations between plumb shall be reasonably leveled out by jacking, loading, or any other feasible

method as recommended by the manufacturer and acceptable to the Architect/Project Structural Engineer.

C. Install flexible bearing pads, where indicated, as precast units are being erected. Set pads on level, uniform bearing surfaces and maintain in correct position until precast units are placed.

D. Do not install precast units until concrete has attained its design strength.

E. Shore and Brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.

F. Do not use drilled or powder-actuated fasteners for attaching accessory items to precast prestressed units.

G. Install precast units without exceeding the erection tolerances recommended in PCI MNL-127, Erectors' Manual: Standards and Guidelines for the Erection of Precast Concrete Products.

H. Grout open spaces at connections and joints, with manufacturer recommended grout, after precast concrete units have been placed and permanently connected.

I. Provide forms or other method for retaining grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping or ramming until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

J. Place control joints in topping slabs, directly over joints between precast units, by tooling into plastic concrete. Fill control joints with a high quality traffic-bearing polyurethane or silicone sealant.

K. Perform cutting and fitting of precast slab units as required for the passage of other projecting or adjacent work. Provide straight and clean cuts without breaking or spalling edges.

L. Do not cut any reinforcing steel members unless otherwise acceptable to the precast unit manufacturer and the Architect/Structural Engineer.

M. Reinforce edges of cut openings where required to maintain the structural integrity of the precast units.

N. Lifting devices shall be removed after units are in place.

O. Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.

P. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as directed.

Q. Repair damaged metal surfaces by cleaning and applying a coat of galvanizing repair paint to galvanized surfaces or repriming and painting damaged painted surfaces.

R. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.

S. Grind the surface adjacent to double tees used in parking garages to create a smooth driving surface.

END OF SECTION 034100

SECTION 036200 - NON-SHRINK GROUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes non-shrink grout under base plates, bearing plates, or as otherwise required by the structural engineer-of-record.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

1.3 REFERENCES

A. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

B. ASTM C1107 - Standard Specification For Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).

1.4 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Perform compressive strength tests in accordance with ASTM C109 with 2-inch x 2-inch cubes. Test one cube at three days, two cubes at seven days and three cubes at 28 days. Perform one compressive strength test for each ten bags of grout used and/or perform one test minimum for each day of grouting, whichever is more frequent.

1.5 SUBMITTALS

A. Submit product data sheets for review.

PART 2 - PRODUCTS

2.1 GROUT

A. Provide a non-shrink, non-metallic grout that complies with ASTM C1107.

B. Grout shall have a minimum compressive strength of 7500 psi at 28 days.

C. Grout placed in exterior exposed conditions or areas subject to moisture shall be free of gypsum.

2.2 WATER

A. Provide clean, potable water.

PART 3 - EXECUTION

3.1 HANDLING

A. Store and protect non-shrink grout from moisture and contamination.

3.2 PREPARATION

A. Remove mud, dirt and other foreign materials from areas to be grouted.

B. Apply grout to rough concrete surface; roughen concrete as necessary prior to placing grout.

3.3 MIXING

A. Mix grout to its fluid, self-leveling consistency in accordance with manufacturer’s recommendations. Do not retemper grout. Do not exceed manufacturer's maximum limit on water content or use at a consistency which produces free bleeding. Mix grout in a paddle-type mortar mixer. Do not mix by hand.

3.4 PLACEMENT

A. Consolidate grout to provide uniformity. Do not vibrate grout.

B. Use forms to contain grout.

3.5 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 for three days.

END OF SECTION 036200

SECTION 042200 - STRUCTURAL CONCRETE MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes structural concrete masonry shown on the Structural Drawings.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

C. Section 032000 - Concrete Reinforcement.

D. Section 033000 - Cast-in-Place Concrete.

E. Section 042000 - Unit Masonry.

1.3 REFERENCES

A. ACI 530.1/ASCE 6/TMS 602 - Specifications for Masonry Structures.

B. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

C. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

D. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

E. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

F. ASTM A951 - Standard Specification for Masonry Joint Reinforcement.

G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.

H. ASTM C91 - Standard Specification for Masonry Cement.

I. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

J. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

K. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

L. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

N. ASTM C476 - Standard Specification for Grout for Masonry.

O. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

P. ASTM C1314 - Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.

Q. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

1.4 SUBMITTALS

A. Submit mortar mix design including type of cement used.

B. Submit coarse grout mix design.

C. Submit material certificates signed by the material supplier that the masonry units, mortar, reinforcement, and joint material complies with specification requirements.

D. Submit shop drawings for masonry reinforcement in accordance with Section 032000.

E. Submit procedures for construction of masonry walls to be filled with coarse grout. Procedures should include high lift or low lift grouting as applicable to project.

1.5 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Verify reinforcing steel for quantity, size, and location.

2. Verify placement of coarse grout as indicated in high or low lift procedure.

3. Verify compressive strength of concrete masonry units, mortar, coarse grout, or masonry prisms for each 10,000 sq. ft. of surface area as follows:

a. Concrete masonry units shall be tested in accordance with ASTM C140.
b. Six (6) mortar cube specimens shall be tested, three (3) at 7-days and three (3) at 28-days, in accordance with ASTM C109.
c. Six (6) coarse grout specimens shall be tested, three (3) at 7-days and three (3) at 28-days, in accordance with ASTM C1019.
d. In lieu of individual tests of masonry units, mortar, and grout, if directed by the Architect/Structural Engineer, perform one (1) prism test (which consists of three prisms) in accordance with ASTM C1314.

1.6 HANDLING OF MATERIALS

A. Package, handle, and store materials to protect from elements and prevent contamination.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY

A. Concrete masonry shall have the minimum compressive strength (f'm) specified on the Drawings.

2.2 CONCRETE MASONRY UNITS

A. Concrete masonry units shall conform to ASTM C90.

B. Provide normal weight concrete masonry units.

C. Concrete masonry units shall have, as a minimum, the net area compressive strength listed in Table 2 of ACI 530.1/ASCE 6/TMS 602 required for the specified f'm.

D. Provide standard units with face dimensions of 16" long x 8" high nominal, unless indicated otherwise.

E. Provide special shapes where indicated on the Drawings.

2.3 MORTAR

A. Mortar shall be Type S in accordance with the proportion specification requirements of ASTM C270.

B. Do not use admixtures that contain chlorides.

2.4 COARSE GROUT

A. Coarse grout shall conform to ASTM C476.

B. Coarse grout shall have the minimum compressive strength specified on the Drawings.

C. Mix grout to a consistency which has a slump between 8 and 10 inches.

D. Do not use admixtures that contain chlorides.

2.5 WATER

A. Provide clean potable water free of deleterious substances.

2.6 REINFORCEMENT

A. Horizontal and vertical reinforcing bars shall comply with Section 032000.

2.7 HORIZONTAL JOINT REINFORCEMENT

A. Provide horizontal joint reinforcement that conforms to ASTM A951. Horizontal joint reinforcement shall be manufactured with longitudinal parallel, deformed side wires of the size specified on the drawings. Cross wires shall be No. 9 gage, plain, in accordance with ASTM A82.

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. Provide truss type joint reinforcement, except ladder type reinforcement shall be used for walls with vertical reinforcement.

D. Horizontal joint reinforcement shall be hot-dipped galvanized in accordance with ASTM A153, Class B-2.

E. Provide prefabricated corner and tee shape corner accessories.

2.8 CONTRACTION (CONTROL) JOINT MATERIAL

A. Contraction (Control) joint material shall comply with ASTM D2000, M2AA-805 with rubber shear keys with a minimum durometer hardness of 80.

PART 3 - EXECUTION

3.1 MIXING

A. Except as otherwise approved for small batches, mix in mechanically operated batch mixers of drum type in which water can be accurately and uniformly controlled. Mortar materials shall be placed in the mixer in a similar manner from batch to batch, in the following order: place 3/4 of the required water, 1/2 of the required sand, and all of the cementitious materials into the mixer and mix briefly. Add the balance of the sand. Add the balance of the water as the mortar is mixed and begins to stiffen. Total mixing time shall be a minimum of 3 minutes and a maximum of 5 minutes. Do not permit volume of batch to exceed manufacturer's rated capacity of mixer drum. Empty drum completely before placing next batch. Keep mixers and wheelbarrows clean. Do not deposit mortar upon or permit contact with ground.

B. Do not use anti-freeze compounds.

3.2 CONSTRUCTION

A. Use dry masonry units. No frozen or wet units shall be used.

B. Discard cracked, chipped, and spalled masonry units.

C. Deliver mortar to mason's board at point of use within 45 minutes after mixing. Do no retempering. Use no admixtures. Discard all mortar which has begun to stiffen or is not used within 2 1/2 hours after initial mixing. Use pre-hydrated mortar for tuck points. Prepare pointing mortar with as dry consistency as will produce mortar sufficiently plastic to be worked into joints.

D. During erection cover top of wall with strong waterproof membrane at end of each day when shutdown. Cover partially completed walls when work is not in progress. Extend and secure cover a minimum of 24 in. down both sides. Do not apply uniform floor or roof loading for at least 12 hours after building masonry columns or walls. Do not apply concentrated loads for at least 3 days after building masonry columns or walls.

E. Provide temporary bracing during erection as required to stabilize erected masonry.

F. Except where otherwise indicated, lay block in running bond.

G. Before placement of grout in masonry units, remove all mortar droppings, projections larger than 1/2 inch and debris from cores, reinforcement and foundation or bearing surface.

H. For low-lift grouting, pour height shall not exceed five (5) feet. For all lifts except the final, the level of grout being placed shall be stopped at an elevation of 1 1/2 inches below the top bed joint to form a shear key for the successive lift.

I. For high-lift grouting, provide cleanouts for removal of debris at the bottom of all cores containing reinforcement for partially grouted walls and at a maximum spacing of 32 inches on center for fully grouted walls. Cleanouts shall have a minimum opening dimension of 3 inches. Delay grouting until mortar has cured sufficiently to prevent horizontal movement (blowout) of the units.

J. Consolidate all grout pours with a mechanical vibrator upon placement. Reconsolidate after a waiting period of 3 to 10 minutes. Top off all grouted cells after reconsolidation.

3.3 PLACING AND BONDING

A. Hollow masonry units shall be placed such that face shells of bed joints are fully mortared. Webs shall be fully mortared in all courses of piers, columns, pilasters, in the starting course on foundations, where adjacent cells or cavities are to be grouted, and where otherwise indicated. Head joints shall be mortared a minimum distance from each face equal to the face shell thickness of the unit.

B. Unless otherwise required or indicated on the construction drawings, solid masonry units shall be placed in fully mortared bed and head joints. The ends of the units shall be completely buttered. Head joints shall not be filled by slushing with mortar. Head joints shall be constructed by shoving mortar tight against the adjoining unit. Bed joints shall not be furrowed deep enough to produce voids.

C. Unless otherwise required or indicated on the construction drawings, head and bed joints shall be 3/8 inch thick, except that the thickness of the bed joint of the starting course placed over the foundations shall not be less than 1/4 inch and not more than 3/4 inch.

D. Fully bond external corners of concrete block. Where interior block partitions intersect other block walls or partitions, provide control joints with mortar raked back 1/4 inch.

E. Isolate masonry partitions from vertical structural framing members with control joints, with mortar racked back 1/4 inch.

F. Where non-bearing masonry partitions extend to underside of floor, roof deck or structural system, stop masonry short 3/8 to 1/2 inch to allow for live load deflection. Fill gap with soft joint filler.

G. Where masonry chase walls are constructed, one wall can be stopped above ceiling to provide access space.

3.4 CONTRACTION (CONTROL) JOINTS

A. Install contraction (control) joints at locations indicated on the drawings in all masonry walls. Nonstructural reinforcement, such as horizontal joint reinforcement, shall not be continuous through contraction (control) joints. Structural reinforcement, such as bond beam reinforcement, shall be continuous through contraction (control) joints.

3.5 TOLERANCES

A. Variation from Unit to Adjacent Unit: 1/32 inch maximum.

B. Variation from Plan of Wall: Maximum 1/4 inch in 10 feet, and 1/2 inch in 20 feet or more.

C. Variation from Plumb: +/- 1/4 inch in 10 feet, +/- 3/8 inch in 20 feet; +/- 1/2 inch maximum.

D. Variation in Level Coursing: +/- 1/4 inch in 10 feet; +/- 1/2 inch maximum.

E. Variation in Joint Thickness: +/- 1/8 inch maximum.

3.6 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.

3.7 HORIZONTAL JOINT REINFORCEMENT

A. Place horizontal joint reinforcement in the horizontal mortar beds at spacings as noted in the Drawings, except as specified herein.

B. For masonry below grade, space horizontal joint reinforcing at 8 inches vertically.

C. Above lintels and below sills at openings, place a continuous run of horizontal joint reinforcement in the first two bed joints, 8 inches apart. Extend joint reinforcement two feet beyond opening.

D. Joint reinforcement shall be continuous, except it shall not pass through vertical masonry contraction joints. Lap joint reinforcement a minimum of 6 inches.

3.8 ENVIRONMENTAL PROVISIONS

A. Cold weather masonry construction shall comply with "Recommended Practices and Guide Specifications for Cold Weather Masonry Construction, Section 04200" by the International Masonry All-Weather Council.

END OF SECTION 042200

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes fabrication and erection of structural steel indicated in the Contract Documents or otherwise required for proper completion of the work.

B. All rolled steel sections, rectangular and square hollow structural steel sections, and round hollow structural steel sections should be produced in the United States of America.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

C. Section 053000 - Steel Decking.

1.3 REFERENCES (Current edition adopted by the building code used for the project design as listed in the Structural Drawings)

A. AISC (American Institute of Steel Construction)

1. Specification for Structural Joints Using High-Strength Bolts

2. 303 - Code of Standard Practice for Steel Buildings and Bridges

3. Manual of Steel Construction

B. ANSI (American National Standards Institute) / AISC (American Institute of Steel Construction)

1. 341 - Seismic Provisions for Structural Steel Buildings

2. 358 - Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications

3. 360 - Specification for Structural Steel Buildings

C. AWS (American Welding Society)

1. A5.1 - Specification for Carbon Steel Electrodes for Shield Metal Arc Welding

2. A5.17 - Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding

3. A5.20 - Specification for Carbon Steel Electrodes for Flux Cored Arc Welding

4. A5.5 - Specification for Low-Alloy Steel Covered Arc Welding Electrodes

5. D1.1 - Structural Welding Code

6. D1.8 - Structural Welding Code - Seismic Supplement

D. ASTM (American Society for Testing and Materials)

1. Structural Shapes Plates and Bars

   a. A1 - Standard Specification for Carbon Steel Tee Rails
   b. A6 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
   c. A29 - Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
   d. A36 - Standard Specification for Carbon Structural Steel
   e. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   f. A216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
   g. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
   h. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
   i. A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
   j. A668 - Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use
   k. A913 - Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST)
   l. A958 - Standard Specification for Steel Castings, Carbon and Alloy, with Tensile Requirements, Chemical Requirements Similar to Standard Wrought Grades
   m. A759 - Standard Specification for Carbon Steel Crane Rails
   n. A992 - Standard Specification for Structural Steel Shapes
   o. A1011 - 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
   p. A1085 - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)

2. Structural Fasteners

   a. A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
   b. A194 - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
   c. A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
   d. A563 - Standard Specification for Carbon and Alloy Steel Nuts
   e. F436 - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions

f. F844 - Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
g. F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series
h. F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
i. F3125 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

3. Other

a. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
b. A673 - Standard Specification for Sampling Procedure for Impact Testing of Structural Steel
c. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
d. A786 - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
e. B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
f. F1136 - Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
g. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

E. SSPC - Steel Structures Painting Manual.

F. Research Council on Structural Connections (RCSC) – Specification for Structural Joints Using High Strength Bolts.

1.4 SUBMITTALS

A. Shop drawings shall be submitted for review.

1. Contact Structural Engineer’s Construction Administration Division prior to detailing structural steel shop drawings.

2. Shop drawings shall clearly indicate the profiles, sizes, ASTM Grade, spacings and locations of all 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 headed shear connectors.

3. Reproduction of Structural Drawings for shop drawings is not permitted.

B. Certification that the fabricator meets the required qualifications shall be submitted.

C. Certification that the erector meets the required qualifications shall be submitted.

D. The documents listed in Section N3.2 of ANSI/AISC 360 shall be maintained and submitted for review upon request.

E. Shop measurements of camber shall be maintained and submitted for review upon request. Field measurements of camber shall be submitted for review.

F. If inspections are not required at the fabricator's premises, at completion of fabrication, the approved fabricators shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents.

G. If inspections are required at the fabricator's premises, prior to delivery of structural steel to the project, inspection reports shall be submitted.

H. Ultrasonic testing reports for complete penetration welds shall be submitted.

1.5 QUALITY ASSURANCE

A. Qualified fabricators

1. Fabricators that are both building code approved and AISC certified:

a. The special inspections described in section 1.5B only apply to work done in the field and are not required for work done on the premises of the fabricator.
b. Fabricator shall perform ultrasonic testing on 100 percent of the complete penetration welds performed in the shop. For welds less than 5/16" thick, a magnetic particle test may be performed.

2. Other fabricators:

a. The special inspections described in section 1.5B are required for both work done in the field and work done on the premises of the fabricator.

B. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Inspection of fabricators

a. The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
b. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.
c. A minimum of one trip per week is recommended. The first trip should be scheduled in the early stages of fabrication.
d. Contact Structural Engineer prior to initial inspection.

2. Fabricator and erector documents

a. Verify reports and certificates as listed in Section N3.2 of ANSI/AISC 360 for compliance with construction documents.

3. Material verification of structural steel

a. The inspector shall conduct periodic inspections to verify high-strength bolts, nuts, and washers:

1) Verify that the identification markings conform to the ASTM standards, specified in the approved construction documents.
2) Verify the manufacturer's certificate of compliance.

b. The inspector shall conduct periodic inspections to verify the structural steel:

1) Verify that the identification markings conform to the ASTM standards, specified in the approved construction documents.
2) Verify the manufacturer's certified mill test reports.

c. The inspector shall conduct periodic inspections to verify the weld filler materials:

1) Verify that the identification markings conform to the AWS specification, specified in the approved construction documents.
2) Verify the manufacturer's certificate of compliance.

4. Embedments including Anchor Bolts

a. Verify diameter, grade, type, length, embedment and configuration of embedments.

b. Expansion Anchors

1) Verify proper installation in accordance with manufacturer recommendations and ICC-ES Code Report requirements. This includes; but is not limited to, verifying the location of the anchor including any edge distance and spacing requirements, drill bit type and size, hole depth, hole cleaning technique (if applicable), anchor type, size, embedment and installation procedure.

c. Adhesive Anchors

1) Verify proper installation in accordance with manufacturer recommendations and ICC-ES Code Report requirements. This includes; but is not limited to, verifying the location of the anchor, any edge distance and spacing requirements, drill bit type and size, hole depth, hole cleaning technique (very important), anchor type, size, embedment and installation procedure including adhesive expiration date and proper dispensing.

5. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents.

a. Camber

1) Measure 25 percent of all cambered steel members (in field) prior to erection for compliance with AISC 303. Camber shall be checked at mid-point of member length.
2) Additional measurements may be required at the Structural Engineer's discretion.

6. Structural steel welding:

a. Inspection shall be in accordance with AWS Structural Welding Code.

b. Inspection tasks Prior to Welding

1) Observe or perform for each welded joint or member the QA tasks listed in ANSI/AISC 360, Table N5.4-1.

c. Inspection tasks During Welding

1) Observe or perform for each welded joint or member the QA tasks listed in ANSI/AISC 360, Table N5.4-2.
2) The inspector shall perform continuous monitoring of complete penetration groove welds, partial penetration groove welds, multi-pass fillet welds, and single-pass fillet welds greater than 5/16".
3) The inspector shall perform periodic monitoring of single-pass fillet welds less than or equal to 5/16".

d. Inspection tasks After Welding

1) Observe or perform for each welded joint or member the QA tasks listed in ANSI/AISC 360, Table N5.4-3.

e. Nondestructive testing (NDT) of welded joints

1) Complete joint penetration welds

a) Ultrasonic testing shall be performed on 100 percent of complete joint penetration groove welds. For welds less than 5/16" thick, a magnetic particle test may be performed.
b) A reduction in rate of ultrasonic testing to 25 percent for an individual welder or welding operator is permitted when the conditions of Section N5.5e of ANSI/AISC 360 have been met.
c) If the rate of testing has been reduced, the rate of testing shall return to 100 percent if conditions of Section N5.5f of ANSI/AISC 360 have been met.

2) Magnetic particle testing or penetrant testing shall be performed on all thermally cut surfaces of access holes when material t > 2".
3) Radiographic testing or ultrasonic testing shall be performed on welded joints subjected to fatigue as noted in the construction documents when required by ANSI/AISC 360, Appendix 3, Table A-3.1.

7. Structural steel bolting:

   a. Inspection and testing shall be in accordance with AISC Specification for Structural Joints Using High-Strength Bolts.

   b. Inspection Tasks Prior to Bolting

      1) Observe or perform tasks for each bolted connection in accordance with QA tasks listed in ANSI/AISC 360, Table N5.6-1.
      2) For connections with fully tensioned bolts, prior to visual and physical testing, tension testing using a calibration device (Skidmore-Wilhelm) must indicate tensions at least 5% in excess of the AISC minimum. Structural steel erector shall supply the tension calibration device. The inspector shall observe the pre-installation testing and calibration procedures.
      3) For connections with snug tight bolts, pre-installation verification testing is not applicable.

   c. Inspection Tasks During Bolting

      1) Observe the QA tasks listed in ANSI/AISC 360, Table N5.6-2.
      2) The inspector shall perform continuous inspection (including 100% of the connections) of bolt installation for tensioning when the calibrated wrench or the turn-of-nut method without match marking methods are used.
      3) The inspector shall perform periodic inspection (including a minimum of 10% of the connections) of bolt installation for tensioning when the turn-of-nut method with match marking techniques, the direct tension indicator, or the alternate design fastener (twist-off bolt) methods are used.
      4) For connections with Snug Tight Bolts, the inspector shall perform periodic inspection (including a minimum of 10% of the connections) of connections with snug tight bolts.

   d. Inspection Tasks After Bolting

      1) Perform tasks for each bolted connection in accordance with QA tasks listed in ANSI/AISC 360, Table N5.6-3.

8. Steel elements of composite construction

   a. Headed Studs

      1) Headed stud bases shall be qualified through an Application Qualification Test (AQT) in accordance with AWS D1.1, Section 7.6 and Annex G. In lieu of an AQT, the manufacturer's Qualification Test (QTD) data may be used. Equipment settings from AQT, or QTD, as applicable, shall serve as the basis for the field production setups.
      2) Pre-production testing and operator qualification shall be performed in accordance with Section 7.7 of AWS D1.1, except that a minimum of

three studs shall be tested for each start, and shift, as defined by AWS D1.1 Section 7.7.1. Pre-production testing for each operator is required if more than one.

3) All production (fabrication) studs shall be visually inspected in accordance with Section 7.8 of AWS D1.1.

4) All production (fabrication) studs shall be subjected to a hammer ping test. Studs with a hollow ping shall be subjected to a bend test.

5) Additionally, two studs shall undergo a bend test (torque test for a threaded stud) for every 110 studs installed within each set-up. These tests shall be performed as described in Section 7.8 of AWS D1.1 to ensure that significant deviation from the initial set-up did not take place. The frequency of these additional tests may be increased as directed by the engineer of record depending on failure rates.

6) Two additional tests per AWS D1.1 Sections 7.8 shall be performed at the start of any welding of studs through deck onto painted surfaces in order to qualify the procedure and the welder for this condition. These additional tests are not required if the paint has been removed from the welding surface. However, in no instance shall the weld occur through the coating which would be in any manner injurious to the strength and quality of the weld.

7) Production studs not passing the visual test and bent at 15 degrees shall be left bent. All other studs bent at 30 degrees shall also be left bent.

1.6 ERECTOR'S QUALIFICATION

A. Erector shall participate in the AISC Certification program and shall be designated an AISC Certified Erector, Category CSE (Certified Steel Erector).

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.

D. Field welders shall be qualified in accordance with AWS D1.1.

1.7 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

2.1 ANCHOR RODS

A. Anchor rods shall be threaded rods conforming to ASTM F1554 Gr. 36 unless noted otherwise on the drawings. The anchor rods shall be threaded at both ends.

B. Provide a heavy hexagonal nut threaded and tack welded to the bottom of each rod unless noted otherwise on the structural documents. The nut shall conform to ASTM A563 Grade A or DH.

C. Provide heavy hexagonal nut and plain steel washer at the top of each rod. The nut shall conform to ASTM A563 Grade A or DH and washer shall conform to ASTM F844. Leveling nuts and washers shall be provided as deemed necessary by the contractor for erection.

D. Provide square plate washers conforming to A36 with standard holes in lieu of top steel washers on base plates with oversize holes. Oversized holes are defined as any hole that is larger than a standard hole as defined in Chapter J of the ANSI/AISC 360. Recommended maximum base plate holes as given in the AISC Manual of Steel Construction are considered oversized holes and should not be exceeded.

2.2 ROLLED STEEL SHAPES, PLATES, AND BARS

A. Rolled steel W and WT shapes shall conform to ASTM A992, 50 ksi minimum yield strength, unless noted otherwise on the contract drawings. ASTM A572, Grade 50 may be substituted for ASTM A992.

B. Rolled steel M, S, C, MC, and L shapes shall conform to ASTM A36, 36 ksi minimum yield strength, unless noted otherwise on the contract drawings.

C. Plates and Bars shall conform to ASTM A36, 36 ksi minimum yield strength, unless noted otherwise on the contract drawings.

D. Steel used for bearing bars, cross bars, and connecting bars of metal bar gratings and treads shall conform to ASTM A1011 Commercial Steel (Type B).

E. At the contractor’s option, additional shop inspections of hot rolled shapes with flanges 1-1/2 in. thick and thicker, and plates that are 2-in. thick or thicker should be conducted to verify that base metal is free of defects such as lamellar tearing. If such defects are discovered during subsequent ultra-sonic testing, they shall be repaired and re-inspected at the contractor’s expense.

2.3 SQUARE/RECTANGULAR HOLLOW STRUCTURAL STEEL SECTIONS

A. Square/rectangular hollow structural steel sections shall conform to ASTM A500, Grade C, 50 ksi minimum yield strength or ASTM A1085.

2.4 ROUND HOLLOW STRUCTURAL STEEL SECTIONS

A. Round hollow structural steel sections shall conform to ASTM A500, Grade C, 46 ksi minimum yield strength or ASTM A1085.

2.5 ROUND HOLLOW STEEL PIPE

A. Round hollow steel pipe shall conform to ASTM A53, Grade B, 35 ksi minimum yield strength.

2.6 NON-HIGH-STRENGTH FASTENERS

A. Non-high-strength bolts shall conform to ASTM A307, Grade A, 60 ksi minimum, where noted on the Structural Drawings.

B. Hardened steel washers shall conform to ASTM F436.

2.7 HIGH-STRENGTH FASTENERS

A. High-strength bolts shall conform to ASTM F3125 as noted on the Structural Drawings.

B. Provide 3/4-inch minimum diameter bolts, unless noted otherwise.

C. Hardened steel washers shall conform to ASTM F436.

D. Spline-type tension control bolts, plain hardened washers and suitable nuts are an acceptable alternate design bolt assembly.

E. Do not use load indicating washers.

2.8 HEADED STUDS

A. Headed steel studs shall conform to the requirements of AWS D1.1 and shall be Type B made from ASTM A108 material.

B. Provide 3/4-inch diameter headed steel studs, unless noted otherwise.

C. Provide heat-resistant ceramic arc shields with studs.

2.9 ROUND RODS

A. Rods shall conform to ASTM, A36.

B. The rods shall be threaded at each end.

2.10 POST-INSTALLED ANCHORS

A. Post-installed anchors installed into structural concrete shall be ICC approved for use in cracked concrete.

B. Post-installed anchors installed into concrete block shall be approved for use in the block type (grout filled or hollow) under consideration.

2.11 WELD ELECTRODES

A. E-70 series low hydrogen electrodes shall conform to AWS A5.1, A5.5, A5.17, or A5.20.

B. Properly store electrodes to maintain flux quality.

2.12 GALVANIZING

A. Galvanized steel coating shall conform to ASTM A123.

B. Galvanize bolts, nuts, and washers in accordance with ASTM F2329 when used to connect steel members that are specified to be galvanized.

C. Post-Installed anchors specified to be galvanized shall be mechanically galvanized in accordance with ASTM B695, Class 65, Type I.

PART 3 - EXECUTION

3.1 GENERAL

A. Fabricate and erect structural steel in accordance with AISC Specifications and Code of Standard Practice.

B. The Erector shall provide all required temporary erection bracing and shoring necessary to safely erect the structural frame to withstand construction loading as provided in ASCE 37.

C. Notify Architect/Structural Engineer and Structural Testing/Inspection Agency at least 48 hours prior to structural steel fabrication and erection.

3.2 ANCHOR BOLT (ROD) SETTING

A. Provide templates for setting anchor bolts (rods). Position anchor bolts (rods) by using templates with two nuts to secure in place prior to placement of concrete.

B. Do not erect steel where anchor bolt (rod) nuts will not have full threads.

3.3 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 Specification for Structural Joints Using High-Strength 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.)

3.4 FASTENER INSTALLATION

A. Install high-strength bolts according to AISC Specification for Structural Joints Using High-Strength Bolts for type of bolt and type of joint specified.

B. High-strength bolts installed shall have a hardened washer under the element turned in tightening.

3.5 HEADED STUDS

A. Headed studs shall be welded in accordance with AWS D1.1.

B. Locate studs directly over the web of beams with flanges less than 0.3 inches thick.

C. The minimum center spacing shall be 6 diameters along the longitudinal axis of the beam and 4 diameters transverse to the longitudinal axis of the beam.

D. Where double rows of studs are required, begin double rows at each end of the beam.

E. Remove shields after welding studs.

F. Headed stud welding shall not take place when the temperature is below 0 Degree Fahrenheit, or when the welding surface is not dry.

3.6 WELDING

A. Comply with AWS Structural Welding Code. Use prequalified weld procedures.

B. Provide end returns where fillet welds terminate at end 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.

3.7 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.

3.8 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.

3.9 MILL SCALE

A. Remove loose mill scale.

3.10 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.

3.11 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 051200

SECTION 051500 - BARRIER CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes barrier cables for parking garage.

1.2 RELATED SECTIONS

A. Section 031000 - Concrete Formwork.

B. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ASTM A416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.

B. ASTM A882 Standard Specification for Filled Epoxy-Coated Seven-Wire Prestressing Steel Strand.

C. ASTM A475 Standard Specification for Zinc-Coated Steel Wire Strand.

D. Post-Tensioning Manual – Sixth Edition.

1.4 QUALITY ASSURANCE

A. Work shall be performed by a PTI Certified company which specializes in the type of barrier cables work required for this Project, with a minimum of three (3) years of documented successful experience and five (5) projects of similar size and scope.

1. Work shall be performed under the immediate supervision of a person employed by the Barrier Cable Contractor and experienced in this type of work for close check and rigid control of all operations as necessary for full compliance with Contract Documents requirements.

2. Work shall be performed in compliance with Owner’s insurance underwriters’ requirements.

B. Inspections:

1. Check bulkheads, anchorage positioning, tendon location, size and placement of containment and reinforcement and other reinforcing steel in post-tensioned areas and generally maintain a consistent and acceptable good standard of workmanship.

2. Mark tendon prior to stressing. Measure tendon elongations accurately and make records for submittal.

3. Do not allow burning off of tendons until stressing records have been approved.

C. Manufacturer’s identification tags or marks are not acceptable on surfaces which will remain exposed to view after installation.

1. Evidence of “patching” after removal of tags or marks is not acceptable.

1.5 SUBMITTALS

A. Shop Drawings shall be sealed and signed by a professional structural engineer registered in the state in which this Project is located, and shall clearly indicate, but not limited to, the following:

1. Complete details of tendon profiles, anchorage components and stressing requirements.

2. Tendon layout and dimensions locating tendons in horizontal plane.

3. Details of tendons at block-outs and anchorages.

4. Vertical locations of tendons and the method of tendon support through columns.

5. Details of reinforcement around stressing pockets.

6. Calculated elongations for each tendon, and maximum temporary jacking force.

7. Method of determining anchor force, or force remaining in tendons after anchor.

8. Method of burning off excess tendon, after anchorage.

9. Method of sealing tendons.

10. Changes or deviations from shop drawings are not permitted without barrier cable manufacturer's approval.

B. Product Data: Shall be clearly marked to indicate all technical information which specifies full compliance with requirements of this section and Contract Documents, including manufacturer's published installation recommendations.

C. Tendon Stressing Records: Tendon stressing records shall be prepared and submitted to engineer on standard forms provided for this purpose.

1. The following information shall be recorded and submitted within 48 hours after stressing:

a. Calculated elongation and actual measured elongation for each jacking point and totals for each tendon.
b. Stressing ram number, jacking pressure and jacking force for each tendon.
c. Date of stressing operation, floor, pour and tendon identification numbers.
d. Signature of the Contractor's stressing personnel and the Project Inspector witnessing the operation.

D. Certified mill reports on the prestressing steel shall be submitted to Architect and shall contain, as a minimum, the following:

1. Coil number.

2. Ultimate tensile strength.

3. Modulus of elasticity.

4. Percent elongation at rupture.

5. Nominal diameter and steel area of strand.

E. Certificates of all jack calibrations used on Project shall be submitted to Architect.

1.6 DEFINITIONS

A. Backstressing – A stressing procedure that ensures that the edges are properly seated into the anchor.

PART 2 - PRODUCTS

2.1 UNAUTHORIZED MATERIALS

A. Materials and products required for work of this section shall not contain asbestos, polychlorinated biphenyls (PCB) or other hazardous materials identified by the Owner.

2.2 GALVANIZED BARRIER CABLES

A. Barrier cables shall be 1/2" diameter seven-wire, Galvanized Prestressed Concrete Strand (***GPC***) manufactured in accordance with ASTM A416, Grade 250 and shall have a minimum ultimate tensile strength of 38,200 pounds.

B. Zinc coating weight shall be Class A as designated in ASTM A475, Table 4 (0.85 oz. per square foot). Coating shall be applied by either hot-dip, hot-dip and post-drawing, or electro-plating process that ensures complete zinc coating around each individual wire of the strand.

2.3 POST TENSIONING HARDWARE

A. Post tensioning hardware including, but not limited to, anchorages, wedges, couplers, bearing plates and other miscellaneous hardware shall be the standard products as manufactured by the post-tensioning supplier unless otherwise approved by the Architect / Engineer.

B. All post-tensioning hardware, whether embedded in concrete or not, shall be hot dipped galvanized with a minimum of 1.8 oz. of zinc per square foot.

C. All post-tensioning anchorage hardware, shall be rated to develop at least 95 percent of the actual ultimate strength of the barrier cable.

D. Castings shall be nonporous and free of sand, blow holes, voids, and other defects.

E. Castings shapes may be rectangular, square, or cylindrical with a tapered conical hole designed to receive a matching set of tapered wedges for engagement and lock-ff of the barrier cable.

F. Barrel anchors shall be cylindrical in shape and made from carbon bar stock with a tapered conical hole designed to receive the matched tapered wedges.

G. Wedges shall be fabricated from carbon steel bar and shall be case hardened. Wedges shall be serrated on the inside and designed to penetrate and hold the barrier cable.

H. Inserts for adjustable anchors shall be cast with the column concrete placement. Inserts shall be rated for an allowable stress tension load of 10,000 lbs. Inserts shall be rated on a minimum 4 to 1 safety ratio for ultimate to service load rating.

I. Adjustable anchors shall be "Grabb-It" Cable Anchors manufactured and supplied by Precision Screw Products Co., Inc. of Grand Prairie, Texas.

2.4 SLEEVES

A. Sleeves shall be 3/4” I.D. PVC.

2.5 SEALANT

A. Sealant shall be an elastic material that will remain pliable, watertight, and is compatible with the cable and cable coating.

PART 3 - EXECUTION

3.1 STORAGE

A. All tendons shall be satisfactorily protected on the job from excessive rust or other corrosion prior to placement.

B. Sufficient protection shall be provided for any portion of the cable that is unprotected such as at the ends of members to prevent corrosion.

3.2 INSTALLATION

A. General:

1. Stressing assemblies at tendon terminals shall be secured to the formwork, which shall be designed to remain in a fixed position during concrete pour.

2. Coordinate with formwork and concrete work in Sections 031000 and Section 033000.

B. Placement of Tendons:

1. The dimensional locations of tendons shall be in accordance with the contract drawings.

2. Welding of cross bars or any welding in the vicinity of the tendons will not be allowed.

3. Tendons shall be placed normal to anchorage plates.

4. Column sleeves and anchorages shall be firmly supported to prevent displacement during concrete placement. They shall be placed with a tolerance of +/- 1/4-inch.

C. Tensioning:

1. The tensioning operation shall not begin until tests of the concrete cylinders indicate that the concrete in the members has attained a compressive strength of not less than 75% of the 28 day strength or as otherwise specified on the Contract Drawings.

2. Each tendon shall typically be stressed to an effective force (after seating losses) of 2 kips, unless noted otherwise on plans.

3. After tests indicate that the concrete has reached sufficient strength, the tendons shall be stressed by means of hydraulic jacks equipped with accurate reading, calibrated hydraulic pressure gauges, to permit the stress in the prestressing steel to be computed at any time.

a. A calibration chart shall accompany each jack.
b. If inconsistencies between the measured elongation and the jack gauge reading occur, the jack-gauge-pump unit shall be recalibrated.

c. An agreement of within 5% shall be satisfactory.

4. To ensure that proper calibration is maintained, care shall be exercised in the handling of all stressing equipment.

a. Adequate power should be available to avoid power drop at the equipment.

D. Backstressing:

1. All fixed and stressing anchorages shall be backstressed in accordance with the following procedures.

2. Starting Anchorage Post: At front side of post anchorage, insert wedges into anchorage and hand seat. At backside of same anchorage point, temporarily stress, without anchoring, each strand to a force of 80 percent of the ultimate cable strength using a slotted steel bearing plate at the concrete face. This operation will fully seat the wedges on the front side.

3. Ending Anchorage Post: Stress cables in accordance with Section C above and power seat the wedges. At opposite of same anchorage point, temporarily stress, without anchoring, each strand to a force of 80 percent of the ultimate cable strength using a slotted steel bearing plate at the concrete face. This operation will fully seat the wedges on the anchor side.

4. Adjustable Anchors: Wedges shall be mechanically and / or hydraulically seated with a force of 80 percent of the ultimate cable strength into the barrel housing to ensure engagement of the wedge teeth into the barrier cable.

E. Grouting Anchorage Recesses:

1. After the stressing records have been approved, cut off the excess tendon strand slightly inside the face of the finished concrete surface, but not less than 1” away from the face of the anchorage.

2. Prior to installing the grout, the inside concrete surfaces of the recess shall be cleaned to remove laitance or grease to enhance the bond of the grout.

3. Anchorage assemblies shall be coated with a suitable rust preventative material.

4. Anchorage recesses shall be filled flush with a non-metallic non-shrink grout mixture compatible for use with prestressing steel. The grout shall not contain chlorides or other chemical known to be deleterious to the steel.

5. Barrier cable sleeves at anchorage columns shall be sealed with a sealant to prevent water from following the path of the barrier cable to the anchorage. Sealant shall extend at least 1-inch past the face of the column.

END OF SECTION 051500

SECTION 054100 - EXTERIOR COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section includes requirements for the materials and services for design and installation of the steel stud exterior non-load-bearing wall framing including anchorage and bracing. Design and provide exterior wall stud framing system capable of resisting the wind forces as indicated on the drawings. Framing system design should include all accessories required for anchorage and bracing.

B. Cold-formed steel design, fabrication and erection shall be in accordance with AISI S100 "North American specification for the design of cold-formed steel structural members".

C. Design of cold-formed steel structural members and their connections shall be the sole responsibility of the contractor. Submit shop drawings sealed an engineer licensed in the project state. shop drawings shall include drawings for framing members showing size and gage designations, number, type, location and spacing. indicate supplemental strapping, bracing, bridging, accessories and details required for proper installation. Review of shop drawings shall be for conformance with the contract documents regarding arrangement and sizes of members and the contractor's interpretation of the design loads and contract document details. such review shall not relieve the contractor of full responsibility for the design of the cold-formed steel structural members and their connections.

D. Cold-formed steel wall systems shall be designed to accommodate differential live load deflections between floors.

1.02 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

1.03 REFERENCES

A. ASTM A653/A653M-02a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. AWS D1.3 - Structural Welding Code: Sheet Steel.

C. AISI - Specification for the Design of Cold-Formed Steel Structural Members.

1.04 SUBMITTALS

A. Submit manufacturer's product information clearly describing quality, performance and finish for steel studs.

B. Submit design criteria prepared by the manufacturer/supplier for approval by the Architect/Structural Engineer. Design criteria shall include, but not be limited to the following:

1. Deflection of steel studs shall not exceed L/360. Verify with EIFS supplier to ensure warranty requirements are met.
2. Wind speed as indicated in Structural Notes.

C. Submit stamped shop drawings and calculations prepared by a registered engineer for approval by the Architect/Structural Engineer. These drawings should include the following:

1. Plans, cross-sections, or elevations as necessary to adequately depict component locations.
2. Stud gage, size and spacing.
3. Connection details showing screw types and locations, weld lengths or other fastener requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of three years documented experience in the manufacturing of products required by the Contract Documents. Acceptable manufacturers are Dietrich Industries and Unimast Incorporated.

B. Installer shall have a minimum of three years documented experience.

C. Design framing system under the direct supervision of a professional structural engineer licensed in the state where the Project is located.

D. Coordinate the placement of components within the stud framing system.

E. Structural Testing/Inspection Agency shall perform the following quality related items:

1. To become familiar with and to keep the Architect/Engineer informed about the quality of work.
2. To guard the Owner against defects and deficiencies in the work.
3. To verify general compliance with the Contract Documents for the following items:
   a. size and spacing of studs and fasteners.
   b. size and location of header beams and supporting studs.

1.06 MOCKUP

A. Unless directed otherwise by the architect, 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 framing accessories. Include interior and exterior corner conditions, and intersections with interior rated stud walls.
2. Typical window frame, door frame and expansion joint.

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.

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 12, 14, or 16 gage shall meet the requirements of ASTM A653, with a minimum yield of 50,000 psi. Studs and accessories which are 18 or 20 gage shall meet the requirements of ASTM A653, with a minimum yield of 33,000 psi.

B. Studs and accessories shall have a G60 galvanized coating meeting the requirements of ASTM A653.

C. Stud gage and spacing shall be determined by engineering analysis and shown in approved shop drawings. Minimum 20 gage studs shall be provided.

D. Substitution of products of other manufacturers may be acceptable. Submit manufacturer literature for approval.

E. Expansion anchors shall be stud type, and shall be zinc plated in accordance with ASTM B633, Type III Fe/Zn 5. 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.

F. Welding: AWS D1.3-8 Structural Welding Code-Sheet Metal (field welding of material shall not be permitted for 20 gage material or thinner).

G. Acoustical Sealant: USG, or approved equal. Refer to Architectural.

PART 3 - EXECUTION

3.01 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 Spacings: As indicated in the approved shop drawings.

C. Stud Tracks: Before installing stud tracks for exterior walls, apply two 1/2- inch round beads of acoustical sealant longitudinally under stud tracks to seal runner to floor.

1. Anchor stud tracks to floor with power-driven fasteners staggered at 16 inches on-center maximum spacing.
2. Attach flange of stud to track with #8 screw through each flange minimum.

D. Door Openings: Install double studs each side of door openings unless noted otherwise on approved shop drawings.

1. Install double studs horizontally between door jambs at door headers.
2. On top of headers, install runners to receive bottom ends of studs over door openings.

E. Window Openings: Install double studs each side of window openings unless noted otherwise on approved shop drawings.

1. Install a minimum of two attached studs horizontally between window jambs to form sills and headers.
2. On top of headers and bottom of sills, install runners to receive short studs.
3. Attach wood blocking to stud framing with a minimum of #10 screws @ 6” o.c. or 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. For windows over 8 feet wide, attach sill and header studs/track to structural steel bracing (when provided) with self-drilling screws. Otherwise, see stamped metal stud shop drawings for metal stud kickers required.

F. Corners: Construct using a minimum of three studs.

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 doubled jamb studs and doubled headers not accessible to insulation contractors, insulation equal to that specified elsewhere shall be provided.

END OF SECTION 054100

SECTION 055000 - METAL FABRICATIONS

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:

1. Steel framing and supports for equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Elevator machine beams, hoist beams, and divider beams.
4. Steel shapes for supporting elevator door sills.
5. Metal ladders.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
2. Steel shapes for supporting elevator door sills.
3. Metal ladders.

1.5 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099100.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with primer specified in Section 099100 where indicated.

2.6 METAL LADDERS

A. General

1. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.

2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.

3. Rungs: 3/4 -inch-diameter steel bars.

4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

5. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Harsco Industrial IKG, a division of Harsco Corporation.
2) ALGRIP; Ross Technology Corporation.
3) SlipNOT Metal Safety Flooring; W.S. Molnar Company.

6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

2.7 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100.

END OF SECTION 055000

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel decorative railings.

1.2 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of decorative metal railings assembled from standard components.
2. Fasteners.
3. Post-installed anchors.
4. Shop primer.
5. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

1. For illuminated railings, include wiring diagrams and roughing-in details.

C. Samples for Initial Selection: For products involving selection of color, texture, or design[, including mechanical finishes].

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups as shown on Drawings.
2. Build mockups for each form and finish of railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Railings, including attachment to building construction, are to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STAINLESS STEEL DECORATIVE RAILINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AGS Stainless Inc.

2. C.R. Laurence Co., Inc.

3. VIVA Railings, LLC.

B. Source Limitations: Obtain stainless steel decorative railing components from single source from single manufacturer.

C. Stainless Steel Cable and Cable Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AGS Stainless Inc.

b. C.R. Laurence Co., Inc.

c. VIVA Railings, LLC.

2. Cable: wire cable made from wire complying with ASTM A492, Type 316.

3. Cable Diameter: 1/4 inch (6.4 mm).

4. Cable Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of cable with which they are used.

5. Intermediate Cable Supports: Stainless steel flat bar, 1/4-by-1-inch, predrilled.

2.3 FASTENERS

A. Fastener Materials:

1. Stainless Steel Railing Components: stainless steel fasteners.

2. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For stainless steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Compatible with coating system specified.

C. Galvanizing Repair Paint: High-zinc-dust-content paint compatible with coating system specified.

D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting." Section 099600 "High-Performance Coatings."

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

2.5 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.

2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.

2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water.

1. Provide weep holes where water may accumulate.

2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded or mechanical connections based upon manufacturers standard, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.

1. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. By bending or by inserting prefabricated elbow fittings.

K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.

2. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

Q. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.

1. Provide socket covers designed and fabricated to resist being dislodged.

2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

R. Stainless Steel Cable Guard Infill: Fabricate cable guard infill assemblies in the shop to field-measured dimensions with fittings machine swaged.

1. Minimize amount of turnbuckle take-up used for dimensional adjustment, so maximum amount is available for tensioning cable.

2. Tag cable assemblies and fittings to identify installation locations and orientations for coordinated installation.

S. Toe Boards: Where indicated on Drawings, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of [aluminum] [and] [copper alloys] that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.

2. For copper-alloy railings, attach posts as indicated, using fittings designed and engineered for this purpose.

3. For stainless steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

4. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with sleeves concealed withinrailing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

C. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

3.6 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099100 "Exterior Painting, Interior Painting, High-Performance Coatings, Staining, and Transparent Finishing."

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made .

B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings in accordance with ASTM E894 and ASTM E935 for compliance with performance requirements.

C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

3.8 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

B. Clean copper alloys in accordance with metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.

C. Clean rails and handrail caps by wiping with a damp cloth and then wiping dry.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.9 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION **057300**

SECTION 057500 - DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

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

1.2 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes of deterioration.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. Shop Drawings: Show fabrication and installation details for decorative formed metal.

1. Include plans, elevations, component details, and attachment details.

2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups for the following types of decorative formed metal:

a. Perforated metal panels.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. For decorative metal items, obtain each color, grade, finish, type, and variety of metal from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design decorative formed metal, including attachment to building construction.

B. Structural Performance: Decorative formed metal items, including anchors and connections, are to withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:

1. Wind Loads on Exterior Items: As indicated on Drawings.

C. Seismic Performance: Exterior decorative formed metal items, including anchors and connections, are to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.0.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 SHEET METAL

A. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Aluminum Sheet: Flat sheet complying with ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.

2.4 MISCELLANEOUS MATERIALS

A. Sealants, Exterior: Elastomeric sealant complying with Section 079200 "Joint Sealants" and as recommended in writing by decorative formed metal manufacturer.

B. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless otherwise indicated.

C. Structural Anchors: For applications indicated to comply with certain design loads, provide fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

D. Nonstructural Anchors: For applications not indicated to comply with design loads, provide fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.

E. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal, will prevent telegraphing and oil-canning, and is compatible with substrate and noncombustible after curing.

F. Isolation Coating: Manufacturer's standard.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.

D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.6 GENERAL FINISH REQUIREMENTS

A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

D. Finish items indicated on Drawings after assembly.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, or thicker.

1. Color: To be selected by Architect from the Manufacturer’s full product line.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Install concealed gaskets, joint fillers, insulation, sealants, and flashings, as the Work progresses, to make exterior decorative formed metal items weatherproof.

E. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

F. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with water and soap, rinsing with clean water, and drying with soft cloths.

B. Clean copper alloys according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.

C. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099100 "Exterior Painting, Interior Painting, High Performance Coatings, Staining and Transparent Finishing."

D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION **057500**

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

C. Application: Treat all rough carpentry unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

B. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

C. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use copper naphthenate for items not continuously protected from liquid water.

E. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).

2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 - SHEATHING

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:
1. Parapet sheathing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 061643 "HCA Gypsum Sheathing for gypsum sheathing.

1.3 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.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 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

2.1 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b for exterior construction not in contact with ground and Use Category UC4a for items in contact with ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.2 PARAPET SHEATHING

A. Plywood Sheathing: Exterior, Structural sheathing.
   1. Span Rating: Not less than 16/0.
   2. Nominal Thickness: Not less than 3/4" unless otherwise noted.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For parapet sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
   2. For wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 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. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.

D. Coordinate parapet 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 parapet 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.

END OF SECTION 061600

SECTION 061643 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gypsum wall sheathing.
   2. Sheathing joint and penetration treatment.

B. Related Requirements:
   1. Section 054100 “Exterior Cold-Formed Metal Framing.”
   2. Section 061600 "Sheathing” for sheathing to be installed on backside of parapet walls.

1.2 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.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports, if required.

1.5 QUALITY ASSURANCE

A. 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.

1.6 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

2.1 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.

B. Coordinate gypsum sheathing with any requirements from manufacturer and Florida Building Code's Notice of Acceptance or Florida Product Approval.

2.2 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: Type X, 5/8 inch (15.9 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.

2.3 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 or of Type 304 stainless steel.

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.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sheathing Sealant: Refer to Section 072419 "Water Drainage EIFS System." Sealant must be approved by Air-Barrier manufacturer.

PART 3 - EXECUTION

3.1 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.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
2. 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”.

3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to “EIFS” 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 or 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.

3.4 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 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cold-applied, emulsified-asphalt dampproofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

B. 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.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Trowel Coats: ASTM D 1227, Type II, Class 1.

B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Protection Course: ASTM D 6506, 1/8-inch- thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for substrate preparation, dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.

1. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

D. Where dampproofing interior face of above-grade, exterior concrete walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft., or one trowel coat at not less than 4 gal./100 sq. ft..

B. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft..

C. Concrete Backup for Brick Veneer Assemblies: Apply one brush or spray coat at not less than 1 gal./100 sq. ft..

D. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..

E. Interior Face of Exterior Concrete Walls: Where above grade and indicated to be furred and finished, apply one brush or spray coat at not less than 1 gal./100 sq. ft..

3.3 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

END OF SECTION 071113

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

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:

1. Modified bituminous sheet waterproofing.

2. Molded sheet drainage panel.

B. Related Requirements:

1. Division 07 Section "Expansion Control" for foundation-wall expansion-joint assemblies that interface with waterproofing.

2. Division 07 Section "Thermal Insulation" for below grade insulation boards that interface with waterproofing as protection course.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch (200-by-200-mm) square of waterproofing and flashing sheet.
2. 4-by-4-inch (100-by-100-mm) square of drainage panel.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following :

a. American Hydrotech, Inc.; VM75.
b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
c. Grace, W. R., & Co. - Conn.; Bituthene 3000/Low Temperature.

2. Physical Properties:

a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

1. Products: Subject to compliance with requirements, provide one of the following :

a. American Hydrotech, Inc.; Hydrodrain 400.
b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRAIN 6000XL.
c. Grace, W. R., & Co. - Conn.; Hydroduct 200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic.

G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

I. Immediately install protection course with butted joints over waterproofing membrane.

1. Board insulation may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation before installing drainage panels.

3.5 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.

B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.

C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.6 FIELD QUALITY CONTROL

A. Owner will engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

B. Prepare test and inspection reports.

3.7 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

SECTION 072419 – WATER DRAINAGE EIFS SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Water-drainage exterior insulation and finish system (EIFS) including liquid-applied air/moisture applied over gypsum sheathing.

B. Related Sections include the following:
   1. Division 06 Section "Gypsum Sheathing" for sheathing.
   2. Division 07 Section "Joint Sealants" for requirements of joints sealants used in EIFS.

1.2 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.

1.3 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 initial Selection: Color to match existing where abutting existing building. Submit manufacturer’s color chart showing complete line of available colors and textures for selection by Architect.

   1. Coordinate submittal of color chart with submittal of joint sealant color samples specified in Division 07 Section “Joint Sealants.”
   2. Architect will select colors for these items concurrently, for subsequent incorporation of these items into mock-up panel, and to facilitate desired color scheme for entire building.

D. 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.

1.4 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.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.

B. Warranties: Special warranty specified in this Section.

1.6 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. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Include each trade whose work is adjacent to or interfaces with EIFS.
2. Include system manufacturer's representative.

1.7 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.

1.8 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.

1.9 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.
c. Insulation adhesive.
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

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following and coordinate with manufacturers listed in Document 002150 - Owner’s Preferred Vendor List. No substitutions permitted.

1. Dryvit Systems, Inc., West Warwick, RI.
2. Sto Corp.
3. Substitutions: None allowed.

2.2 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with the following:

1. Impact Rating: product is tested to meet a Notice of Acceptance or Florida Product Approval for large missile (located within 30 feet of grade) or small missile (more than 30 feet above grade) impact for current Florida Building code for Risk Category IV: Essential Facility buildings or structures (ASTM Level E).

2. Structural Performance: Meets wind loads indicated on structural drawings and the current Florida Building Code.

3. 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.
4. 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. 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.
3. 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.
4. Tensile Adhesion: No failure in the EIFS, adhesive, base coat, or finish coat when tested per ICC-ES AC235.
5. 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.
6. 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.

7. Drainage: According to ICC-ES AC235.
8. Structural Performance Testing: EIFS assembly and components shall comply with ICC-ES AC235 when tested per ASTM E 330.

2.3 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 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.

2.4 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. Window Sill Flashing: Clear anodized aluminum with drip for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior, as specified in Section 076200 “Sheet Metal Flashing and Trim”.

C. Window Head Flashing: Prefabricated type, 0.032 inch clear anodized with drip designed to direct water to exterior.

2.5 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.

2.6 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

3.1 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.

3.2 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.

3.3 EIFS INSTALLATION, GENERAL

A. Comply with EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 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.

3.5 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. Install per EIFS manufacturer guidelines.
2. Window Sill and Head Flashing: Use at windows unless otherwise indicated.

3.6 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.

3.7 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.
1. 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.

3.8 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.

3.9 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 072419

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 075423 – TPO ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Adhered TPO membrane roofing system.
2. Roof insulation.
3. Vapor Barrier.
4. Coverboard.

B. Related Sections:
1. Document 002150 Preferred Vendors and Manufacturers
2. Division 06 Section “Rough Carpentry” for wood nailers, curbs, and blocking.
3. Division 07 Section “Sheet Metal Flashing and Trim” for metal roof penetration flashings, flashings, and counterflashings.
4. Division 07 Section “Joint Sealants” for joint sealants, joint fillers, and joint preparation.

1.2 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.

1.3 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. Energy Performance: Provide roofing system with three-year aged Solar Reflectance Index not less than 64 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

1.4 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. Vapor barrier.
4. Installation accessories.
5. Coverboard.

C. Certificates and Warranties
   1. Sample Manufacturer’s Warranty.
   2. Sample Contractor’s Warranty.
   3. Certificate of UL compliance.

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.

E. Samples for Verification:
   1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
   2. Roof insulation.
   3. Vapor barrier
   4. Metal termination bars.
   5. Six insulation fasteners of each type, length, and finish.
   6. Coverboard

1.5 INFORMATIONAL SUBMITTALS

A. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

B. 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.

C. Preinstallation meeting records.

D. 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.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Manufacturer warranties.

1.7 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. 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.

F. 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.

1.8 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.

1.9 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, 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

2.1 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 one of the following listed on the Owner's Preferred Vendor List, Document 002150:
        a. Carlisle SynTec Incorporated.
        b. Fiber-Tite/Seaman Corporation.
        c. GenFlex Roofing Systems.
        d. Firestone Building Products Company.
        e. Sarnafil/Sika Group.
        f. 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.

2.2 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.

D. 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.

E. 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.

F. 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.

2.3 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.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 2, 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.

2.4 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 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.

2.5 VAPOR BARRIERS

A. Polyethylene Vapor Barriers: ASTM D4397, thick sheet, with maximum permeance rating of 0.1 perm.

2.6 VAPOR BARRIER ACCESSORIES

A. Vapor Barrier Tape: Pressure-sensitive tape of type recommended by vapor barrier manufacturer for sealing joints and penetrations in vapor barrier.

B. Adhesive for Vapor Barriers: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

C. Vapor Barrier Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

2.7 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

B. Asphalt Primer: ASTM D 41.

2.8 COVERBOARD

A. High-Density Polyisocyanurate Coverboard: ASTM C1289, Type II, Class 4, Grade 2, glass-fiber mat facer on exterior surface.

B. Thickness: 1/2-inch

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

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 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 to resist uplift pressure at corners, perimeter, and field of roof.
   2. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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 076113 - STANDING-SEAM METAL ROOF PANELS

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 standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. 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 mockup of typical roof area and eave, including fascia, and soffit as shown on Drawings; approximately 12 feet (3.5 m) square by full thickness, including attachments, underlayment, and accessories.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Solar Reflectance Index: Not less than 78 for slopes at 2:12 and 29 for slopes greater than 2:12 when calculated according to ASTM E 1980.

B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces .

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
1. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PAC-Clad Snap-Clad Panels by Petersen Aluminum Corporation or products by one of the following:

a. MBCI

b. Morin, a Kingspan Company

c. Sheffield Metals International, a Mazzella Company.

d. McElroy Metal

2. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

a. Thickness: 0.032 inch (1.02 mm).
b. Surface: Smooth, flat finish.
c. Exterior Finish: Factory applied, baked-on 70% Kynar 500 PVDF fluoropolymer resin based Fluropon paint coating
d. Color: As selected by Architect from manufacturer's full range.
e. Stiffener bead.

3. Clips: Two-piece floating to accommodate thermal movement.

a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.

4. Panel Coverage: 16 inches (406 mm) .
5. Panel Height: 1.75 inches (44 mm) .

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    b. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT .
    c. Metal-Fab Manufacturing, LLC; MetShield.

B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, corners, bases, framed openings, ridges, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels .

E. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Roof Curbs: Fabricated from same material as roof panels, 0.048-inch (1.2-mm) nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.

1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

G. Panel Fasteners: Self-tapping screws designed to withstand design loads.

H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Factory applied, baked-on 70% Kynar 500 PVDF fluoropolymer resin based Fluropon paint coating as manufactured by Valspar.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
   1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

      a. Verify that air or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below , wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

   1. Apply over the entire roof surface.

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.

3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
   1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

   1. Install clips to supports with self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
   4. Watertight Installation:

      a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
      b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
      c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

   1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
   1. Connect downspouts to underground drainage system indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076113

DEPARTMENT OF REGULATORY AND ECONOMIC RESOURCES (RER)
BOARD AND CODE ADMINISTRATION DIVISION

MIAMI-DADE COUNTY
PRODUCT CONTROL SECTION
11805 SW 26 Street, Room 208
Miami, Florida 33175-2474
T (786) 315-2590 F (786) 315-2599
www.miamidade.gov/economy

NOTICE OF ACCEPTANCE (NOA)

Petersen Aluminum Corporation
102 Northpoint Parkway, Bldg. 106
Acworth, GA 33102

SCOPE:

This NOA is being issued under the applicable rules and regulations governing the use of construction materials. The documentation submitted has been reviewed and accepted by Miami-Dade County RER - Product Control Section to be used in Miami-Dade County and other areas, where allowed by the Authority Having Jurisdiction (AHJ).

This NOA shall not be valid after the expiration date stated below. The Miami-Dade County Product Control Section (In Miami-Dade County) and/or the AHJ (in areas other than Miami-Dade County) reserve the right to have this product or material tested for quality assurance purposes. If this product or material fails to perform in the accepted manner, the manufacturer will incur the expense of such testing and the AHJ may immediately revoke, modify, or suspend the use of such product or material within their jurisdiction. RER reserves the right to revoke this acceptance if it is determined by Miami-Dade County Product Control Section that this product or material fails to meet the requirements of the applicable building code.
This product is approved as described herein and has been designed to comply with the Florida Building Code including the High Velocity Hurricane Zone of the Florida Building Code.

DESCRIPTION: Snap-Clad 0.032in (min.) x 12in thru 18in Wide Aluminum Panel over Wood Deck

LABELING: Each unit shall bear a permanent label with the manufacturer's name or logo, city, state and following statement: "Miami-Dade County Product Control Approved", unless otherwise noted herein.

RENEWAL of this NOA shall be considered after a renewal application has been filed and there has been no change in the applicable building code negatively affecting the performance of this product.

TERMINATION of this NOA will occur after the expiration date or if there has been a revision or change in the materials, use, and/or manufacture of the product or process. Misuse of this NOA as an endorsement of any product, for sales, advertising or any other purposes shall automatically terminate this NOA. Failure to comply with any section of this NOA shall be cause for termination and removal of NOA.

ADVERTISEMENT: The NOA number preceded by the words Miami-Dade County, Florida, and followed by the expiration date may be displayed in advertising literature. If any portion of the NOA is displayed, then it shall be done in its entirety.

INSPECTION: A copy of this entire NOA shall be provided to the user by the manufacturer or its distributors and shall be available for inspection at the job site at the request of the Building Official.

This NOA renews **NOA–No. 19–1028.15** and consists of pages 1 through 5.
The submitted documentation was reviewed by Sifang Zhao, P.E.

MIAMI-DADE COUNTY APPROVED

01/19/2023

NOA–No.: 22–1104.11
Expiration Date: 04/18/2028
Approval Date: 01/19/2023

ROOFING SYSTEM APPROVAL:

Category:	Roofing
Sub-Category:	Metal, Panels (Non-Structural)
Material:	Aluminum
Deck Type:	Wood
Maximum Design Pressure:	**–153.50 psf**

TRADE NAMES OF PRODUCTS MANUFACTURED OR LABELED BY APPLICANT:

Product	Dimensions	Test Specifications	Product Description
Snap-Clad 0.032" x 12"-18" Wide Aluminum Panel	Length: various Height: 1 ¾" Width: 12" thru 18" Thickness 0.032" Min. Yield Strength: 26 ksi	TAS 110	Corrosion resistant preformed standing seam, coated, pre-finished aluminum panels.
Individual Clip	Length: 3.5" Height: 1.875" Width: 1.982" Thickness: 20 ga	TAS 110	20 ga. galvanized or galvalume steel clip with 2 holes, or 20 ga. stainless steel clip with 2 holes.

EVIDENCE SUBMITTED:

Test Agency	Test Identifier	Test Name/Report	Date
Valspar	433X515	ASTM B 117	11/21/11
	433B173	ASTM D 4587, ASTM G 23	11/21/11
Architectural Testing	73784.01-109-18	TAS-100	08/10/07
	D0841.01-450-18-r2	TAS-125	10/03/16
Intertek	J5603.02-450-18	TAS-100	09/26/19

APPROVED ASSEMBLIES:

System:	Snap-Clad 0.032" (min.) x 12" thru 18" Wide Aluminum Panel
Deck Type:	Wood, Non-insulated
Deck Description:	New Construction $^{19}/_{32}$" or greater plywood or wood plank, or for re-roofing 15/32" or greater plywood.
Slope Range:	2":12" or greater
Maximum Uplift Pressure:	**See Table A Below**
Deck Attachment:	In accordance with applicable Building Code, but in no case shall it be less than 8d x 2" ring shank nails spaced 6" o.c. In reroofing, where the deck is less than $^{19}/_{32}$" thick (Minimum $^{15}/_{32}$") The above attachment method must be in addition to existing attachment.
Underlayment:	Minimum Underlayment shall be an ASTM D 226 Type II installed with a minimum 4" side-lap and 6" end-laps. Underlayment shall be fastened with corrosion resistant tin-caps and 12 gauge 1 ¼" annular ring-shank nails, spaced 6" o.c. at all laps and two staggered rows 12" o.c. in the field of the roll. Or, any approved Underlayment having a current NOA.
Fire Barrier Board:	Any approved fire barrier having a current NOA. Refer to a current fire directory listing for fire ratings of this roofing system assembly as well as the location of the fire barrier within the assembly. See Limitation # 1.
Valleys:	Valley construction shall be in compliance with Roofing Application Standard RAS 133 and with the current published installation instructions and details in PAC Contractors Association's Roofing Installation Manual.
Metal Panels and Accessories:	Install the " Snap-Clad 0.032" x 12"-18" Wide Aluminum Panel " panels including flashing penetrations, valleys, end laps and accessories in compliance PAC Contractors Association's current, published installation instructions and in compliance with the minimum requirements detailed in Roofing Application Standard RAS 133. Panels shall be installed along the rib with SNAP CLAD Clips secured with #10 pancake head screws (2 per clip); the screws shall be of sufficient length to penetrate through the sheathing a minimum of $^{3}/_{16}$". The female rib of panel is snapped over the male rib of panel. Panel clips shall be spaced a maximum distance listed below in **Table A**.

TABLE A
MAXIMUM DESIGN PRESSURES

Roof Areas	Field	Perimeter and Corner[1]
Maximum Design Pressures	**-86.00 psf.**	**-153.50 psf**
Clip Type	**Individual**	**Individual**
Maximum Clip Spacing	**24" o.c.**	**6" o.c.**

1. Extrapolation shall not be allowed

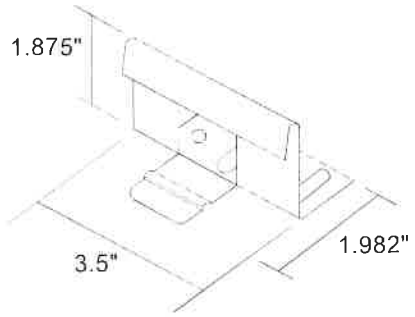
LIMITATIONS

1. Fire classification is not part of this acceptance; refer to a current Approved Roofing Materials Directory for fire ratings of this product.
2. The maximum designed pressure listed herein shall be applicable to all roof pressure zones (i.e., field, perimeters, and corners). Neither rational analysis, nor extrapolation shall be permitted for enhanced fastening at enhanced pressure zones (i.e., perimeters, extended corners and corners).
3. Panels may be roll formed in continuous lengths from eave to ridge. Maximum lengths shall be as described in Roofing Application Standard RAS 133.
4. All panels shall be permanently labeled with the manufacturer's name and/or logo, city, state, and the following statement: "Miami-Dade County Product Control Approved" **or** with the Miami-Dade County Product Control Seal as seen below. All clips shall be permanently labeled with the manufacturer's name and/or logo, and/or model.



5. All products listed herein shall have a quality assurance audit in accordance with the Florida Building Code and Rule **61G20-3** of the Florida Administrative Code.
6. Panels may be shop or jobsite roll formed with machine model #'s **10110884, E00578860 and 01110072** from PAC Contractors Association.

DRAWINGS



INDIVIDUAL CLIP



1.75" HIGH X 12" THRU 18" WIDE SNAP-CLAD PANEL

OPTIONAL FACTORY OR FIELD APPLIED SEALANT IN THE SEAM

CLIP RELIEFS, STIFFENING RIBS AND STRIATIONS OPTIONAL

END OF THIS ACCEPTANCE

SECTION 076200 - SHEET METAL FLASHING AND TRIM

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:

1. Formed wall sheet metal fabrications.
2. Formed overhead-piping safety pans.

B. Related Requirements:

1. Section 075423 "TPO Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.
2. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashings.
3. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
4. Section 079513.13 "Interior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.
5. Section 079513.16 "Exterior Expansion Joint Cover Assemblies" for manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of special conditions.
8. Include details of connections to adjoining work.
9. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:
a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); pre-painted by coil-coating process to comply with ASTM A755/A755M.

1. Surface: Smooth, flat.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.

1. Source Limitations: Obtain underlayment from single source from single manufacturer.

C. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Source Limitations: Obtain underlayment from single source from single manufacturer.

2. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.

4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

2.6 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend beyond wall openings as indicated on drawings. Form head and sill flashing with end dams as indicated. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

2. Stainless Steel: 0.016 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Galvanized Steel: 0.040 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.

1. Install in shingle fashion to shed water.

2. Lap joints not less than 2 inches.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

1. Lap horizontal joints not less than 4 inches.

2. Lap end joints not less than 12 inches.

C. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.

2. Prime substrate if recommended by underlayment manufacturer.

3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.

4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.

5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.

6. Roll laps and edges with roller.

7. Cover underlayment within 14 days.

D. Install slip sheet, wrinkle free, before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.

2. Lapp joints not less than 4 inches.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.

3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.

4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.

5. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.

7. Do not field cut sheet metal flashing and trim by torch.

8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend beyond wall openings as indicated.

3.5 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.

2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans:

1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.

2. Pipe and install drain line to plumbing waste or drainage system.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION **076200**

SECTION 077100 – ROOF SPECIALTIES

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:

1. Copings.
2. Reglets and Counterflashings.
3. Scuppers.

B. Related Sections:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:

1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
3. Details of termination points and assemblies, including fixed points.
4. Details of special conditions.

C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

D. Samples for Verification: For copings roof-edge flashings, roof-edge drainage systems, reglets and counterflashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.

B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. 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 mockup of typical roof edge, including fascia, gutter and downspout, approximately 10 feet long, including supporting construction, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.9 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

1. Surface: Smooth, flat finish. Retain one or more of four finish subparagraphs below. If retaining more than one, indicate location of each on Drawings or by inserts.

2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

1. Exposed High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 2604. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.2 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
    b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
    c. Owens Corning; WeatherLock Metal High Temperature Underlayment.

C. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Carlisle SecurEdge 300 coping system or comparable product by one of the following:

    a. Architectural Products Company
    b. Hickman Company, W.P.
    c. Metal-Era, Inc.
    d. Perimeter Systems; a division of SAF.

2. Extruded-Aluminum Coping Caps: Extruded aluminum, thickness as required to meet performance requirements.

    a. Finish: Two-coat fluoropolymer.

3. Corners: Factory mitered and continuously welded.
4. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.

    a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.6 REGLETS AND COUNTERFLASHINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Architectural Products Company.
    b. Cheney Flashing Company.
    c. Hickman Company, W. P.
    d. MM Systems Corporation.
    e. National Sheet Metal Systems, Inc.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

    1. Formed Aluminum**:** 0.050 inch thick.

    2. Stainless Steel: 0.025 inch thick.

    3. Corners: Factory mitered and continuously welded.

    4. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

    5. Stucco Type, Embedded: Provide reglets with upturned fastening flange and extension leg of length to match thickness of applied finish materials.

    6. Concrete Type, Embedded: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:

    1. Formed Aluminum: 0.032 inch thick.

    2. Stainless Steel: 0.025 inch thick.

D. Accessories:

    1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.

    2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

E. Aluminum Finish: Two-coat fluoropolymer.

1. Color: As selected by Architect from manufacturer's full range.

2.7 SCUPPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Architectural Products Company.
b. Cheney Flashing Company.
c. Hickman Company, W. P.
d. MM Systems Corporation.
e. National Sheet Metal Systems, Inc.

B. Scuppers: Aluminum sheet, ASTM B 209, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent.

1. Thickness:
   a. 0.019 inch (0.48 mm)
2. Size:
   a. As required.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

B. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Section 033000 "Cast-in-Place Concrete" for installation of reglets.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant. Fit counterflashings tightly to base flashings.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

DEPARTMENT OF REGULATORY AND ECONOMIC RESOURCES (RER)
BOARD AND CODE ADMINISTRATION DIVISION

MIAMI-DADE COUNTY
PRODUCT CONTROL SECTION
11805 SW 26 Street, Room 208
Miami, Florida 33175-2474
T (786) 315-2590 F (786) 315-2599
www.miamidade.gov/economy

NOTICE OF ACCEPTANCE (NOA)

Carlisle Syntec Systems a division of Carlisle Construction Materials
1285 Ritner Highway
Carlisle, PA. 17013

SCOPE:

This NOA is being issued under the applicable rules and regulations governing the use of construction materials. The documentation submitted has been reviewed and accepted by Miami-Dade County RER - Product Control Section to be used in Miami Dade County and other areas where allowed by the Authority Having Jurisdiction (AHJ).

This NOA shall not be valid after the expiration date stated below. The Miami-Dade County Product Control Section (In Miami Dade County) and/or the AHJ (in areas other than Miami Dade County) reserve the right to have this product or material tested for quality assurance purposes. If this product or material fails to perform in the accepted manner, the manufacturer will incur the expense of such testing and the AHJ may immediately revoke, modify, or suspend the use of such product or material within their jurisdiction. RER reserves the right to revoke this acceptance, if it is determined by Miami-Dade County Product Control Section that this product or material fails to meet the requirements of the applicable building code.
This product is approved as described herein, and has been designed to comply with the Florida Building Code including the High Velocity Hurricane Zone of the Florida Building Code.

DESCRIPTION: SecurEdge Roof Edge Termination Systems

LABELING: Each unit shall bear a permanent label with the manufacturer's name or logo, city, state and following statement: "Miami-Dade County Product Control Approved", unless otherwise noted herein.
RENEWAL of this NOA shall be considered after a renewal application has been filed and there has been no change in the applicable building code negatively affecting the performance of this product.

TERMINATION of this NOA will occur after the expiration date or if there has been a revision or change in the materials, use, and/or manufacture of the product or process. Misuse of this NOA as an endorsement of any product, for sales, advertising or any other purposes shall automatically terminate this NOA. Failure to comply with any section of this NOA shall be cause for termination and removal of NOA.

ADVERTISEMENT: The NOA number preceded by the words Miami-Dade County, Florida, and followed by the expiration date may be displayed in advertising literature. If any portion of the NOA is displayed, then it shall be done in its entirety.
INSPECTION: A copy of this entire NOA shall be provided to the user by the manufacturer or its distributors and shall be available for inspection at the job site at the request of the Building Official.

This NOA renews and revises NOA # 19-1023.03 and consists of pages 1 through 42.
The submitted documentation was reviewed by Alex Tigera.



ROOFING COMPONENT APPROVAL

Category: Roofing
Sub-Category: Roofing Fasteners
Materials Steel

SCOPE:

This approves roofing components "**SecurEdge Roof Edge Termination Systems**" as described in this Notice of Acceptance. Designed to comply with the Florida Building Code and the High Velocity Hurricane Zone of the Florida Building Code for the locations where the pressure requirements, as determined by applicable building code do not exceed the design pressure values listed herein.

TRADE NAMES OF PRODUCTS MANUFACTURED OR LABELED BY APPLICANT:

Table 1

Product Name	Dimensions	Test Specification	Product Description
SecurEdge 200 Coping	Coping: Max. 12" Outside Face Max. 4" Inside Face Max. Width 32" Wall Min. Thickness. 24ga. Anchor Clip: Max. Width. 12" Max. Length 12' Min. Thickness 20ga.	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.
SecurEdge 200 Gold Coping	Coping: Max. 12" Outside Face Max. 4" Inside Face Max. Width 32" Wall Max. Length 12' Min Thickness. 24ga. or 0.040" aluminum Anchor Clip: Max. Width. 12" Max. Length 12' Min. Thickness 16ga.	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.
SecurEdge One Fascia	Edge Metal: Max. Length 12' Max. Thickness 24ga. Formed Rail Cleat: Max. Length 12' Max. Thickness 20ga. Spring Clip: Max. Length 6' Max. Thickness 26ga.	TAS 111 (B)	Decorative galvanized steel fascia with continuous formed rail.

SecurEdge 2000 Standard Fascia	Max. 8.5” Outside Face Max. Length 12’ Min. Thickness 24ga.,or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous extruded aluminum bar.
SecurEdge 2000 Extended Fascia	Max. 13” Outside Face Max. Length 12’ Min. Thickness 0.050” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous extruded aluminum bar.
SecurEdge 2000 Extended Canted WD Fascia	Max. 8.5” Outside Face Max. Length 12’ Min. Thickness 24 ga. or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous extruded aluminum bar.
SecurEdge 2000 Drip Edge	Max. 7.5” Outside Face Max. Length 12’ Min. 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with extruded aluminum bar.
SecurEdge 2000 HG Fascia	Max. 10” Outside Face Max. Length 12’ Min. Thickness 22ga or 0.050” aluminum	TAS 111 (B)	Decorative aluminum fascia with continuous extruded aluminum bar.
SecurEdge 2000 HG Fascia with Eliminailer-T	Max. 10” Outside Face Max. Length 12’ Min. Thickness 22ga., or 0.050” aluminum	TAS 111 (B)	Decorative aluminum fascia with continuous extruded aluminum bar.
SecurWeld 200 Drip Edge	Max. 10” Front Face Max. Length 12’ Max 4” Top Flange Min. Thickness 24ga.,or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.
SecurEdge One Fascia (Single Ply)	Max. 8” Outside Face Max. Length 12’ Min. Thickness 24ga.,or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.
SecurEdge One Extended Fascia	Max. 12.5” Outside Face Max. Length 12’ Min. Thickness 0.050” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge 200 Gravel Stop	Max. 10” Outside Face Max. Length 12’ Max 4” Top Flange Min. Thickness 24ga.,or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.
SecurEdge System 200 Fascia, Crimp-On	Max. 12.5” Outside Face Max. Length 12’ Min. Thickness 24ga.,or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed galvanized waterdam.
SecurEdge System 200 Fascia, Snap-On	Max. 12.75” Face Height Max. Length 12’ Min. Thickness 24ga., or 0.040” aluminum	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with formed galvanized waterdam.
SecurEdge 200 Flush Face Coping	Max. 12” Outside Face Max. Length 12’ Max. Wall width 32”Inside Face 4” Min. Thickness 24ga. or 0.040” aluminum	TAS 111 (C)	Decorative aluminum or galvanized coping cap with galvanized steel anchor/support cleats.
SecurEdge 200 Continuous Cleat Coping	Max. 12” Outside Face Max. Length 12’ Max. Wall width 32” Inside Face 4” Min. Thickness 24ga., or 0.040” aluminum	TAS 111 (C)	Decorative aluminum or galvanized coping cap with galvanized steel anchor/support cleats.
SecurEdge 200 Single Cantilever Gold Coping	Max. 10” Outside Face Max. Length 12’ Max. Wall width 24” Max. 4” Inside Face Min. Thickness 24ga. or 0.040” aluminum	TAS 111 (C)	Decorative aluminum or galvanized coping cap with galvanized steel anchor/support cleats.
SecurEdge Eliminailer-T	Metal Deck or Masonry Wall: Max. 3” Face Height Max. 5.5” Flange Length Max. Length 12’ Min. Thickness. 0.100” aluminum Wood Nailer: Max. 3” Face Height Max. 2.5” Flange Length Max. Length 12’ Min. Thickness. 0.080” aluminum	FM 4435	A heavy gauge aluminum nailer replacement or enhancement for wood nailers having a 9/32 x 3/8” predrilled slotted holes spaced 6” o.c.

SecurEdge 300 Edgebox RI	Maximum Length 10' Maximum face leg 4.5" Maximum cap width 5.5"	TAS 111 (B)	An engineered metal replacement system for roof nailers.
SecurEdge Extender-A	Maximum Length 10' Maximum face leg 8"	TAS 111 (B)	System used to extend the coverage of continuous water-tight metal systems. Secured with a continuous cleat.
SecurEdge Extender-B	Maximum Length 10' Maximum face leg 8"	TAS 111 (B)	System used to extend the coverage of continuous water-tight metal systems. Secured with a continuous cleat.
Carlisle Industrial Gutter (Box)	Maximum length 10' Maximum face leg 7-3/4"	TAS 111 (B)	Gutters fabricated from either aluminum or prefinished steel.
Carlisle Industrial Gutter (Offset)	Maximum length 10' Maximum face leg 7-3/4"	TAS 111 (B)	Gutters fabricated from either aluminum or prefinished steel.
Carlisle Industrial Gutter (Chamfer)	Maximum length 10' Maximum face leg 7-3/4"	TAS 111 (B)	Gutters fabricated from either aluminum or prefinished steel.

EVIDENCE SUBMITTED:

Test Agency	Test Identifier	Test Name/Report	Date
Intertek ETL Semko	3032125	TAS 111(B)	10/31/02
		TAS 111(C)	10/31/02
	3033767	TAS 111 (B)	10/31/02
	3033767 Addendum	TAS 111 (B)	10/02/03
Farabaugh Engineering and Testing, Inc.	T295-16	TAS 111 (C)	11/02/16
	T294-16	TAS 111 (C)	11/02/16
	T291-16	TAS 111 (B)	11/02/16
Factory Mutual Research Corp.	3052487	FM 4435	08/17/16
	PR449542	FM 4435	10/02/18
	3062924	FM 4435	04/17/19

MANUFACTURING LOCATION

1. Waukesha, WI.

INSTALLATION:

SecurEdge 200 Coping (14"):

SecurEdge Anchor clips shall be spaced a maximum of three feet o.c. Anchor clips shall be fastened with #10 x 1-$^1/_2$" hex head screws fastened through the third hole of the top portion of the anchor clip the side where the stainless-steel spring clip is located (see detail "A" herein). And with two additional 1-¼" annular ring shank nail fastened in the provided holes on the opposite face at a maximum of 3" up from the bottom lip (see detail "A" herein).
Maximum Design Pressure: -168.5 psf. (vertical)

SecurEdge 200 Coping (16"):

SecurEdge Anchor clips shall be spaced a maximum of three feet O.C. Anchor clips shall be fastened with #10-12 s 1-1/2" long S.S. hex head screws with ½" washer. One fastener located in third full hole from bend on both sides of 12" wide anchor clip on inside face and outside face of coping. In addition, one fastener #14-12 x 1-1/2" long flat head screw located in hole closest to center of wood blocking on both sides of 12" anchor clip on inside wall of coping and one fastener #14-12 x 1-1/2" long flat head screw in fifth hold from bottom of drip edge on both sides of 12" wide anchor clip (see detail "B" herein).
Maximum Design Pressure: -301.7 psf. (horizontal); -261.5 psf. (vertical)

SecurEdge 200 Gold Coping:

SecurEdge Anchor clips shall be spaced a maximum of three feet O.C. Anchor clips shall be fastened with #10-12 s 1-1/2" long S.S. hex head screws with ½" washer. One fastener located in third full hole from bend on both sides of 12" wide anchor clip on inside face and outside face of coping. In addition, one fastener #14-12 x 1-1/2" long flat head screw located in hole closest to center of wood blocking on both sides of 12" anchor clip on inside wall of coping and one fastener #14-12 x 1-1/2" long flat head screw in fifth hold from bottom of drip edge on both sides of 12" wide anchor clip (see detail "C" herein).
Maximum Design Pressure: -368.3 psf. (horizontal); -242.8 psf. (vertical)

SecurEdge One Fascia

The top portion of the anchor bar shall be fastened with a minimum #10-12 x 2" S.S. hex head screw with ½" S.S. washer @ 12" on center secured to the top nailer (see detail "D" herein).
Maximum Design Pressure: -141.5 psf. (horizontal)

SecurEdge 2000 Standard Fascia	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous extruded aluminum bar.

SecurEdge 2000 Standard Fascia

- For Face Height less than or equal to 5.5 in (140 mm): The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) with washer secured on the vertical face with the fasteners spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) down from top of anchor bar.
- For Face Heights less than or equal to 8.5 in (216 mm) The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face in one row only. The top row of fasteners is spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top of the anchor bar.
- For Face Heights greater than 5.5 in (140 mm) and less than or equal to 8.5 in (216 mm) The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face in two rows. The top row of fasteners is spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top of the anchor bar. The bottom row of fasteners is spaced 24 in (610 mm) o.c. approximately 2.75 in (70 mm) from top of the anchor bar. The rows are staggered
- Fascia cover is installed over the anchor bar.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	5.5	262	454	272	570
0.040in. Alum [Fascia Cover]	8.5 [fastening only (1) row]	146	252	145	304
0.040in. Alum [Fascia Cover]	5.5 [fastening (2) rows]	175	302	163	342
0.040in. Alum [Fascia Cover]	8.5 fastening (2) rows]	175	302	163	342
24ga. Steel [Fascia Cover]	5.5	262	454	272	570
24ga. Steel [Fascia Cover]	8.5 [fastening only (1) row]	146	252	145	304
24ga. Steel [Fascia Cover]	5.5 [fastening (2) rows]	175	302	163	342
24ga. Steel [Fascia Cover]	8.5 [fastening (2) rows]	175	302	163	342

SecurEdge 2000 Extended Fascia	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous extruded aluminum bar.

SecurEdge 2000 Extended Fascia

- The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face with the fasteners spaced maximum 12 in (305 mm) o.c. approximately 1.25 in (32 mm) down from the top anchor bar.
- The cleat is secured to the wood nailer with #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face with the fasteners spaced maximum 24 in (610 mm) o.c. approximately 2.125 (54 mm) o.c. up from the bottom of the cleat
- Fascia cover is applied over the anchor bar.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.050in. Alum [Fascia Cover]	13	175	302	163	342
0.063in. Alum [Fascia Cover]	13	175	303	163	342
20ga. Steel [Cleat]	13	175	303	163	342

SecurEdge 2000 Extended Canted WD Fascia	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous extruded aluminum bar.

SecurEdge 2000 Extended Canted WD Fascia

- The waterdam is secured to wood nailers with 1.25 in (32 mm) long ring shank roofing nails spaced maximum 6 in (152 mm) o.c. 0.5 in (13 mm) from edge of roof flange or secured to the Eliminailer T using 4 in. (102 mm) wide 24 ga clips 72 in (1829 mm) o.c.
- The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates), or Tek 3 x 1 in (76 x 25 mm) long (Eliminailer T) secured on the vertical face with the fasteners spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top anchor bar.
- The cleat is secured to the wood nailer with 1/4 x1 1/4 masonry/wood screws secured on the vertical face with the fasteners spaced maximum 24 in (610 mm) o.c. approximately 2.0 (51 mm) o.c. up from the bottom of the cleat
- Fascia cover is snapped into place.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	5.5	175	302	163	342
0.050in. Alum [Fascia Cover]	8.5	291	504	289	607
0.050in. Alum [Fascia Cover]	10	204	353	199	417
0.050in. Alum [Fascia Cover]	13.5	131	227	127	266
0.063in. Alum [Fascia Cover]	8.5	291	504	289	607
0.063in. Alum [Fascia Cover]	10	204	353	199	417
0.063in. Alum [Fascia Cover]	13.5	131	227	127	266
20ga. Steel [Cleat]	13.5	131	227	127	266
22ga. Steel [Fascia Cover]	7.5	175	302	163	342
22ga. Steel [Fascia Cover]	10	175	302	163	342
24ga. Steel [Fascia Cover]	8.5	175	302	163	342
24ga. Steel [Waterdam]	13.5	131	227	127	266

SecurEdge 2000 Drip Edge	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge 2000 Drip Edge

- The anchor bar is secured to the wood nailer with #10-1.5 in (38 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face in two rows. The top row of fasteners is spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top of the anchor bar. The bottom row of fasteners is spaced 24 in (610 mm) o.c. approximately 2.75 in (70 mm) from top of the anchor bar. The rows are staggered
  • Fascia cover is applied over the anchor bar.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	6	568	983	560	1176
24ga. Steel [Fascia Cover]	6	568	983	561	1176

SecurEdge 2000 Drip Edge	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge 2000 Drip Edge

- The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face in two rows. The top row of fasteners is spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top of the anchor bar. (Optional) The bottom row of fasteners is spaced 24 in (610 mm) o.c. approximately 2.75 in (70 mm) from top of the anchor bar. The rows are staggered
  • Fascia cover is applied over the anchor bar.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)		# of Fastening Rows
		Horizontal	Vertical	Horizontal	Vertical	
0.040in. Alum [Fascia Cover]	7.5	87	151	90	190	1
	7.5	247	428	253	531	2

SecurEdge 2000 HG Fascia	TAS 111 (B)	Decorative aluminum fascia with continuous extruded aluminum bar.

SecurEdge 2000 HG Fascia

- The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured on the vertical face with the fasteners spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top anchor bar.
- Fascia cover is applied over the anchor bar.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	8.5	175	302	163	342
0.050in. Alum [Fascia Cover]	7	364	630	362	759
0.050in. Alum [Fascia Cover]	8.5	291	504	289	607
0.050in. Alum [Fascia Cover]	10	189	328	181	380
0.063in. Alum [Fascia Cover]	7	364	630	362	759
22ga. Steel [Fascia Cover]	8.5 or 10	175	302	163	342

SecurEdge 2000 HG Fascia with SecurEdge Eliminailer-T	TAS 111 (B)	Decorative aluminum fascia with continuous extruded aluminum bar.

SecurEdge 2000 HG Fascia with SecurEdge Eliminailer-T

- The anchor bar is secured to the wood nailer with #10-2.0 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates), or Tek 3 x 1 in (76 x 25 mm) long (Eliminailer T) secured on the vertical face with the fasteners spaced 12 in (305 mm) o.c. approximately 1.25 in (32 mm) from the top anchor bar.
- Fascia cover is applied over the anchor bar.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.050in. Alum [Fascia Cover]	10	204	353	199	417
22ga. Steel [Fascia Cover]	8.5 or 10	175	302	181	380

SecurEdge Eliminailer-T (Sub-assembly Performance)	TAS 111 (B)	Decorative aluminum fascia with continuous extruded aluminum bar.

SecurEdge Eliminailer-T (Sub-assembly Performance)

- The Eliminailer T is a heavy gauge aluminum nailer replacement or enhancement for wood nailers or masonry walls. When used with a masonry wall, the face height is 1.5 or 3 in. (38 or 76 mm), the flange length is 5.5 in. (140 mm) wide, and the thickness is 0.100 in. (2.5 mm), and it can be secured with a #14 masonry screw or 0.25 in. (6.4 mm) concrete spike. When used with a wood nailer, the face height is 1.5 or 3 in (38.1 or 76.2 mm), the flange length is 2.5 in, (64 mm) wide, and the thickness is 0.080 in (2.0 mm) and secured with a #14 steel screws. Both come with 9/32 x 3/8 in. (7.1 x 15.9 mm) predrilled slotted holes spaced 6 in (152.4 mm) o.c. staggered distances from the face. The Eliminailer T is to be used with FM Approved fascia.
- Anchor-Tite HG Fascia or Anchor-Tite Canted Fascia are attached to the Eliminailer T with Tek 3 x 1 in. (76 x 25 mm) long fasteners secured on the vertical face with the fasteners spaced 12 in. (305 mm) o.c. approximately 1.25 in. (32 mm) from the top of the Eliminailer T face.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)*		Corner Pressure (psf.)*	
		Horizontal	Vertical	Horizontal	Vertical
0.080in. Alum [Fascia Cover]	1.5	960	1,663	1,193	2,505
0.100in. Alum [Fascia Cover]	3	960	1,663	1,193	2,505
Note:	*Performance herein reflects performance of the SecurEdge Eliminailer-T sub-assembly. Overall system performance to be limited to that of the SecurEdge 2000 Drip Edge or Anchor-Tite HG Fascia assembly selection, as noted herein.				

SecurWeld 200 Drip Edge	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurWeld 200 Drip Edge

- For Face Height less than or equal to 6 in (152 mm): The continuous cleat is secured to the wood nailer with 1.25 in (32 mm) long ring shank nails secured on the vertical face spaced 12 in (305 mm) o.c. approximately 0.813 in (21 mm) down from the top of the wall.
- The top flange of the fascia cover is fastened with 1.25 in (32 mm) long ring shank nails spaced 6 in (152 mm) o.c, 0.5 in (13 mm) edge of flange.
- For Face Height greater than 6 in (152 mm) and less than or equal to 10 in (254 mm): The continuous cleat is secured to the wood nailer with 1.25 in (32 mm) long ring shank nails secured on the vertical face spaced 12 in (305 mm) o.c. approximately 1.5 in (38 mm) up from the drip.
- The top flange of the fascia cover is fastened with 1.25 in (32 mm) long ring shank nails spaced 6 in (152 mm) o.c, 0.4375 in (11 mm) edge of flange.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	6	276	479	271	569
0.040in. Alum [Fascia Cover]	10	175	302	163	342
0.050in. Alum [Fascia Cover]	6	276	479	271	569
0.050in. Alum [Fascia Cover]	10	175	302	163	342
0.063in. Alum [Fascia Cover]	6	276	479	271	569
0.063in. Alum [Fascia Cover]	10	175	302	163	342
0.040in. Alum [Fascia Cover – PVC or TPO Coating]	6	276	479	271	569
0.040in. Alum [Fascia Cover – PVC or TPO Coating]	10	175	302	163	342
22ga. Steel [Fascia Cover]	6	276	479	271	569
22ga. Steel [Fascia Cover]	10	175	302	163	342
24ga. Steel [Fascia Cover]	6	276	479	271	569
24ga. Steel [Fascia Cover]	10	175	302	163	342
24ga. Steel [Fascia Cover – PVC or TPO Coating]	6	276	479	271	569
24ga. Steel [Fascia Cover – PVC or TPO Coating]	10	175	302	163	342
22ga. Steel [Cleat]	6	276	479	271	569
22ga. Steel [Cleat]	10	175	302	163	342

SecurEdge One Fascia (Single Ply)	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge One Fascia (Single Ply)

- The continuous cleat is secured to the wood nailer with #10-2 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured 12 in (305 mm) o.c. approximately 13/16 - 1 in (21-25 mm) down from the upper horizontal surface.
- Spring clips are placed over the rail spaced 48 in (1219 mm) o.c.
- Fascia cover is snapped into place.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	4	393	680	380	797
0.040in. Alum [Fascia Cover]	8	146	252	145	304
24ga. Steel [Fascia Cover]	4	393	680	380	797
24ga. Steel [Fascia Cover]	8	146	252	145	304
20ga. Steel [Cleat]	4	393	680	380	797
20ga. Steel [Cleat]	8	146	252	145	304

SecurEdge One Extended Fascia	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge One Extended Fascia

- The continuous cleat is secured to the wood nailer in two rows. The top row is #10-2 in (51 mm) long or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) secured 12 in (305 mm) o.c. approximately 1 in (19 mm) down from the upper horizontal surface. The bottom row is 1/4x1 ¼ Long masonry/wood screws spaced 24 in (605 mm) o.c. approximately 2.125 in (54 mm) up from the bottom edge of the cleat.
- Spring clips are placed over the rail spaced 48 in (1219 mm) o.c.
- Fascia cover is snapped into place.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.050in. Alum [Fascia Cover]	12.5	146	252	145	304
20ga. Steel [Cleat]	12.5	146	252	145	304

SecurEdge 200 Gravel Stop	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge 200 Gravel Stop

- For Face Height less than or equal to 6 in (152 mm): The continuous cleat is secured to the wood nailer with 1.25 in (32 mm) long ring shank nails secured on the vertical face spaced 12 in (305 mm) o.c. approximately 13/16 in (21 mm) down from the top of the wall.
- The top flange of the fascia cover is fastened with 1.25 in (32 mm) long ring shank nails spaced 6 in (152 mm) o.c, 0.4375 in (11 mm) edge of flange.
- For Face Height >6 in (152) up to 10 in (254 mm): The continuous cleat is secured to the wood nailer with 1.25 in (32 mm) long ring shank nails secured on the vertical face spaced 12 in (305 mm) o.c. approximately 1.5 in (38 mm) up from bottom of cleat.
- The top flange of the fascia cover is fastened with 1.25 in (32 mm) long ring shank nails spaced 6 in (152 mm) o.c, 0.4375 in (11 mm) edge of flange.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	6	204	353	200	417
0.040in. Alum [Fascia Cover]	10	247	428	253	531
0.050in. Alum [Fascia Cover]	6	204	353	200	417
0.050in. Alum [Fascia Cover]	10	247	428	253	531
0.063in. Alum [Fascia Cover]	6	204	353	200	417
0.063in. Alum [Fascia Cover]	10	247	428	253	531
0.040in. Alum [Fascia Cover – PVC or TPO Coating]	6	204	353		417
0.040in. Alum [Fascia Cover – PVC or TPO Coating]	10	247	428	253	531
24ga. Steel [Fascia Cover]	6	204	353	200	417
24ga. Steel [Fascia Cover]	10	247	428	253	531
24ga. Steel [Fascia Cover – PVC or TPO Coating]	6	204	353	200	417
24ga. Steel [Fascia Cover – PVC or TPO Coating]	10	247	428	253	531
22ga. Steel [Cleat]	6	204	353	200	417
22ga. Steel [Cleat]	10	247	428	253	531

SecurEdge System 200 Fascia, Crimp-On	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge System 200 Fascia, Crimp-On

- Steel cant/waterdam is secured to wood nailers with 1-¼ in (32 mm) long ring shank roofing nails secured on the vertical face spaced 12 in (305 mm) o.c. 2 ¼ in (57 mm) from bottom of drip edge and on the top 6 in (152) o.c. approximately 0.5 in (13 mm) from the edge.
- An FM Approved single ply roof membrane is applied over the cant.
- The fascia cover is then applied over the cant and crimped with a hand crimper maximum 18 in (457 mm) o.c.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	8	116	202	127	266
0.050in. Alum [Fascia Cover]	5	189	328	181	380
0.050in. Alum [Fascia Cover]	12.5	87	152	91	190
0.063in. Alum [Fascia Cover]	5	189	328	181	380
0.063in. Alum [Fascia Cover]	12.5	87	152	91	190
24ga. Steel [Fascia Cover]	8	116	202	127	266
24ga. Steel [Waterdam]	5	189	328	181	380
24ga. Steel [Waterdam]	8	116	202	127	266
24ga. Steel [Waterdam]	12.5	87	152	91	190

SecurEdge System 200 Fascia, Snap-On	TAS 111 (B)	Decorative galvanized steel or aluminum fascia with continuous formed rail.

SecurEdge System 200 Fascia, Snap-On

- Steel cant/waterdam is secured to wood nailers with 1-¼ in (32 mm) long ring shank roofing nails secured on the vertical face spaced 12 in (305 mm) o.c. 2 ¼ in (57 mm) from bottom of drip edge and on the top 6 in (152) o.c. approximately 0.5 in (13 mm) from the edge.
- Stainless steel spring clips are applied maximum 4 ft. (1.2 m) o.c.
- An FM Approved roof membrane is applied over the cant.
- The fascia cover is then snapped into place over the cant.

Material	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum [Fascia Cover]	8.25	189	328	182	380
0.040in. Alum [Fascia Cover]	12.75	116	202	109	228
0.050in. Alum [Fascia Cover]	8.25	204	353	200	417
0.050in. Alum [Fascia Cover]	12.75	116	202	109	228
0.063in. Alum [Fascia Cover]	12.75	116	202	109	228
24ga. Steel [Fascia Cover]	8.25	189	328	182	380
24ga. Steel [Fascia Cover]	12.75	116	202	109	228
24ga. Steel [Waterdam]	8.25	189	328	182	380
24ga. Steel [Waterdam]	12.75	116	202	109	228

SecurEdge 200 Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.

SecurEdge 200 Coping (Min. 20ga. Anchor Clips)

- Anchor clips are secured on the 6 in (152 mm) face with two #10 or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) 1.5 in (38 mm) from the bottom and on the top of the 6 in (152 mm) side with two screws 1.75 in (44 mm) from the edge. On the 4 in (102 mm) side the face is secured with two screws 1.25 in (32 mm) from the bottom and on the top of the 4 in (102 mm) side with two screws 1.125 in (28.6 mm) from the edge.
- Anchor clips are spaced 24 in (610 mm), 36 in (914 mm) or 48 in (1219 mm) o.c.
- The coping cap is snapped into place over the anchor clips.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
				Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum or 24ga. Steel [Coping Cap]	4	8	6	161	278	127	266
	Anchor Clip Material and O.C. Spacing: 20 ga, and 4 ft o.c.						
	4	12	6	87	151	73	152
	Anchor Clip Material and O.C. Spacing: 20 ga, and 4 ft o.c.						
	4	10	6	204	353	163	342
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	12	6	116	202	91	190
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	14	6	116	202	91	190
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	16	6	131	227	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	24	6	73	126	N/A	N/A
	Anchor Clip Material and O.C. Spacing: 16 ga, and 3 ft o.c.						
0.040in. Alum or 24ga. Steel [Coping Cap]	4	16	12	73	126	N/A	N/A
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
0.050in. or 0.063in. Alum [Coping Cap]	4	8	6	218	378	182	380
	Anchor Clip Material and O.C. Spacing: 20 ga, and 4 ft o.c.						
	4	10	6	233	403	182	380
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	12	6	131	227	109	228
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	14	6	116	202	91	190
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	16	6	88	152	73	152
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	24	6	102	177	73	152
	Anchor Clip Material and O.C. Spacing: 16 ga, and 3 ft o.c.						
	4	32	6	88	152	73	152
	Anchor Clip Material and O.C. Spacing: 16 ga, and 2 ft o.c.						
0.050in. or 0.063in. Alum [Coping Cap]	4	16	12	117	202	91	190
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	24	12	102	177	91	190
	Anchor Clip Material and O.C. Spacing: 16 ga, and 3 ft o.c.						

SecurEdge 200 Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.

SecurEdge 200 Coping (<u>16 ga. Anchor Clips</u>)

- Anchor clips are secured on the 6 in (152 mm) face with two #10 or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) 1.5 in (38 mm) from the bottom and on the top of the 6 in (152 mm) side with two screws 1.75 in (44 mm) from the edge. On the 4 in (102 mm) side the face is secured with two screws 1.25 in (32 mm) from the bottom and on the top of the 4 in (102 mm) side with two screws 1.125 in (28.6 mm) from the edge.
- Anchor clips are spaced 24 in (610 mm), 36 in (914 mm) or 48 in (1219 mm) o.c.
- The coping cap is snapped into place over the anchor clips.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
				Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum or 24ga. Steel [Coping Cap]	4	12	6	146	252	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
0.050in. or 0.063in. Alum [Coping Cap]	4	12	6	218	378	182	380
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	16	6	146	252	127	266
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						

SecurEdge 200 Flush Face Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.
SecurEdge 200 Gold Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.

SecurEdge 200 Flush Face Coping or SecurEdge 200 Gold Coping (Min. 20 ga. Anchor Clips)

- Anchor clips are secured on the outside face with two #10 or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) 1.5 in (38 mm) from the bottom and on the top of the outside with two screws 1.75 in (44 mm) from the edge. On the inside face are secured with two screws 1.25 in (32 mm) from the bottom and on the top of the inside with two screws 1.125 in (28.6 mm) from the edge.
- Anchor clips are spaced 24 in (610 mm), 36 in (914 mm) or 48 in (1219 mm) o.c. as noted below
- The coping cap is snapped into place over the anchor clips.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure (psf)		Corner Pressure (psf.)	
				Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum or 24ga. Steel [Coping Cap]	4	8	6	146	252	109	228
	Anchor Clip Material and O.C. Spacing: 20 ga, and 4 ft o.c.						
	4	10	6	218	378	182	380
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	12	6	116	202	91	190
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	14	6	87	151	73	152
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	16	6	87	151	N/A	N/A
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	24	6	116	202	91	190
	Anchor Clip Material and O.C. Spacing: 16 ga, and 3 ft o.c.						
0.040in. Alum or 24ga. Steel [Coping Cap]	4	16	12	131	227	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	24	12	87	151	73	152
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
0.050in. or 0.063in. Alum [Coping Cap]	4	8	6	190	328	163	342
	Anchor Clip Material and O.C. Spacing: 20 ga, and 4 ft o.c.						
	4	10	6	291	504	236	493
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	12	6	146	252	109	228
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	14	6	116	202	91	190
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	16	6	102	176	73	152
	Anchor Clip Material and O.C. Spacing: 20 ga, and 3 ft o.c.						
	4	24	6	131	227	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 3 ft o.c.						
	4	32	6	87	151	73	152
	Anchor Clip Material and O.C. Spacing: 16 ga, and 2 ft o.c.						
0.050in. or 0.063in. Alum [Coping Cap]	4	16	12	146	252	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	24	12	102	176	91	190
	Anchor Clip Material and O.C. Spacing: 16 ga, and 3 ft o.c.						

SecurEdge 200 Flush Face Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.
SecurEdge 200 Gold Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.

SecurEdge 200 Flush Face Coping or SecurEdge 200 Gold Coping (16 ga. Anchor Clips)

- Anchor clips are secured on the outside face with two #10 or #14 stainless steel screws (wood substrates only) or masonry screws (wood or masonry substrates) 1.5 in (38 mm) from the bottom and on the top of the outside with two screws 1.75 in (44 mm) from the edge. On the inside face are secured with two screws 1.25 in (32 mm) from the bottom and on the top of the inside with two screws 1.125 in (28.6 mm) from the edge.
- Anchor clips are spaced 24 in (610 mm), 36 in (914 mm) or 48 in (1219 mm) o.c. as noted below
- The coping cap is snapped into place over the anchor clips.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure (psf)		Corner Pressure (psf)	
				Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum or 24ga. Steel [Coping Cap]	4	12	6	189	328	163	342
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	16	6	131	227	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
0.050in. or 0.063in. Alum [Coping Cap]	4	12	6	233	403	182	380
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						
	4	16	6	146	252	109	228
	Anchor Clip Material and O.C. Spacing: 16 ga, and 4 ft o.c.						

SecurEdge 200 Continuous Cleat Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.

SecurEdge 200 Continuous Cleat Coping

- The outside cleat is secured to the front face of the substrate with #14 stainless steel screws (wood substrate only) or masonry screw spaced 12 in (305 mm) o.c. and 1.25 in (32 mm) up from the bottom edge of the cleat and is secured to the top face of the substrate with #14 stainless steel screws (wood substrate only) or masonry screw spaced 12 in (305 mm) o.c. and 0.5 in (13 mm) from the edge of the cleat.
- The inside cleat is secured to the inside face of the substrate with #14 stainless steel screws (wood substrates only) or masonry screw spaced 12 in (305 mm) o.c. and 1.75 in (44 mm) up from the bottom edge of the cleat and is secured to the top face of the substrate with #14 stainless steel screws (wood substrates only) or masonry screw spaced 12 in (305 mm) o.c. and 0.5 in (13 mm) from the edge of the cleat.
- The coping cap is secured over the two cleats and crimped on the inside face with a hand crimper maximum 18 in (457 mm) o.c.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
				Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum or 24ga. Steel [Coping Cap]	4	12	6	190	328	145	304
	4	14	6	160	277	127	266
	4	16	6	175	304	145	304
	4	24	6	88	152	73	152
0.040in. Alum or 24ga. Steel [Coping Cap]	4	16	12	146	252	109	228
	4	24	12	88	152	73	152
0.050in. or 0.063in. Alum [Coping Cap]	4	12	6	218	378	182	380
	4	14	6	175	304	145	304
	4	16	6	233	404	199	418
	4	24	6	131	227	109	228
	4	32	6	102	176	73	152
0.050in. or 0.063in. Alum [Coping Cap]	4	16	12	218	378	182	380
	4	24	12	131	227	109	228

SecurEdge 200 Single Cantilever Gold Coping	TAS 111 (C)	Decorative aluminum coping cap with galvanized steel anchor/support cleats.

SecurEdge 200 Single Cantilever Gold Coping

- For 6 in (152 mm) face and 16 in (406 mm) wide walls: Anchor clips are secured on the inside face with two #10 or #14 stainless steel screws (wood substrate only) or masonry screw 1.75 in (44 mm) from the bottom and on the top of the inside side with two screws 1.5 in (38 mm) from the edge. On the top of the outside face is secured with two #10 or #14 stainless steel screws (wood substrate only) or masonry screw 4.5 in (114 mm) from the edge and another two screws 5 in (127 mm) from the edge
- For 10 in (254 mm) face and 24 in (610 mm) wide walls: Anchor clips are secured on the inside face with two #10 or #14 stainless steel screws (wood substrate only) or masonry screw 1.375 in (35 mm) from the bottom and on the top of the inside side with two screws 2.5 in (63.5 mm) from the edge. The top of the outside face is secured with two #10 or #14 stainless steel screws (wood substrate only) or masonry screw 4.5 in (114 mm) from the edge and another two screws 5 in (127 mm) from the edge
- Anchor clips are spaced 36 in (914 mm) o.c.
- The coping cap is snapped into place over the anchor clips.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure (psf.)		Corner Pressure (psf.)	
				Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum or 24ga. Steel [Coping Cap]	4	16	6	116	202	91	190
0.050in. Alum or 0.063in. Alum [Coping Cap]	4	16	6	116	202	91	190
0.040in. Alum or 24ga. Steel [Coping Cap]	4	24	10	88	152	N/A	N/A
0.050in. Alum or 0.063in. Alum [Coping Cap]	4	24	10	88	152	73	152

SecurEdge 300 Edgebox RI	TAS 111 (B)	An engineered metal replacement system for roof nailers.

SecurEdge 300 Edgebox RI- Maximum length 10'. 5.5" face width, 4.5" face leg, 4.5" back leg. Minimum 20ga. galvanized steel two-piece unit. Installed to the bottom with #14 Universal fasteners, spaced at 12" o.c. and top secured with #14 HD fasteners spaced at 48" o.c. and #14 Universal fasteners at 12" o.c. through each side of SecurEdge 300 Edgebox RI.

Material	Max Back Height (in.)	Max Wall Width (in.)	Max Face Height (in.)	Perimeter Pressure(psf)		Corner Pressure (psf)	
				Horizontal	Vertical	Horizontal	Vertical
20ga. Steel	4.5	5.5	4.5	523	n/a	434	n/a

SecurEdge Extender-A	TAS 111 (B)	System used to extend the coverage of continuous water-tight metal systems.

SecurEdge Extender-A – Maximum length 10'. Maximum face height 8.0". 24ga. galvanized steel cleat with fascia cover. Installed 1.5" stainless steel ring shank at 12" o.c.

Material	Max Face Height (in.)	Perimeter Pressure(psf)		Corner Pressure (psf)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum	8	58	n/a	73	n/a
0.050in. Alum	8	102	n/a	91	n/a
24ga. Steel	8	73	n/a	73	n/a

SecurEdge Extender-B	TAS 111 (B)	System used to extend the coverage of continuous water-tight metal systems

SecurEdge Extender-B– Maximum length 10'. Maximum face height 8.0". 24ga. galvanized steel cleat with fascia cover. Installed 1.5" stainless steel ring shank at 12" o.c.

Material	Max Face Height (in.)	Perimeter Pressure(psf)		Corner Pressure (psf)	
		Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum	8	58	n/a	73	n/a
0.050in. Alum	8	102	n/a	91	n/a
24ga. Steel	8	73	n/a	73	n/a

Carlisle Industrial Gutter (Box)	TAS 111 (C)	Gutters fabricated from either aluminum or prefinished steel

Carlisle Industrial Gutter (Box)– Maximum length 10'. Maximum face width 7 ¾", 6" face leg. 0.050 aluminum or 24ga. galvanized steel gutter and 1" wide two-piece extruded aluminum gutter bracket. Installed 1.5" universal fasteners at 24" o.c.

Material	Max Face Height (in.)	Max Top Width (in.)	Perimeter Pressure(psf)		Corner Pressure (psf)	
			Horizontal	Vertical	Horizontal	Vertical
0.040in. Alum	6	7.75	87	151	109	228
24ga. Steel	6	7.75	87	151	109	228

Carlisle Industrial Gutter (Offset)	TAS 111 (C)	Gutters fabricated from either aluminum or prefinished steel.

Carlisle Industrial Gutter (Offset)– Maximum length 10'. Maximum face width 7 ¾", 6" face leg. 0.050 aluminum or 24ga. galvanized steel gutter and 1" wide two-piece extruded aluminum gutter bracket. Installed 1.5" universal fasteners at 24" o.c.

Material	**Max Face Height (in.)**	**Max Top Width (in.)**	**Perimeter Pressure(psf)**		**Corner Pressure (psf)**	
			Horizontal	**Vertical**	**Horizontal**	**Vertical**
0.040in. Alum	6	7.75	87	151	109	228
24ga. Steel	6	7.75	87	151	109	228

Carlisle Industrial Gutter (Chamfer)	TAS 111 (C)	Gutters fabricated from either aluminum or prefinished steel

Carlisle Industrial Gutter (Chamfer)– Maximum length 10'. Maximum face width 7 ¾", 6" face leg. 0.050 aluminum or 24ga. galvanized steel gutter and 1" wide two-piece extruded aluminum gutter bracket. Installed 1.5" universal fasteners at 24" o.c.

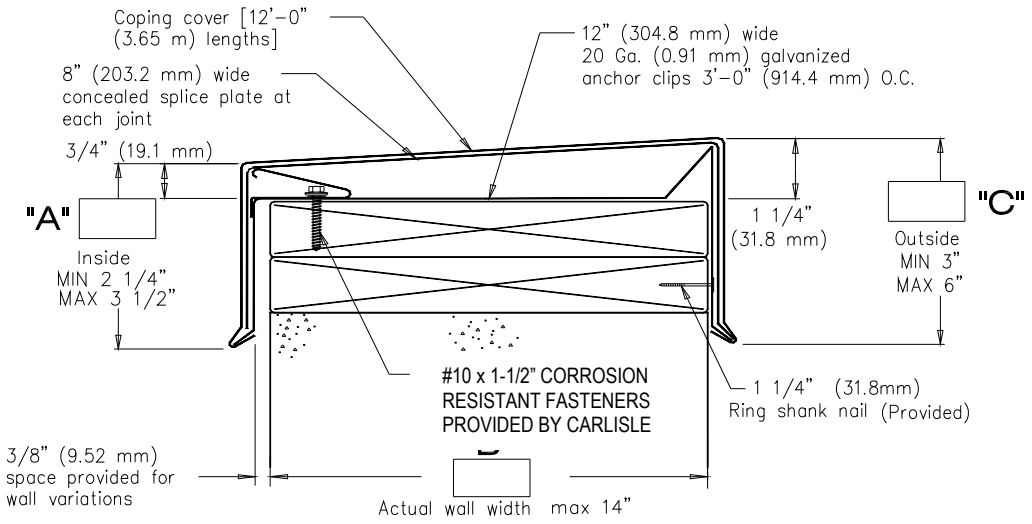
Material	**Max Face Height (in.)**	**Max Top Width (in.)**	**Perimeter Pressure(psf)**		**Corner Pressure (psf)**	
			Horizontal	**Vertical**	**Horizontal**	**Vertical**
0.040in. Alum	6	7.75	87	151	109	228
24ga. Steel	6	7.75	87	151	109	228

LIMITATIONS:

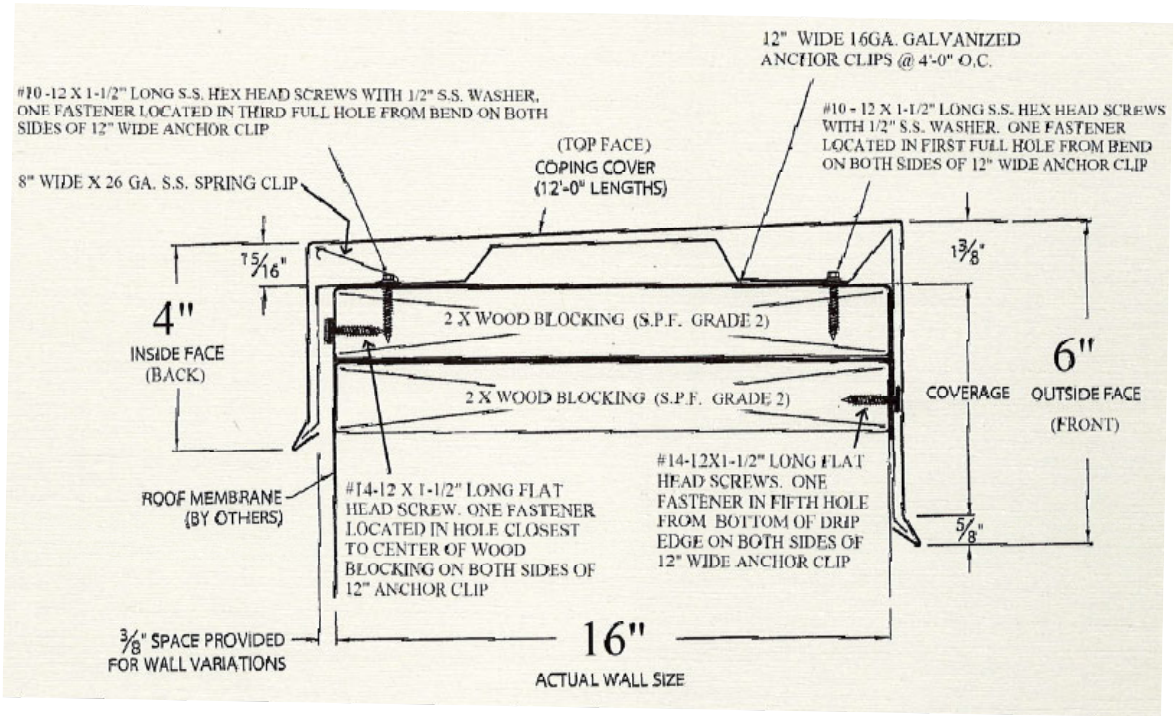
1. All products listed herein shall be installed in accordance with the requirements set forth in RAS 111.
2. Maximum dimensions shall be as outlined in Table 1 herein.
3. All products listed herein shall be installed in conjunction with Carlisle Syntec's required accessories including but not limited to: miters, splice caps, splice plates, corners, end caps, pier caps, etc.
4. Downspout scuppers, spillout scuppers shall be fabricated and installed in accordance with RAS 111.
5. If required, install water cut-off as recommended by the membrane manufacturer and under the anchor bar.
6. Contractor shall check as-built conditions and verify roof edge details for accuracy to fit as built conditions prior to installation. Installer shall comply with Carlisle Syntec's published installation requirements.
7. Fasteners shall be Carlisle Syntec's approved fasteners.
8. Fasteners shall provide a minimum pull out resistance of 240lbf (109 kg) into the substrate being fastened into. When tested in accordance with TAS 105.
9. No exposed fasteners shall be permitted.
10. All fasteners shall be of compatible materials.
11. Finishes shall be natural aluminum mill finish, or pre-coated Kynar 500. All coatings shall be in compliance with the Florida Building Code (FBC).
12. The maximum design pressures listed here in are applicable to the perimeter areas of the roof. Increased design pressures for corner areas, in compliance with applicable building code may be met through rational analysis by increasing the number of attachment points in these areas. The maximum fastener spacing noted in the "Systems Description" section of this approval shall not be exceeded. All rational analysis computations shall be prepared, signed and sealed by a Florida Registered Professional Engineer, Registered Architect, or Registered Roof Consultant.
13. All products listed herein shall have a quality assurance audit in accordance with the Florida Building Code and Rule 61G20-3 of the Florida Administrative Code.
14. All approved products listed herein shall be labeled and shall bear the imprint or identifiable marking of the manufacturer's name or logo and following statement: "Miami-Dade County Product Control Approved" or the Miami-Dade County Product Control Seal as shown below.



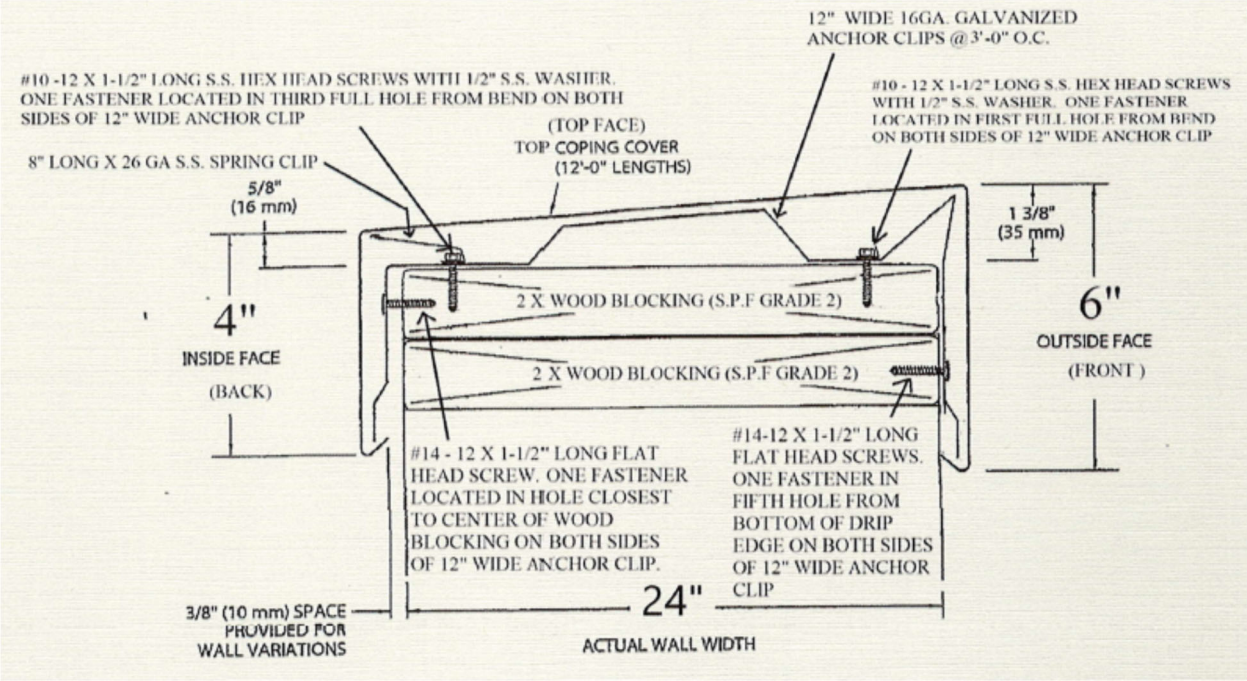
DETAIL DRAWINGS



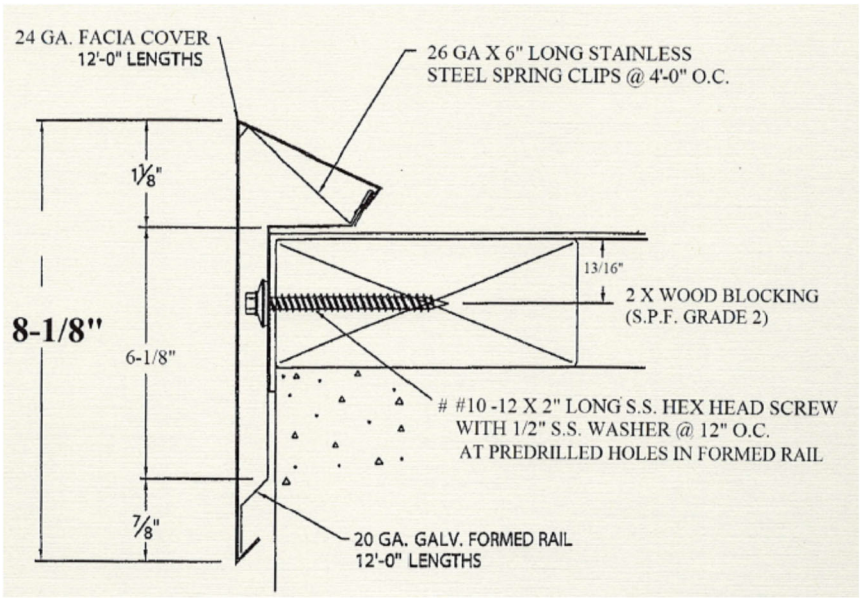
SECUREDGE 200 COPING (14" WIDE)



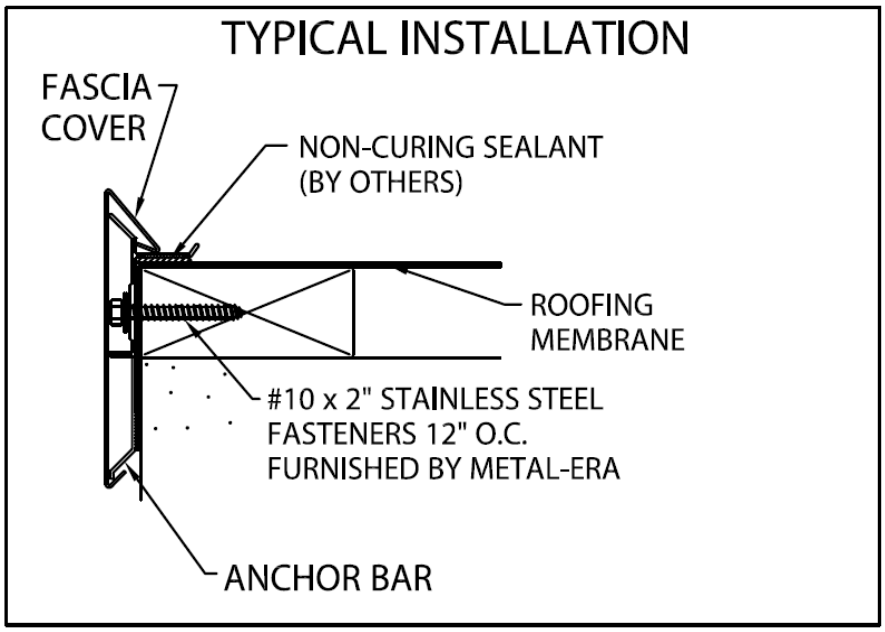
SECUREDGE 200 COPING (16" WIDE)



SECUREDGE 200 GOLD COPING

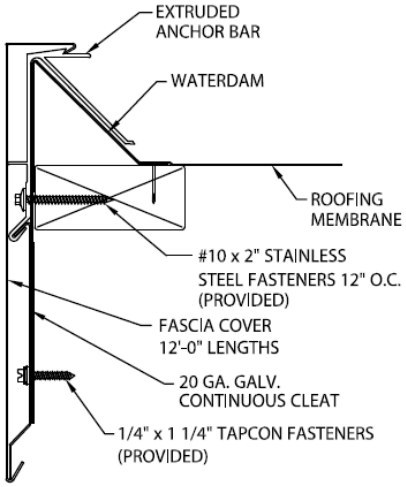


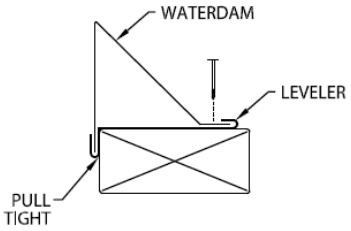
SECUREDGE ONE FASCIA



SECUREDGE 2000 STANDARD FASCIA

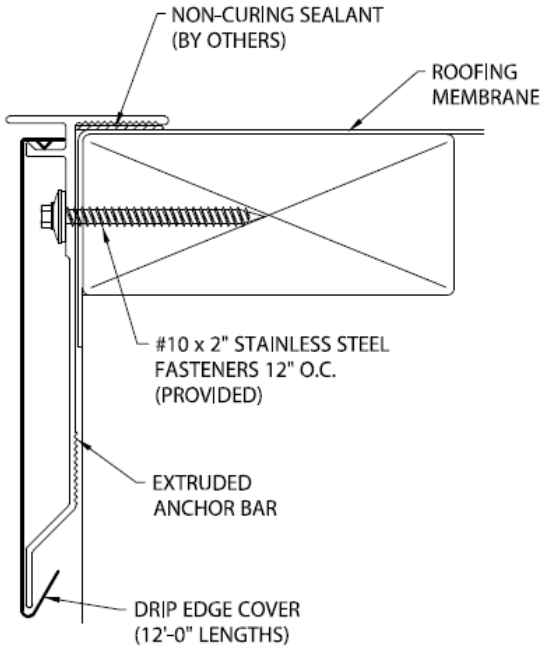
SINGLE-PLY APPLICATION
TYPICAL INSTALLATION



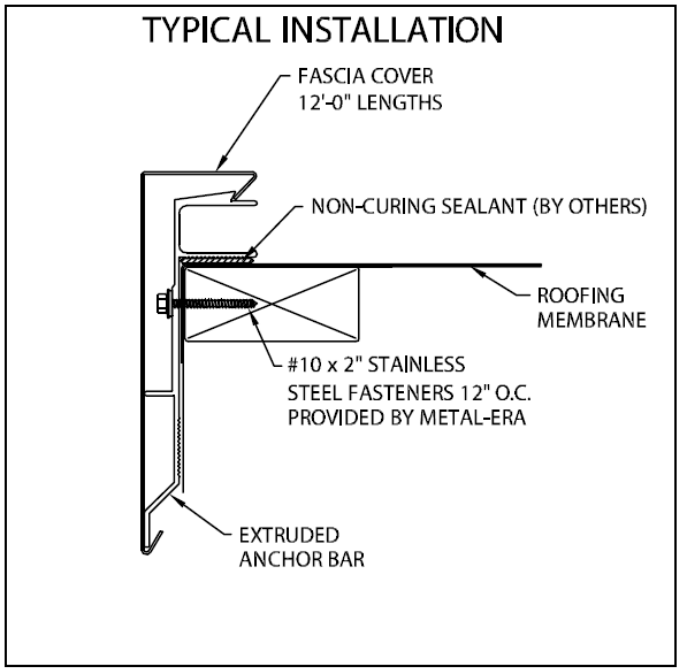


WATERDAM MUST BE PULLED TIGHT TO THE OUTSIDE FACE OF THE BUILDING BEFORE NAILING THE ROOF FLANGE.

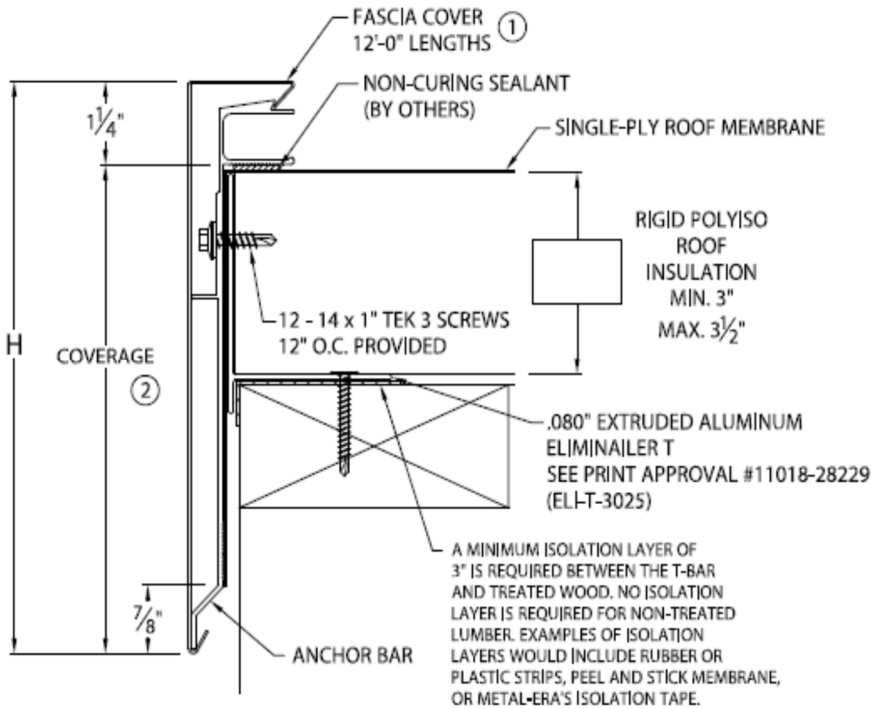
SECUREDGE 2000 EXTENDED FASCIA OR SECUREDGE 2000 EXTENDED CANTED WD FASCIA



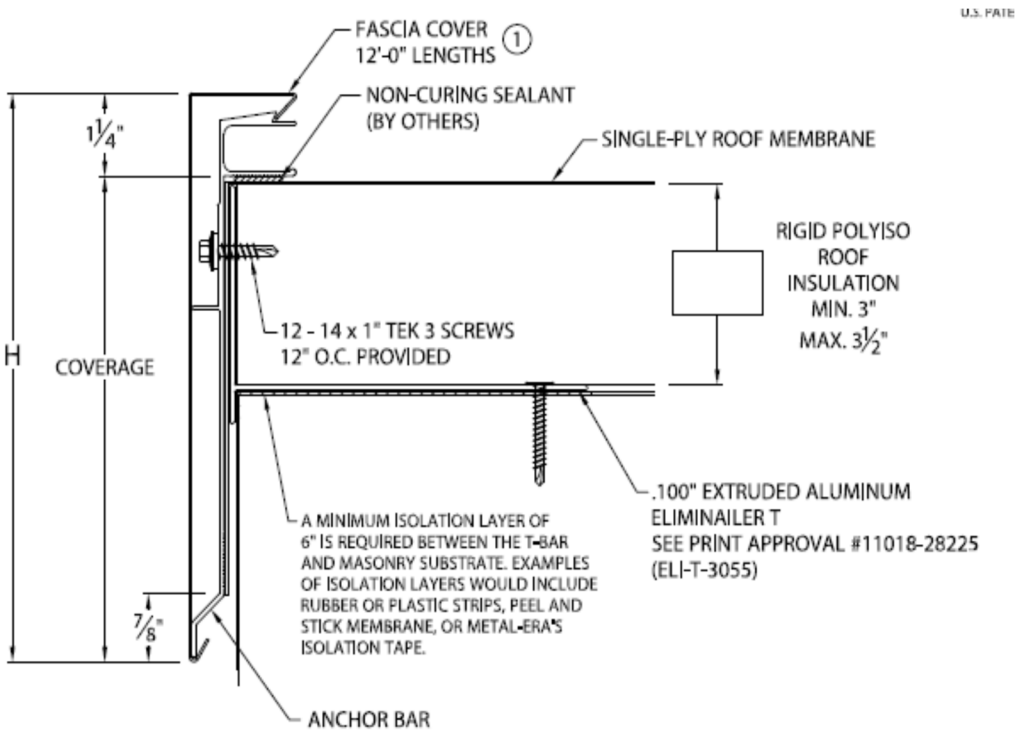
SECUREDGE 2000 DRIP EDGE



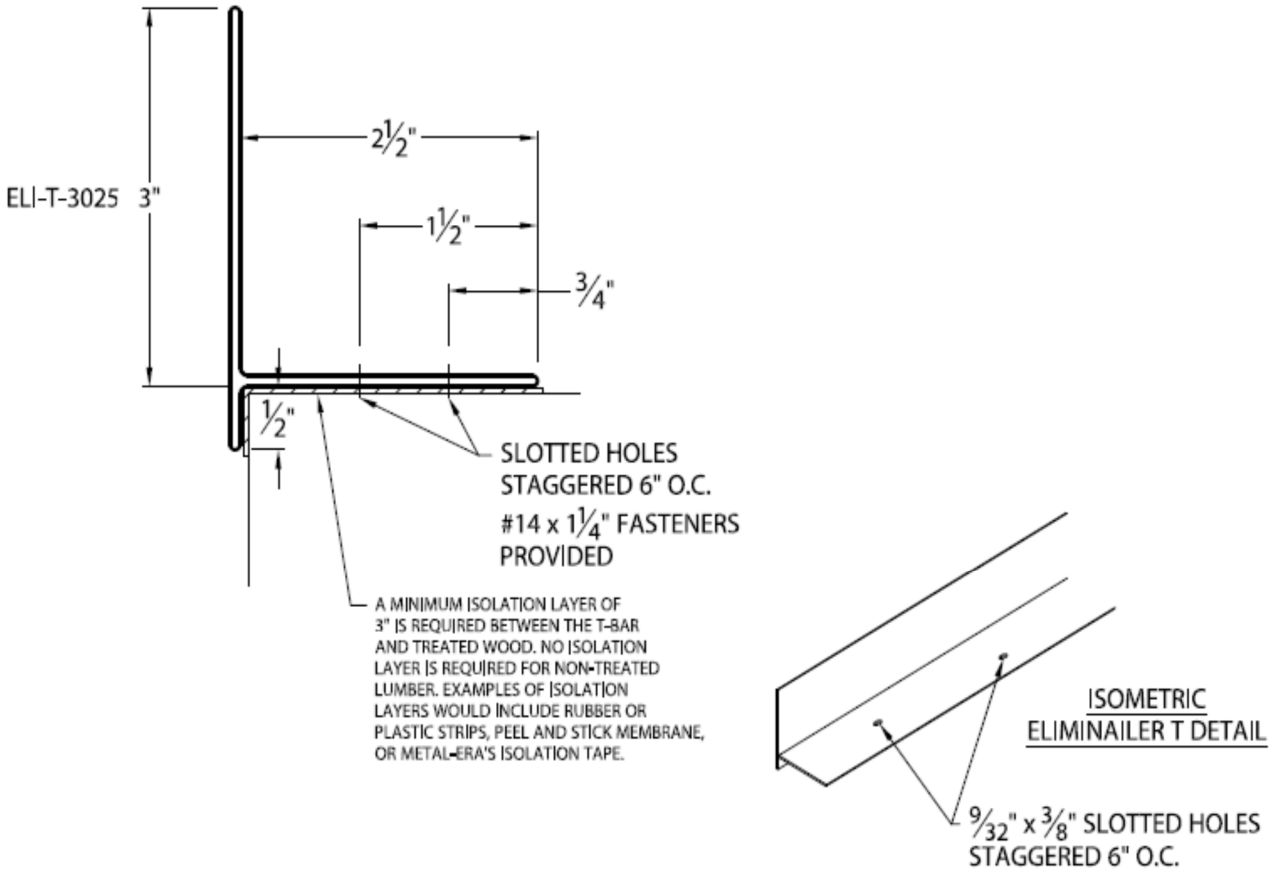
SECUREDGE 2000 HG FASCIA



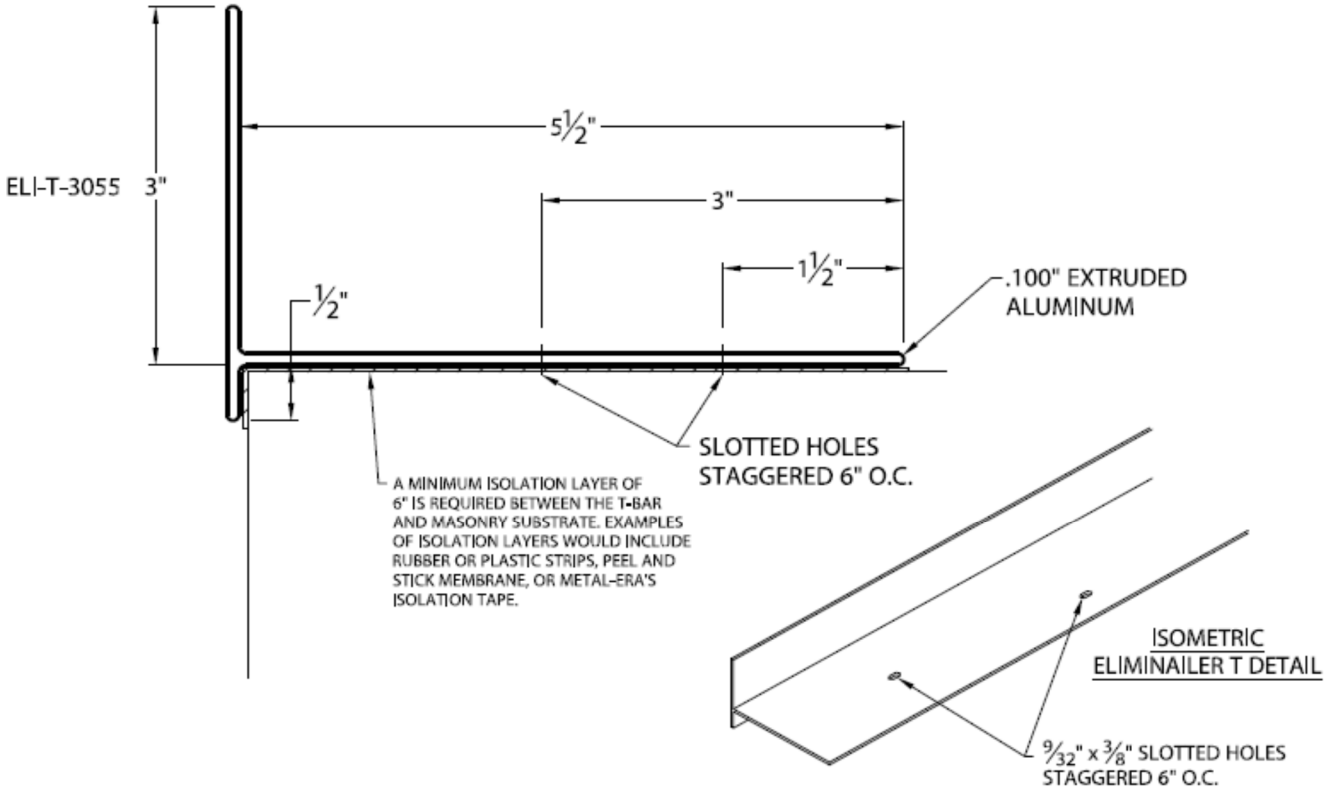
SECUREDGE HG FASCIA-SINGLE PLY WITH SECUREDGE ELIMINAILER-T



SECUREDGE HG FASCIA-SINGLE PLY WITH SECUREDGE ELIMINAILER-T (CONTINUE)

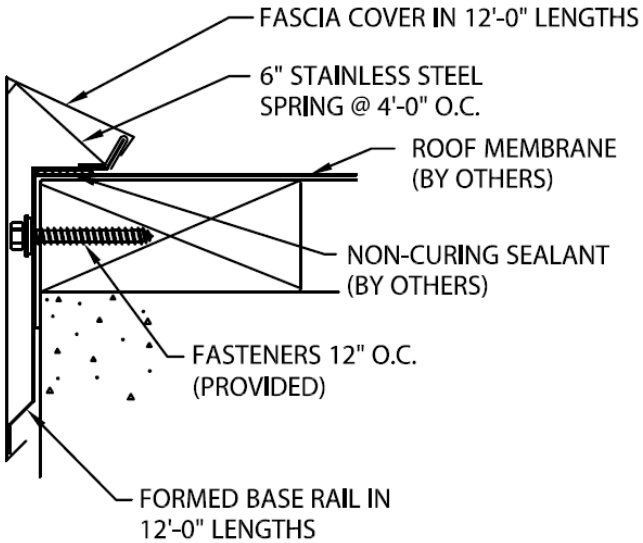


SECUREDGE ELIMINAILER-T (SUB-ASSEMBLY PERFORMANCE)



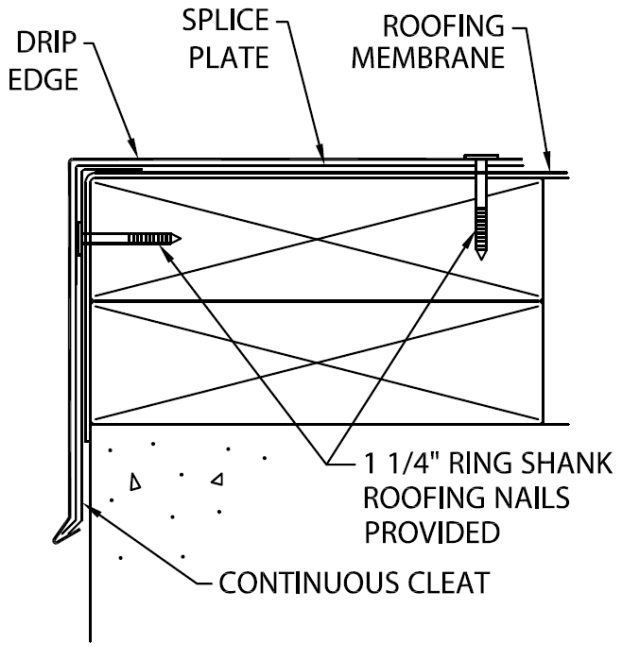
SECUREDGE ELIMINAILER-T (SUB-ASSEMBLY PERFORMANCE)
(CONTINUED)

TYPICAL INSTALLATION FOR 12'-0" STRAIGHT COVER



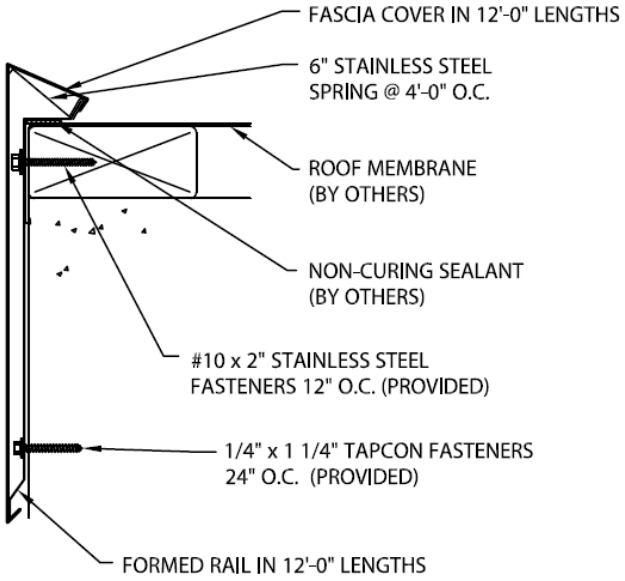
SECUREDGE ONE FASCIA (SINGLE PLY)

TYPICAL INSTALLATION

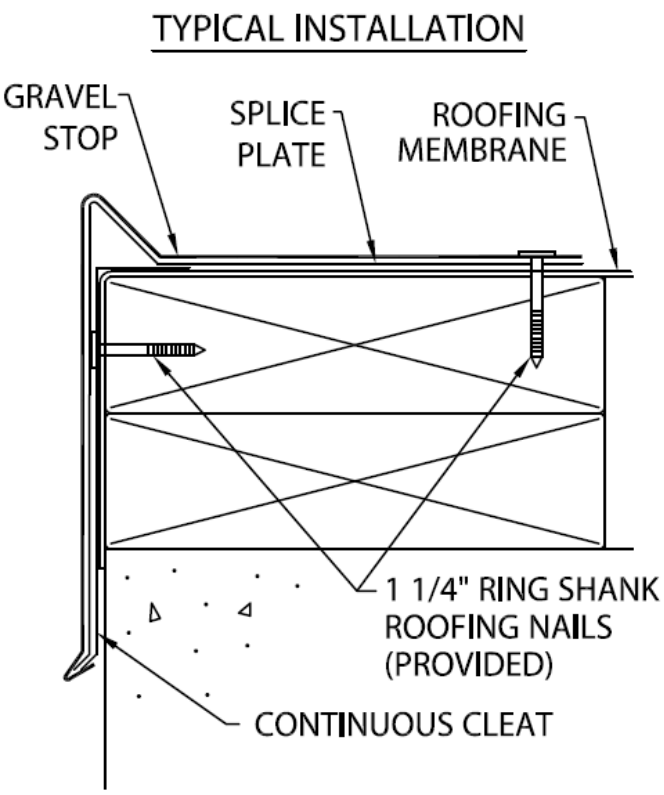


SECURWELD 200 DRIP EDGE

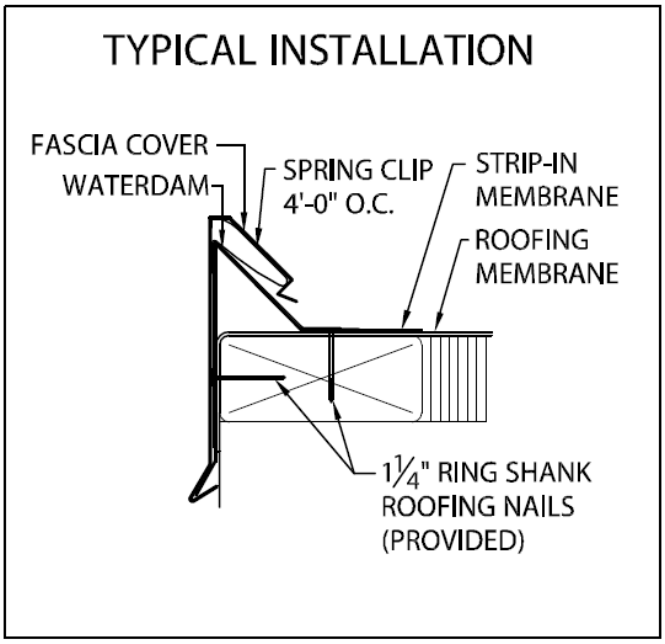
TYPICAL INSTALLATION FOR 12'-0" STRAIGHT COVER



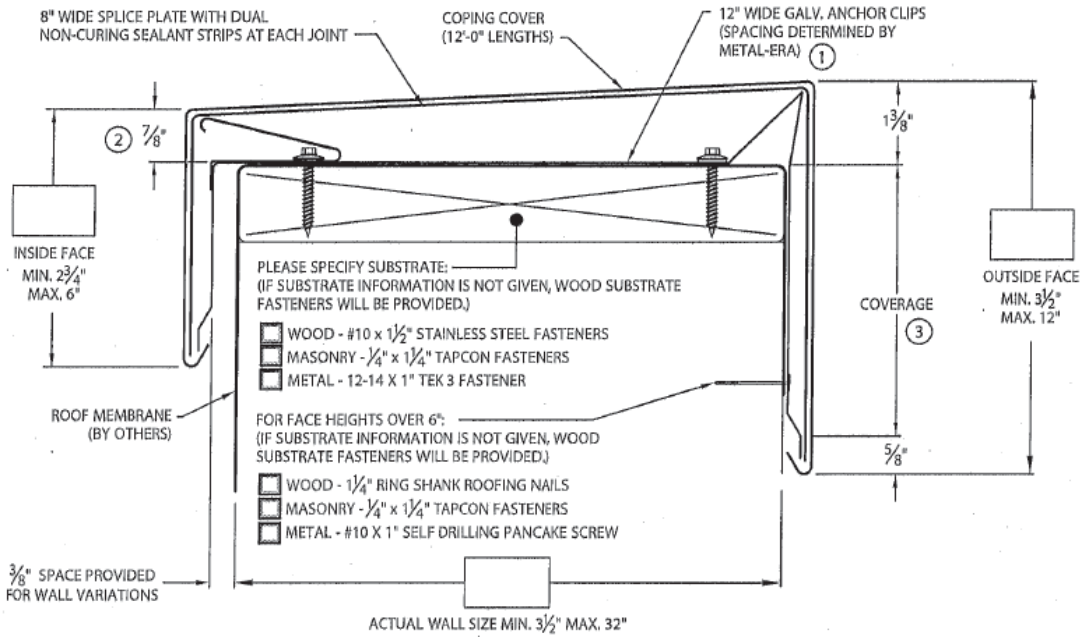
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SECUREDGE 200 GRAVEL STOP

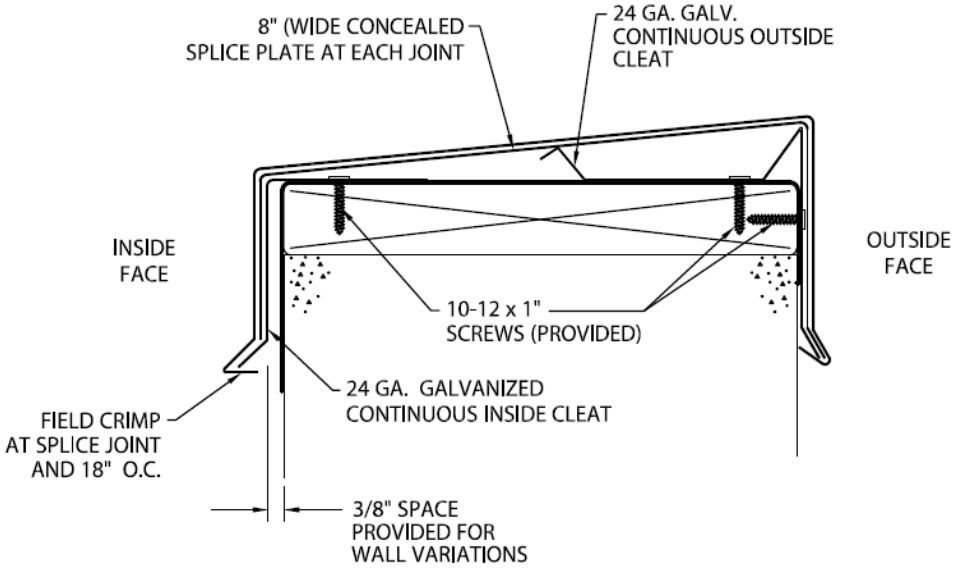


SECUREDGE SYSTEM 200 FASCIA, CRIMP-ON OR SNAP-ON



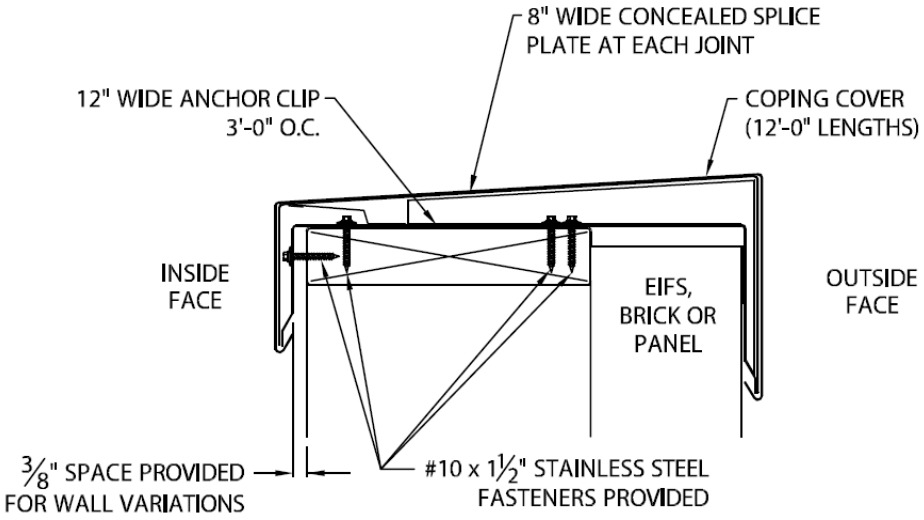
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TYPICAL INSTALLATION

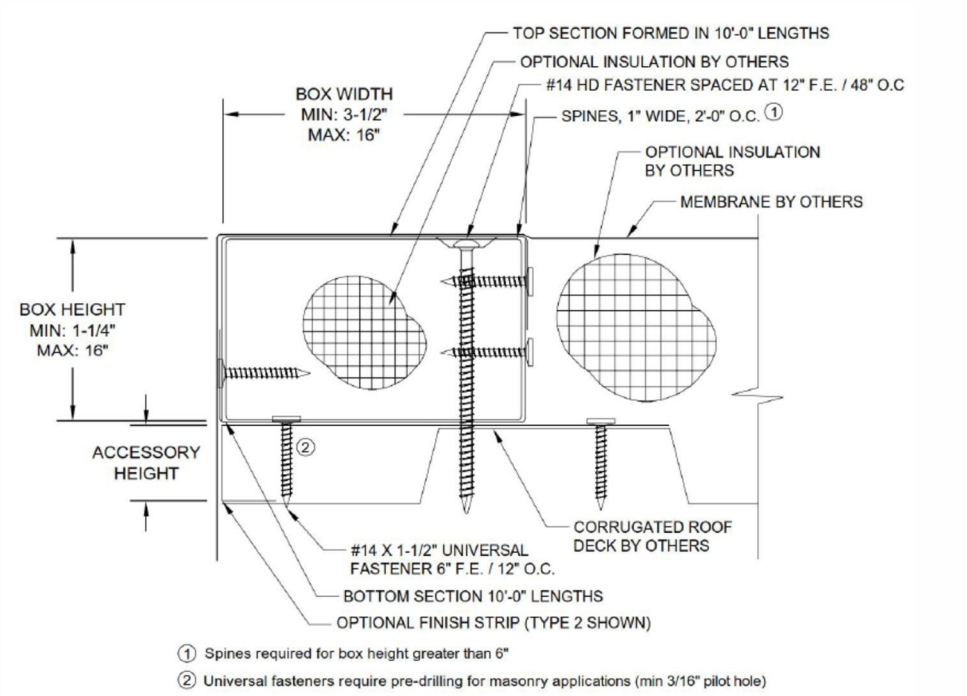


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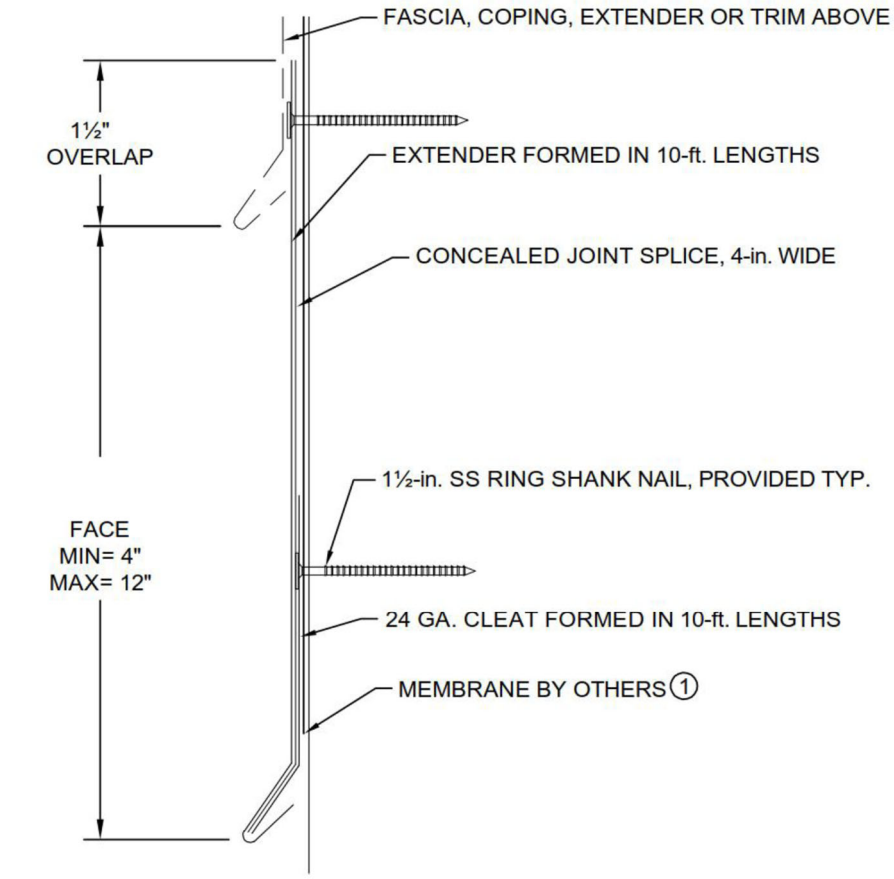
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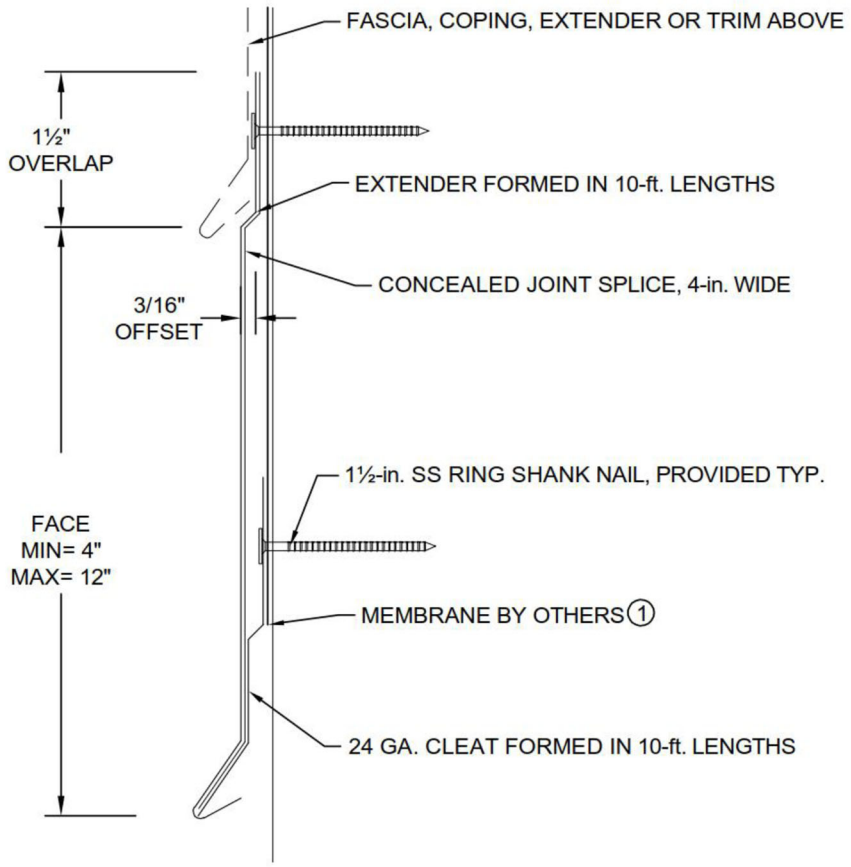
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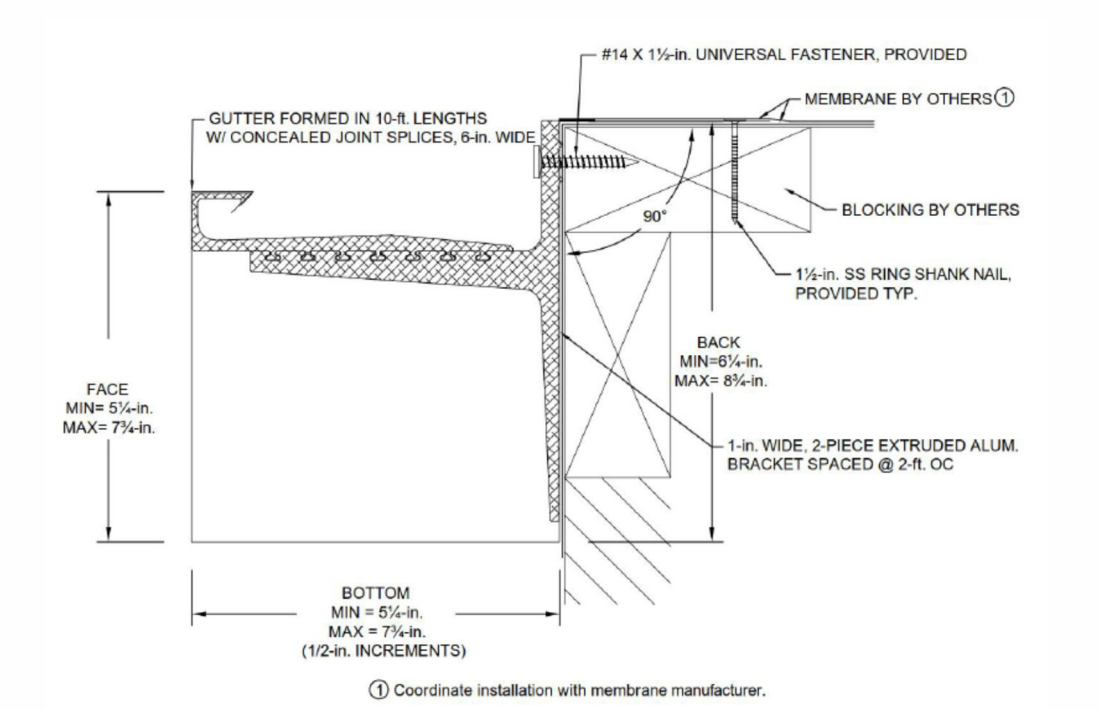
SECUREDGE 300 EDGEBOX RI



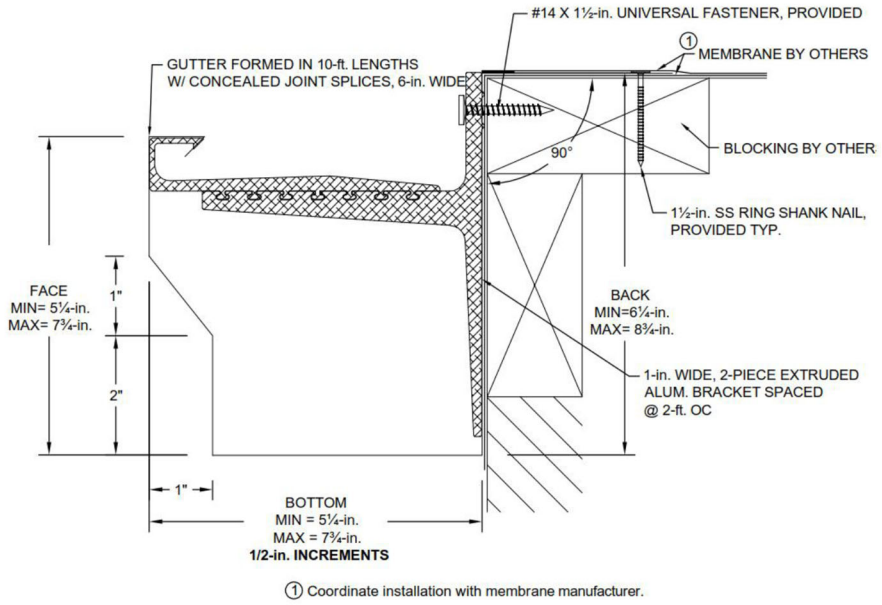
SECUREDGE EXTENDER-A



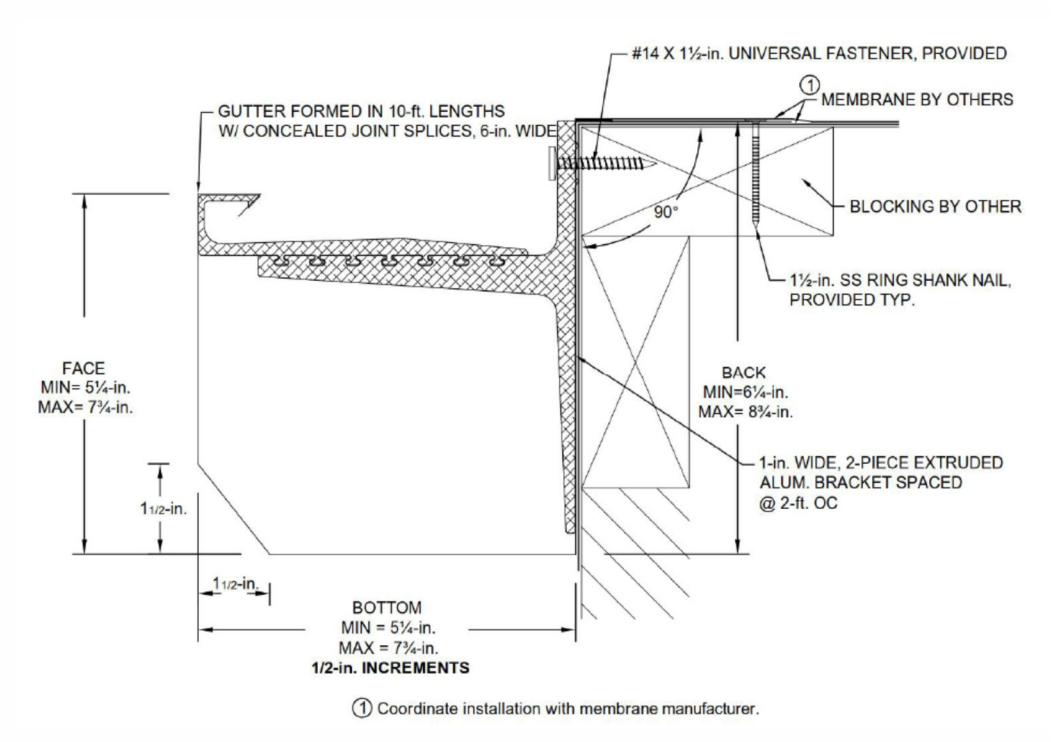
SECUREDGE EXTENDER-B



CARLISLE INDUSTRIAL GUTTER (BOX)



CARLISLE INDUSTRIAL GUTTER (OFFSET)



CARLISLE INDUSTRIAL GUTTER (CHAMFER)

END OF THIS ACCEPTANCE

SECTION 079200 - JOINT SEALANTS

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:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.

B. Related Requirements:
1. Division 32 for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.

5. Number of samples required.

D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs 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 sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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 manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
2. Joint Sealant: Urethane, M, P, 50, T, NT.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
   a. Construction joints in cast-in-place concrete.
   b. Control and expansion joints in unit masonry.
   c. Perimeter joints between materials listed above and frames of doors and windows.
2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:
   a. Control and expansion joints in tile flooring.
2. Joint Sealant: Urethane, S, P, 25, T, NT.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
   a. Tile control and expansion joints where indicated.
   a. Control joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.

E. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:
   a. Aluminum thresholds.
   b. Sill plates.
2. Joint Sealant: Butyl-rubber based.

END OF SECTION 079200

SECTION 079513.16 - EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

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 exterior building expansion joint cover assemblies.

B. Related Requirements:

1. Section 077129 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion joint cover assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.

B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches long in size.

D. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Expansion Joint Design Criteria:

1. Type of Movement: Thermal.

a. Nominal Joint Width: As indicated on Drawings.
b. Joint Movement: As indicated on Drawings.

2.3 EXTERIOR EXPANSION JOINT COVERS

A. Exterior Elastomeric-Seal Joint Cover : Assembly consisting of elastomeric seal anchored to surface-mounted frames fixed to sides of joint gap.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Construction Specialties, Inc.; VF or comparable product by one of the following:

a. InPro Corporation (IPC).
b. Emseal Joint Systems Ltd.

2. Application: Wall to wall.
3. Installation: Recessed.
4. Fire-Resistance Rating: Not less than that indicated on Drawings.
5. Seal: Preformed elastomeric membrane or extrusion.

a. Color: As selected by Architect from manufacturer's full range.

2.4 MATERIALS

A. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions.

B. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.

1. Provide where indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

B. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

C. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

D. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

E. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

3.4 CONNECTIONS

A. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers specified in Section 077129 "Manufactured Roof Expansion Joints." Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

3.5 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections.

END OF SECTION **079513.16**

SECTION 095423 - LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linear metal ceilings.

1.2 COORDINATION

A. Coordinate layout and installation of linear metal pans 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.

1.3 ACTION SUBMITTALS

A. Product Data: For linear metal ceilings.

B. Shop Drawings: For linear metal ceilings.

1. Include reflected ceiling plans, sections, and details, drawn to scale, showing the following:

a. Linear ceiling patterns and joints.
b. Ceiling suspension members.
c. Method of attaching hangers to building structure and locations of cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
d. Ceiling-mounted items including, but not limited to, light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.
e. Ceiling perimeter and penetrations through ceiling; trim and moldings.

C. Samples for Initial Selection: For units with factory-applied colors and finishes.

1. Include Samples of accessories involving color and finish selections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver ceiling components and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle ceiling components and accessories in a manner that prevents damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" to design attachment devices.

B. Structural Performance: Exterior linear metal ceilings to withstand exterior exposure, the effects of gravity loads, and the following loads and stresses without showing permanent deformation of ceiling system components, including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling pans; or permanent damage to fasteners and anchors:

1. Wind Load: Uniform pressure indicated on Drawings acting inward or outward.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

D. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

2.2 LINEAR METAL CEILINGS

A. Pans and Suspension System:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Armstrong Ceiling & Wall Solutions.
   b. B+N Industries, Inc.
   c. USG Corporation.

B. Metal Pans: Complying with ASTM E1264 for and formed to snap on to carriers securely, without separate fasteners.

1. Metal: Aluminum sheet, ASTM B209, alloy and temper recommended by producer and finisher for type of use and finish indicated.

2. Form: Unperforated-M1.

3. Pan Thickness: As indicated on drawings.

4. Pan Edge Detail: As indicated on drawings.

5. Pan Width: As indicated on drawings.

6. Pan Depth: As indicated on drawings.

C. Pan Splices: Formed for snap fit into butt-cut pans, long.

1. Finish: As indicated on drawings.

D. End Caps: Manufacturer's standard material fabricated to fit and conceal exposed ends of pans.

1. Finish: As indicated on drawings.

E. Moldings and Trim: Manufacturer's standard for exposed members, to conceal edges of penetrations through ceiling, to conceal ends of pans and carriers, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching linear metal pans or extruded plastic unless otherwise indicated.

1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.3 ACCESSORIES

A. Access Panels: For access at locations indicated, provide door hinge assembly, retainer clip, and retainer bar, assembled with ceiling panels and carrier sections into access doors permitting upward or downward opening.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal 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 linear metal ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of linear metal pans.

1. Balance border widths at opposite edges of each ceiling.

2. Avoid using less-than-half-width pans at borders.

3.3 INSTALLATION OF LINEAR METAL CEILINGS

A. Comply with ASTM C636/C636M and seismic requirement indicated, in accordance with manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

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 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. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts or post-installed mechanical or adhesive anchors that extend through forms into concrete.

5. 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.

6. Do not attach hangers to steel deck tabs.

7. Do not attach hangers to steel roof deck. Attach hangers to structural members.

8. 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.

9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns in 1-1/2 inches. Suspend bracing from building's structural members as required for hangers and 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 at perimeter of linear metal ceiling area and where necessary to conceal edges and ends of linear metal pans.

1. Screw attach moldings to substrate at intervals of 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.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system carriers so they are aligned and securely interlocked with one another.

1. Install stabilizer channels, tees, and bars at regular intervals to stabilize carriers and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated.

2. Remove and replace dented, bent, or kinked members.

F. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness.

G. Install linear metal pans in coordination with suspension system and exposed moldings and trim.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated on Drawings.

2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.

a. Install pans with butt joints aligned using internal pan splices.

3. Where metal pan ends are visible, install end caps unless trim is indicated.

4. Install filler strips.

H. Install hold-down clips where indicated.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections: Testing and inspecting of completed installations of linear metal ceiling hangers, anchors, and fasteners to take place in successive stages, in test areas and using methods as follows. Do not proceed with installations of linear metal ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.

1. Test Areas: Test installation of ceiling suspension systems on each floor when installation has reached 20 percent completion but before pans have been installed.

a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

B. Linear metal ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings, after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, 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, including dented and bent units.

END OF SECTION **095423**

SECTION 099100 - EXTERIOR PAINTING, INTERIOR PAINTING, HIGH-PERFORMANCE COATINGS, STAINING AMD TRANSPARENT FINISHING

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 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. Concrete masonry units (CMU)
c. Steel (ferrous metal)
d. Galvanized and nonferrous metal
e. Aluminum (not anodized or otherwise coated)
f. Stainless steel flashing
g. Wood (Exposed glue-laminated beams and columns, exposed dimension lumber, dressed lumber, exposed wood panel products)
h. Gypsum board (Interior and Exterior)
i. ASJ insulation covering (mechanical pipe insulation)

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 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.

3. Division 08 Sections for factory priming wood windows and doors with primers specified in this Section.

4. Division 09 Section "Gypsum Board" for surface preparation of gypsum board.

5. Divisions 22, 23 and 26 for additional painting, color coding and stenciling requirements.

6. Division 32 for alkyd-resin and glass bead pavement-marking paints and decorative concrete staining.

1.3 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.

1.4 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.

1.5 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:

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.

D. 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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

2.1 MANUFACTURERS

A. The “Basis of Design” is the Sherwin-Williams Co., as listed in Section 3.6 Exterior Paint and Finish Schedule. These products establish performance requirements and a standard of quality, unless otherwise specified.

1. Substitutions shall be manufacturers as listed in the Manufacturers section.

2. Subject to compliance with requirements, provide products by manufacturers listed in Document 002150 - Owner’s Preferred Vendor List. No substitutions permitted.

2.2 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. Non-flat 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

C. Colors: See the Finish Materials Listing in the Finish Drawings.

2.3 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

3.1 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. Interior and Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. 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

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 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. 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."

F. 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.

G. 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.

H. Aluminum Substrates: Remove loose surface oxidation.

I. 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.

3.3 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.

3.4 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.

3.5 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.

3.6 EXTERIOR PAINTING AND FINISH SCHEDULE

A. EPS-1 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: Medium Texture

3. 1st Coat: Concrete, Dense Masonry, Brick and Stucco - Loxon Concrete & Masonry Primer, LX02W0050
2nd & 3rd Coat: Conflex XL Texture High Build Coating CF12W810 Series

B. EPS-2 Steel, Galvanized Steel or Nonferrous Metals

1. Acrylic Coating

2. Finish: Semi-Gloss

3. 1st Coat: Pro Industrial DTM Primer Acrylic PrimeXr/Finish #B66W00011

4. 2nd & 3rd Coat: Pro Industrial DTM Acrylic coating #B66-1100 Series

C. EPS-3 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 Enamel HS #B54Z-400 Series

D. EPS-4 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 DTM Acrylic coating #B66-200 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. 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.

E. Exterior 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 099100

SECTION 101400 – SIGNAGE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. All labor, supervision, materials, services, artwork and equipment required for interior signs in conjunction with the fabrication, finishing, delivery and installation of interior signs and sign structures as shown on the drawings and in the Message Schedule following this section.

B. Requirements of this section are in addition to requirements of the Bidding/ Contract Conditions and Division 01.

1.2 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capability to produce sign units required without causing delay in the work.

B. Single Source Responsibility: All specialty signs shall be contracted through a single firm specializing in this type of work for single source responsibility.

C. Design Concept: The drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided that deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

D. Work determined to be defective by the Owner at completion of the project, regardless of all previous inspection, shall be corrected to the satisfaction of the Owner at no extra cost to the Owner.

E. Contractor shall be fully responsible for accuracy of all measurements, verify all dimensions given on all drawings, and make such field measurements as are necessary to lay out the work properly.

1.3 SUBMITTALS

A. Time requirements for completion of sign products following necessary approvals, including the production of all prototypes for approval, for appropriate partial deliveries and for total completion shall be submitted with the bid. If awarded the contract, the contractor agrees that time is an essential condition of the contract.

B. Subsequent to award of the contract, the following shall be submitted:
1. (6) sets of Shop-drawings clearly showing materials, type layouts and style, sizes, methods, finishes, anchorages, connections, and other details of construction.
2. (1) sample of Interior Sign Type A
3. No construction shall begin until all shop drawings have had proper approval by Designer and Owner.
4. Signs to match specifications or approved equal. See sign drawings for specific material details.

1.4 SCOPE OF WORK

A. The following signs will be included in the overall scope of work:

1. All ADA required Room Identification signs including:
   a. Permanent Room ID signs

2. All Fire Code required signs including:
   b. Evacuation Maps
   c. Maximum Occupancy signs
3 Any additional building informational signs including:
   d. Building Directional signs
   e. Public Informational signs

B. Additional signs may be added to this scope per the Owner's request.

1.5 DELIVERY, HANDLING, STORAGE

A. Products shall be delivered to job-site in original protective packaging bearing manufacturer's labels.

B. Store and protect products in accordance with manufacturer's recommendations.

1.6 PROTECTION

A. In the event of damage, the contractor is responsible to make immediate repairs and/or replacements to the approval of the Owner without expense to the Owner.

B. Spatters, drippings, smears, and/or spray shall be completely removed to the satisfaction of the Owner.

1.7 WARRANTIES

A. During the warranty period, the contractor shall restore defective work to the standards set forth in the Contract Documents without any cost to the Owner.

B. All interior room sign shall be warranted for five years against discoloration and delaminating of any portion of the sign.

C. Vinyl die-cut and computer cut letters shall be warranted for five years against delaminating from the substrate.

D. Raised letters shall be warranted for five years against delaminating from the substrate.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Signcraft USA

   b. Architectural Identification, Inc.

   c. APCO Signs

B. Signs are to be square cornered acrylic with beveled and polished edges - Coordinate with existing signage at facility.

C. ADA Complaint Interior Room Signs:

1. All interior signs, which require tactile copy and Grade II Braille, shall be manufactured utilizing engraved and raster bead braille process unless otherwise noted.
2. Letters, numerals and characters shall be raised 1/32 inch.
3. Characters and symbols shall contrast with the background color according to ADA guidelines. Characters and background shall have a non-glare finish.

D. Vinyl Film & Silk-screening
1. Non-reflective vinyl film shall be “Scotchcal” brand as manufactured by the Minnesota Mining and Manufacturing Company (3M), or as approved.
a) Thickness shall be 0.003” minimum and 0.006” maximum, or as approved.
b) The pigmented material shall be sufficiently opaque when applied to completely hide a contrasting black printed legend on a white surface.
2. Vinyl legends shall be computer or die-cut in such a manner that edges and corners are true, clear and photographically precise.
3. Screen inks shall be “Scotchcal” brand opaque screen-printing in Series 3900, or as approved.
4. Press ink shall be “Scotchcal” brand letterpress inks Series 850, or as approved.

E. Cutout Characters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:

2. Character Material: Sheet or plate aluminum
3. Character Height: As indicated.
4. Thickness: 0.25 inch.
5. Finishes:

a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities. Retain "Integral Stainless-Steel Finish" Subparagraph below for integral finishes on stainless steel Retain one option in "Mounting" Subparagraph below; revise to suit Project. Insert specific material or exposed fastener design if required; verify available materials and designs with manufacturers.

6. Mounting: Projecting studs.
7. Typeface: As selected by Architect.

2.2 RELATED MATERIALS

A. Adhesive Tape:
1. Foam tape shall be manufactured by Minnesota Mining and Manufacturing (3M), No. 4262, double-coated neoprene foam, or as approved. Thickness shall be that needed to achieve maximum adhesion with minimum visibility.
2. Acrylic tape for acrylic joining of interior signs shall be manufactured by 3M, No. Y-9469, A-10 Isotac brand adhesive, or as approved.
3. Magnetic tape shall be manufactured by Chartpak, “Magnyl” pressure-sensitive tape of 1/16” thickness, or as approved.

2.3 FINISHES

A. Paints or inks required shall be made for the surface material on which they are to be applied, and to be applied as recommended by the manufacturer of the paint or ink.

B. Prime coats or other surface pre-treatment where recommended shall be included in the work.

C. Sign colors shall match approved samples and shall be exactly as specified in unit descriptions. Sign colors shall be consistent in chroma and value, shall maintain proper opacity or translucency and shall be free of all imperfections.

D. Graphic paint system shall be outdoor bulletin sign enamel manufactured by one of the following: Glidden – Durkee Div. Of SCM Corp.; Sherwin-Williams; Mercury Paint Co.; or as approved.

E. Urethane Paint (On Aluminum): Paint shall be Matthews Acrylic Polyurethane (MAP).

2.4 FABRICATION

A. Fabrication of signage assemblies shall be in accordance with approved shop drawings and manufacturer's recommendations.

B. All copy must be reproduced accurately and free from distortion. Round positive or negative corners, nicked or ragged edges are not acceptable. Arrows and symbols should be reproduced exactly by photographic process and submitted for approval prior to manufacturing. The Sign Contractor is responsible for submitting and receiving approvals for any message layouts, which must alter from specifications because of size constraints.

C. Painting:
1. Paint shall not be applied until the preceding coat has dried.
2. Clean and prepare surfaces according to manufacturer's printed instructions.
3. Before application of the finish paint, touch up all chipped or abraded areas within boundaries of graphic painting. Touch up paint shall be of the same formulation and color as original paint.
4. Acrylic paint shall be applied with brush or spray or silk-screened.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and the conditions under which the graphics are to be installed. Do not proceed with work until unsatisfactory conditions detrimental to the timely and proper completion of the work have been corrected.

3.2 INSTALLATION

A. Install all signs using personnel thoroughly familiar with procedures used. Install sign units level, plumb and at height indicated with sign surfaces free from cracks, chips or other defects of appearance.

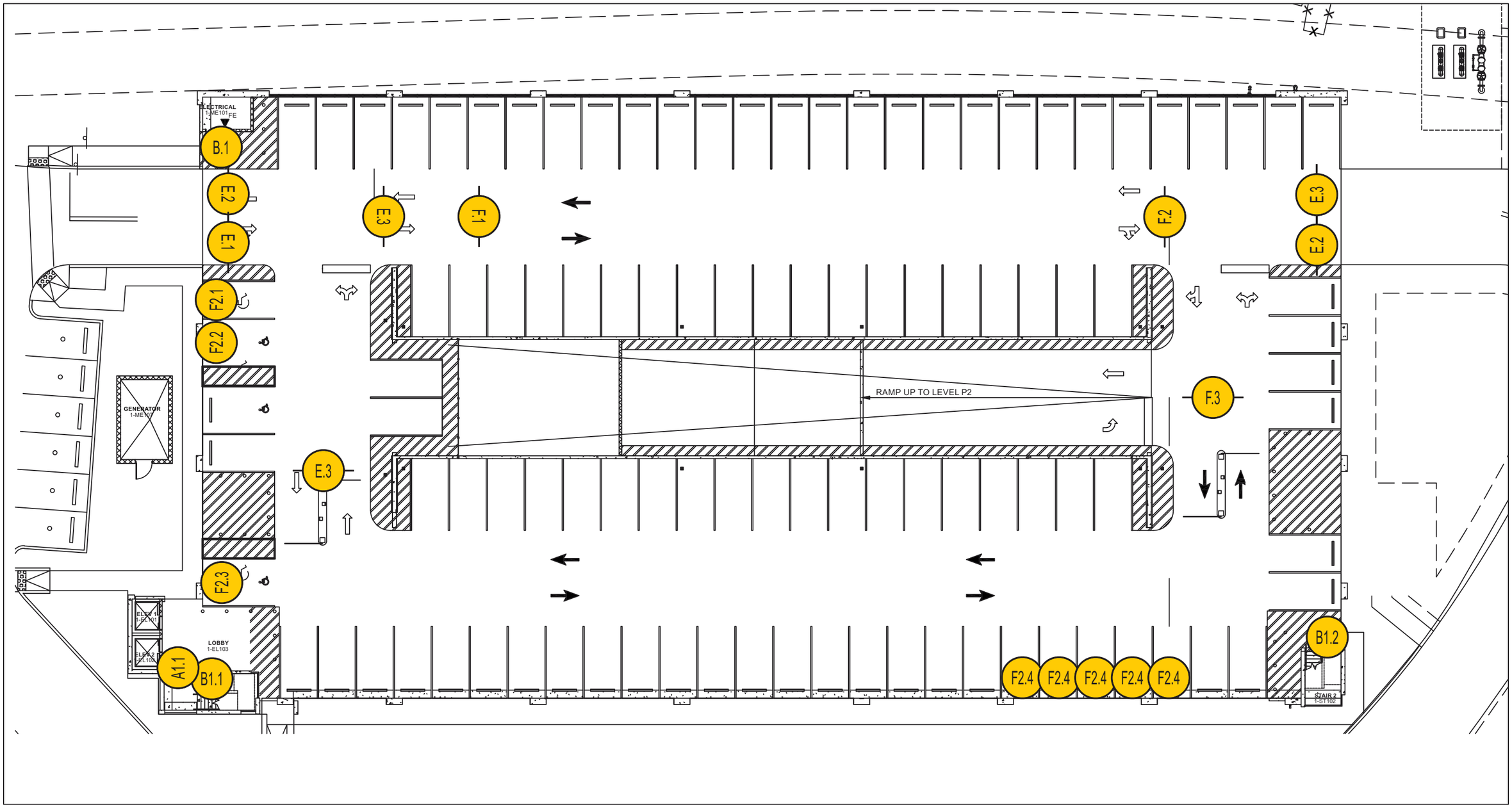
3.3 CLEANING AND ADJUSTMENT

A. All installed units are to be left level and fully cleaned on the agreed date of completion by the Contractor/ Installer.

3.4 SIGN SCHEDULES

A. Refer to Signage Schedule and Drawings for sizes, locations, sign types, layouts, typestyle specifications, sign text/copy and sign graphics.

END OF SECTION 101400



1st Floor - Sign Locations

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 7-24-24

Scale: N.T.S.

Customer Approval:

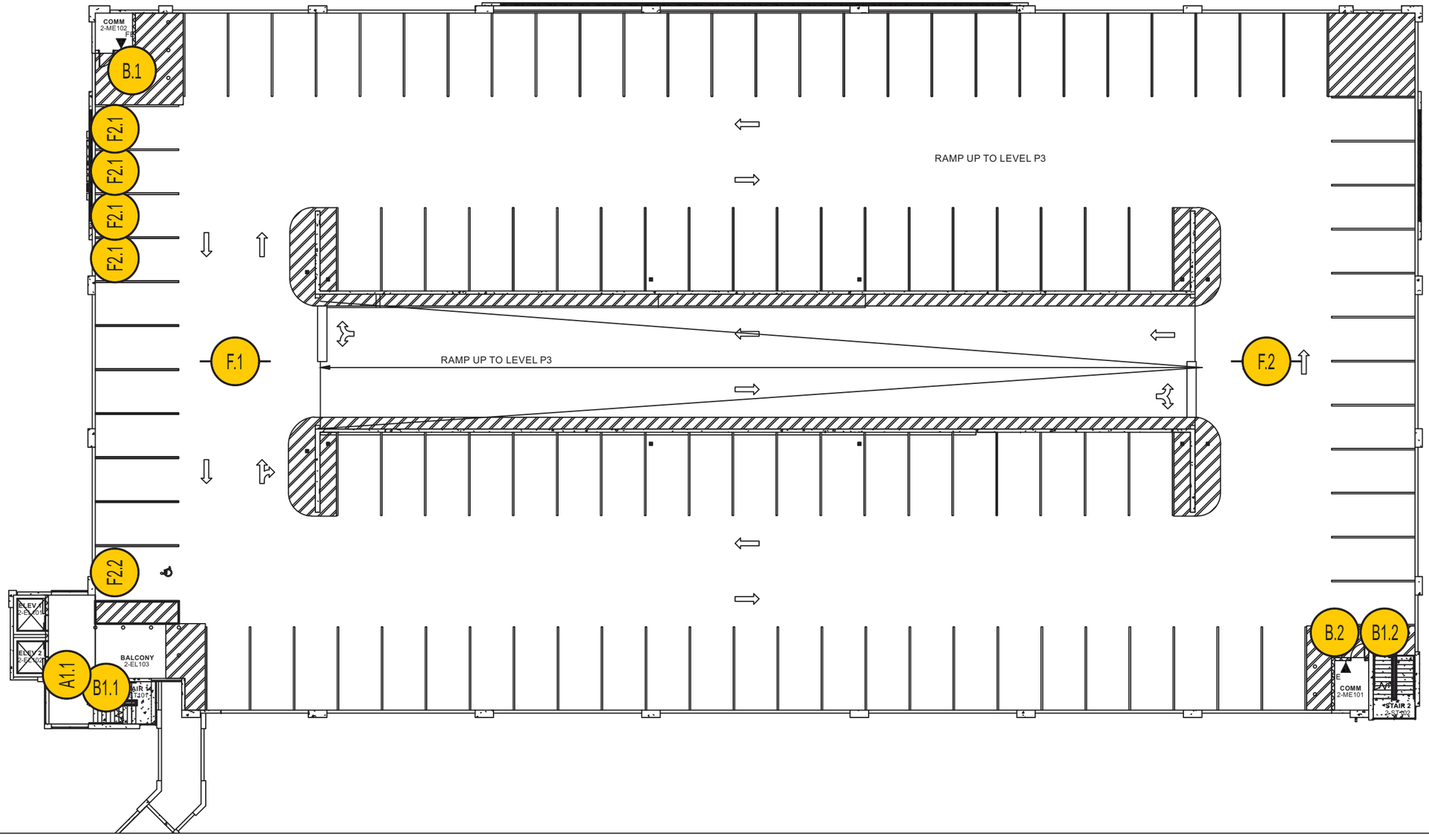
Project Manager: Trent M. Eckfeld

Drawn By: JWC

architectural identification incorporated

Corporate Office:
1170 Claycraft Road
Gahanna, OH 43230
Tel: 614-868-8400

Florida Branch Office:
2105 Tyrone Blvd. N.
St. Petersburg, FL 33710
Tel: 727-851-9544



2nd Floor - Sign Locations

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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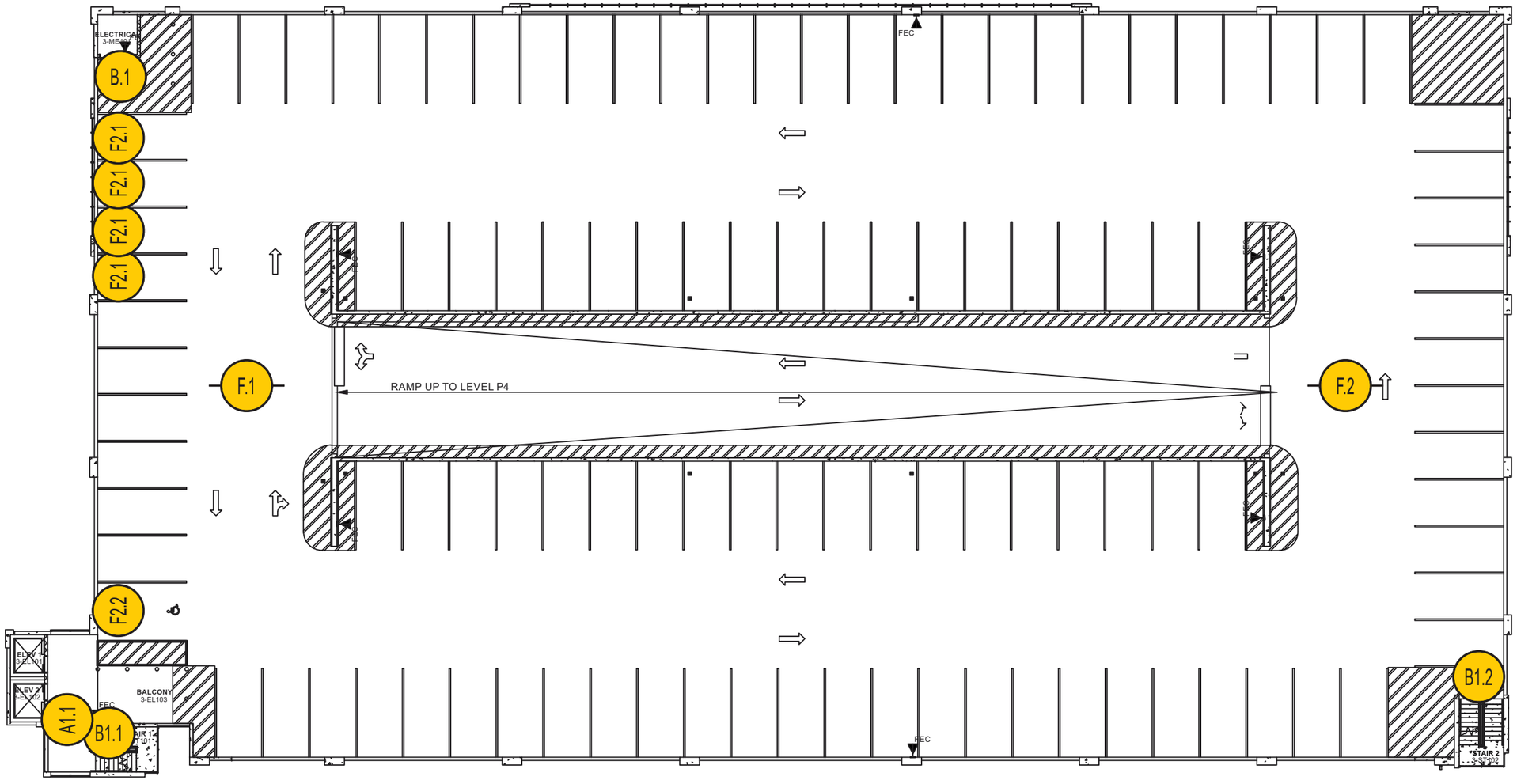
Project Manager: Trent M. Eckfeld

Drawn By: JWC

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Florida Branch Office:
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3rd Floor - Sign Locations

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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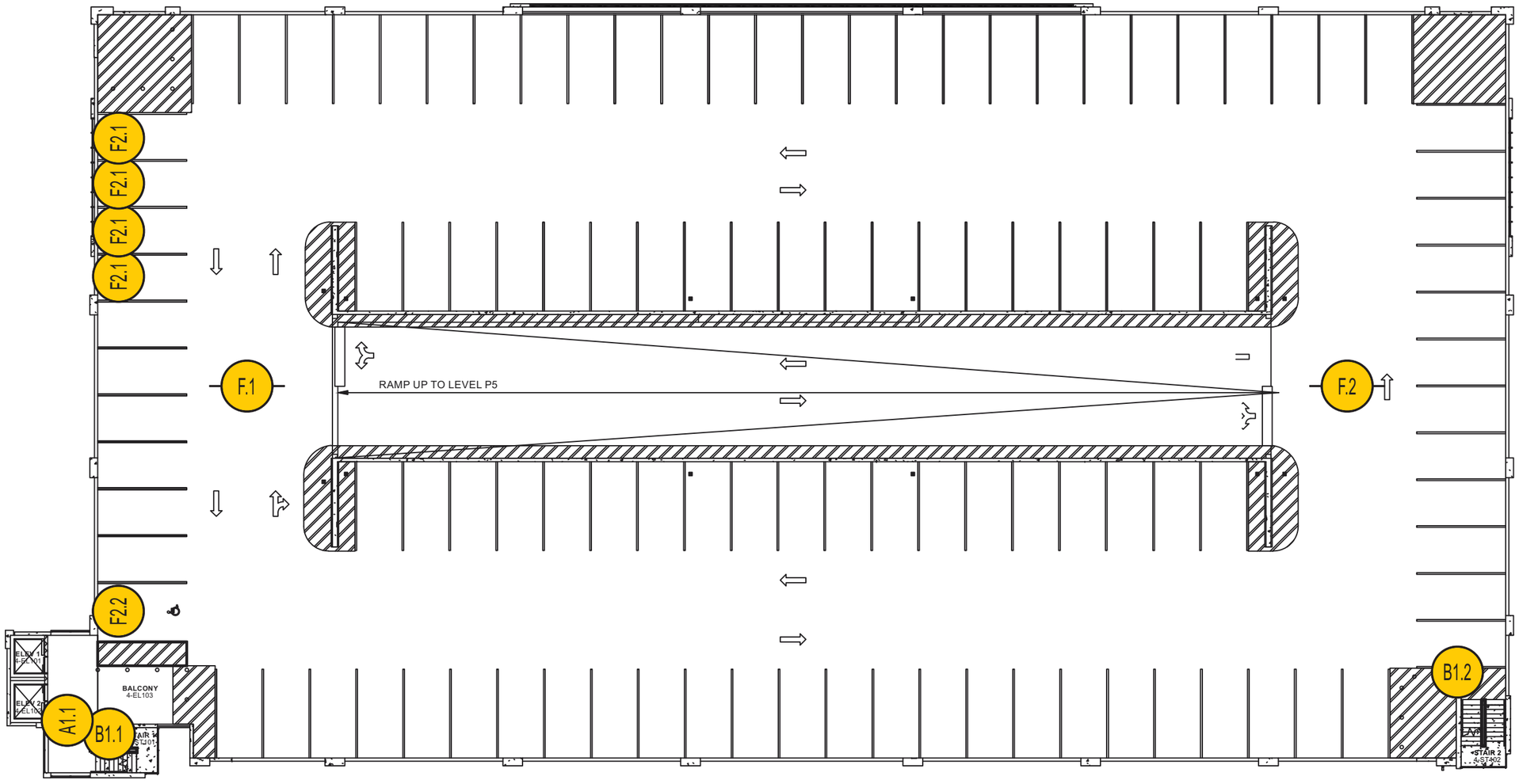
Project Manager: Trent M. Eckfeld

Drawn By: JWC

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Florida Branch Office:
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4th Floor - Sign Locations

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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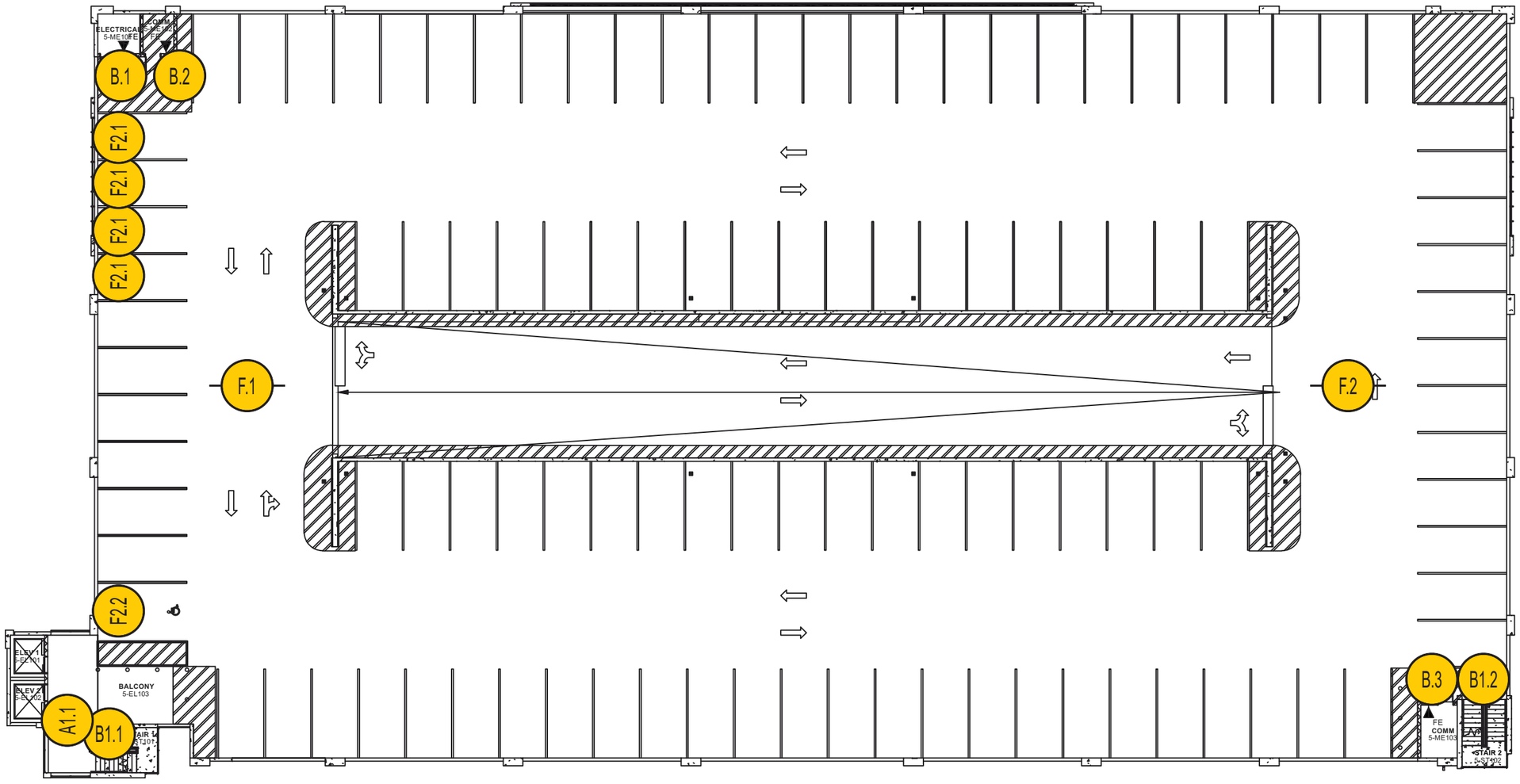
Project Manager: Trent M. Eckfeld

Drawn By: JWC

architectural identification incorporated

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Florida Branch Office:
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St. Petersburg, FL 33710
Tel: 727-851-9544



5th Floor - Sign Locations

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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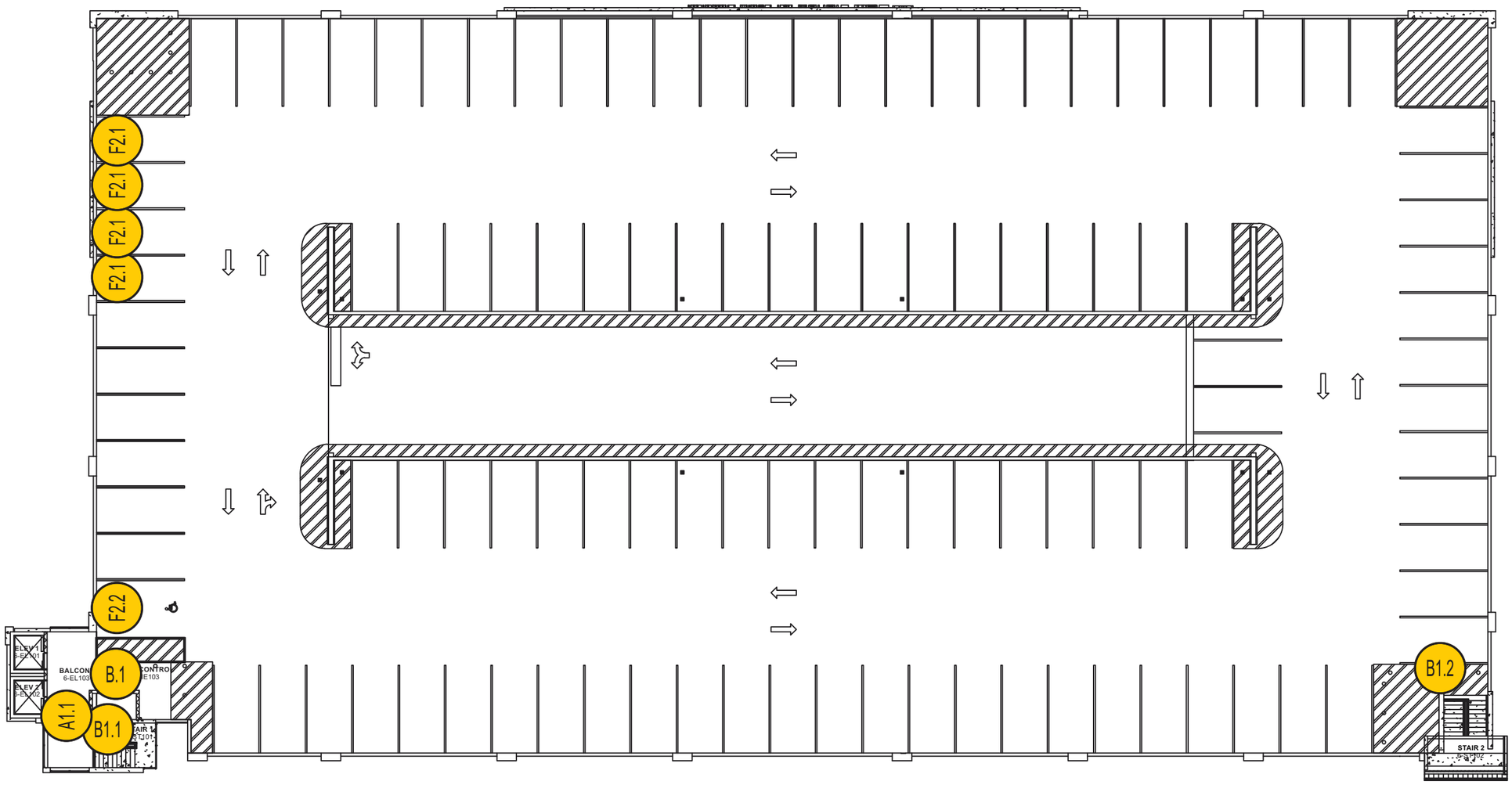
Project Manager: Trent M. Eckfeld

Drawn By: JWC

architectural identification incorporated

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Florida Branch Office:
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St. Petersburg, FL 33710
Tel: 727-851-9544



6th Floor - Sign Locations

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 7-24-24

Scale: N.T.S.

Customer Approval:

Project Manager: Trent M. Eckfeld

Drawn By: JWC

architectural identification incorporated

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Florida Branch Office:
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St. Petersburg, FL 33710
Tel: 727-851-9544

HCA Florida St. Lucie Hospital **07/18/24**
07/26/24

Project: Parking Garage

Location	Code	Qty.	Message	NOTES
			***** SEE DRAWINGS FOR ALL SIGN DETAILS *****	
			LEVEL 1	
A1.1	A1	1	SIDEWALK TO HOSPITAL ➔	
B.1	B	1	ELECTRICAL	
B1.1	B1	1	STAIR 1	w/ Stair Symbol
B1.2	B1	1	STAIR 2	w/ Stair Symbol
E.1	E	1	CLEARANCE - 8'-2"	
E.2	E	2	CAUTION! - KEEP RIGHT	
E.3	E	3	CLEARANCE - 7'-0"	
F.1	F	1	(Side 1, Column 1) ↑ LEVEL 2 (Side 1, Column 2) ➔ ELEVATORS ➔ STAIRS (Side 2, Column 1) ← ELEVATORS ← STAIRS (Side 2, Column 2) ↑ EXIT	
F.2	F	1	(Side 1, Column 1) ➔ STAIRS (Side 1, Column 2) ↑ EXIT ➔ LEVEL 2	

Location	Code	Qty.	Message	NOTES
			(Side 2, Column 1) 🡐 LEVEL 2 🡐 STAIRS (Side 2, Column 2) 🡑 ELEVATORS 🡑 STAIRS	
F.3	F	1	(Side 1, Column 1) 🡑 STAIRS (Side 1, Column 2) 🡒 LEVEL 2 (Side 2, BLANK)	
F2.1	F2	1	PARKING BY DISABLED PERMIT ONLY VAN ACCESSIBLE	w/ Disabled Symbol
	F2	1	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
F2.2	F2	1	PARKING BY DISABLED PERMIT ONLY VAN ACCESSIBLE	w/ Disabled Symbol
F2.3	F2	1	PARKING BY DISABLED PERMIT ONLY	w/ Disabled Symbol

Location	Code	Qty.	Message	NOTES
F2.4	F2	5	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
			LEVEL 2	
A1.1	A1	1	SIDEWALK TO HOSPITAL 🡻 DOWN TO 1	
B.1	B	1	COMM.	
B1.1	B1	1	STAIR 1	w/ Stair Symbol
B1.2	B1	1	STAIR 2	w/ Stair Symbol
F.1	E	1	(Side 1, Column 1) 🡐 EXIT 🡐 LEVEL 1 (Side 1, Column 2) 🡑 ELEVATORS 🡑 STAIRS (Side 2, Column 1) BLANK (Side 2, Column 2) 🡒 EXIT 🡒 LEVEL 1	
F.2	E	1	(Side 1, Column 1) 🡑 ELEVATORS 🡑 STAIRS (Side 1, Column 2) 🡑 EXIT 🡒 LEVEL 3	

Location	Code	Qty.	Message	NOTES
			(Side 2, Column 1) ← LEVEL 3 (Side 2, Column 2) ↑ EXIT	
F2.1	F2	4	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
F2.2	F2	1	PARKING BY DISABLED PERMIT ONLY	w/ Disabled Symbol
			LEVEL 3	
A1.1	A1	1	SIDEWALK TO HOSPITAL ↓ DOWN TO 1	
B.1	B	1	ELECTRICAL	
B.3	B	1	COMM. ROOM	
B1.1	B1	1	STAIR 1	w/ Stair Symbol
B1.2	B1	1	STAIR 2	w/ Stair Symbol
F.1	E	1	(Side 1, Column 1) ← EXIT ← LEVEL 2 (Side 1, Column 2) ↑ ELEVATORS ↑ STAIRS	

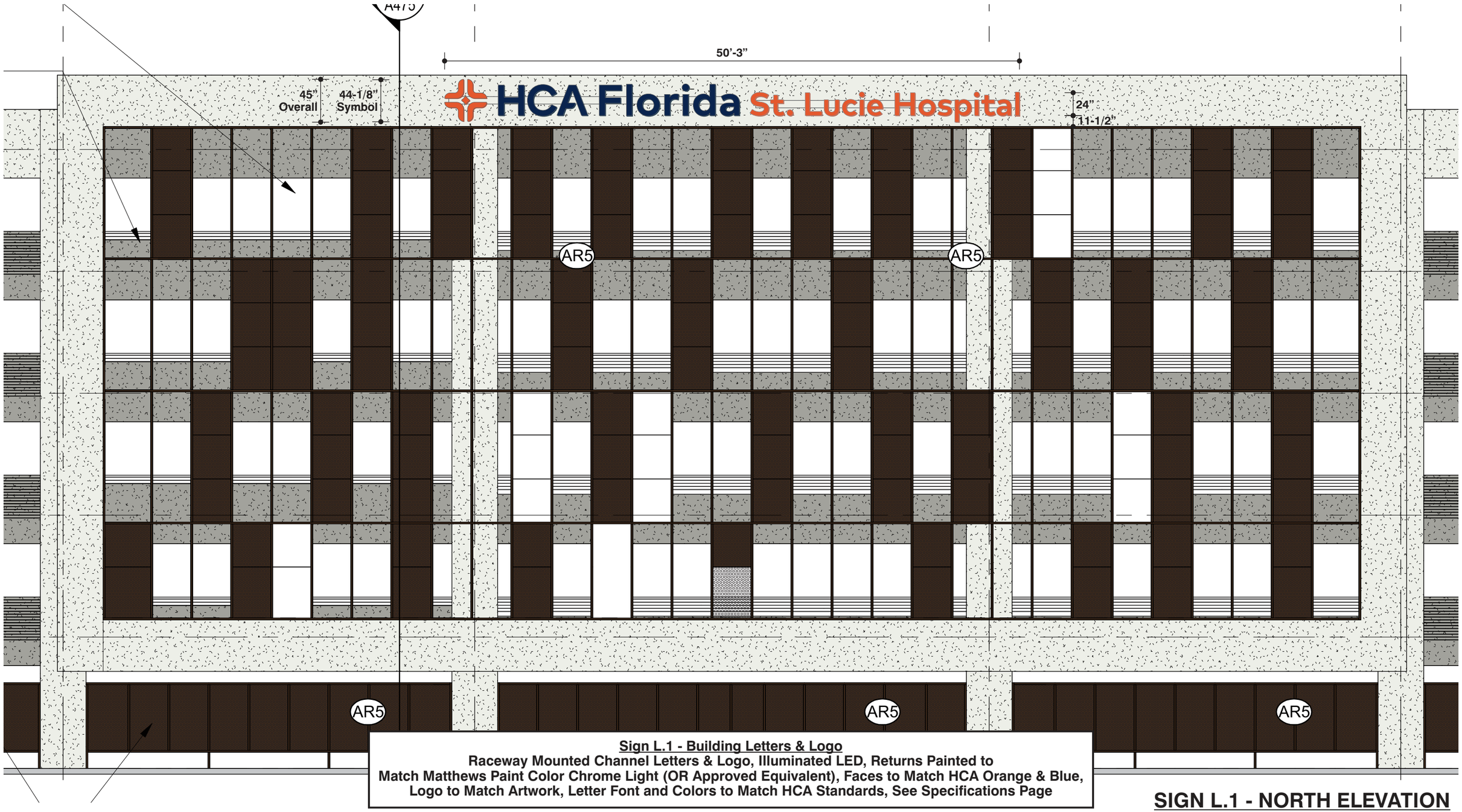
Location	Code	Qty.	Message	NOTES
			(Side 2, Column 1) BLANK (Side 2, Column 2) ➔ EXIT ➔ LEVEL 2	
F.2	E	1	(Side 1, Column 1) ↑ ELEVATORS ↑ STAIRS (Side 1, Column 2) ↑ EXIT ➔ LEVEL 4 (Side 2, Column 1) ← LEVEL 4 (Side 2, Column 2) ↑ EXIT	
F2.1	F2	4	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
F2.2	F2	1	PARKING BY DISABLED PERMIT ONLY	w/ Disabled Symbol
			LEVEL 4	
A1.1	A1	1	SIDEWALK TO HOSPITAL ↓ DOWN TO 1	
B1.1	B1	1	STAIR 1	w/ Stair Symbol
B1.2	B1	1	STAIR 2	w/ Stair Symbol

Location	Code	Qty.	Message	NOTES
F.1	E	1	(Side 1, Column 1) 🡐 EXIT 🡐 LEVEL 3 (Side 1, Column 2) 🡑 ELEVATORS 🡑 STAIRS (Side 2, Column 1) BLANK (Side 2, Column 2) 🡒 EXIT 🡒 LEVEL 3	
F.2	E	1	(Side 1, Column 1) 🡑 ELEVATORS 🡑 STAIRS (Side 1, Column 2) 🡑 EXIT 🡒 LEVEL 5 (Side 2, Column 1) 🡐 LEVEL 5 (Side 2, Column 2) 🡑 EXIT	
F2.1	F2	4	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
F2.2	F2	1	PARKING BY DISABLED PERMIT ONLY	w/ Disabled Symbol

LEVEL 5

Location	Code	Qty.	Message	NOTES
A1.1	A1	1	SIDEWALK TO HOSPITAL 🡻 DOWN TO 1	
B.1	B	1	ELECTRICAL	
B.2	B	1	COMM. ROOM	
B.3	B	1	COMM. ROOM	
B1.1	B1	1	STAIR 1	w/ Stair Symbol
B1.2	B1	1	STAIR 2	w/ Stair Symbol
F.1	E	1	(Side 1, Column 1) 🡸 EXIT 🡸 LEVEL 4 (Side 1, Column 2) 🡹 ELEVATORS 🡹 STAIRS (Side 2, Column 1) BLANK (Side 2, Column 2) 🡺 EXIT 🡺 LEVEL 4	
F.2	E	1	(Side 1, Column 1) 🡹 ELEVATORS 🡹 STAIRS (Side 1, Column 2) 🡹 EXIT 🡺 LEVEL 6 (Side 2, Column 1) 🡸 LEVEL 6 (Side 2, Column 2) 🡹 EXIT	

Location	Code	Qty.	Message	NOTES
F2.1	F2	4	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
F2.2	F2	1	PARKING BY DISABLED PERMIT ONLY	w/ Disabled Symbol
			LEVEL 6	
A1.1	A1	1	SIDEWALK TO HOSPITAL ↓ DOWN TO 1	
B.1	B	1	ELEVATOR CONTROL	
B1.1	B1	1	STAIR 1	w/ Stair Symbol
B1.2	B1	1	STAIR 2	w/ Stair Symbol
F2.1	F2	4	ELECTRIC VEHICLE CHARGING STATION	w/ EV Symbol
F2.2	F2	1	PARKING BY DISABLED PERMIT ONLY	w/ Disabled Symbol



Sign L.1 - Building Letters & Logo
Raceway Mounted Channel Letters & Logo, Illuminated LED, Returns Painted to Match Matthews Paint Color Chrome Light (OR Approved Equivalent), Faces to Match HCA Orange & Blue, Logo to Match Artwork, Letter Font and Colors to Match HCA Standards, See Specifications Page

SIGN L.1 - NORTH ELEVATION

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 6-14-24

Scale: 1/8" = 1'-0"

Customer Approval:

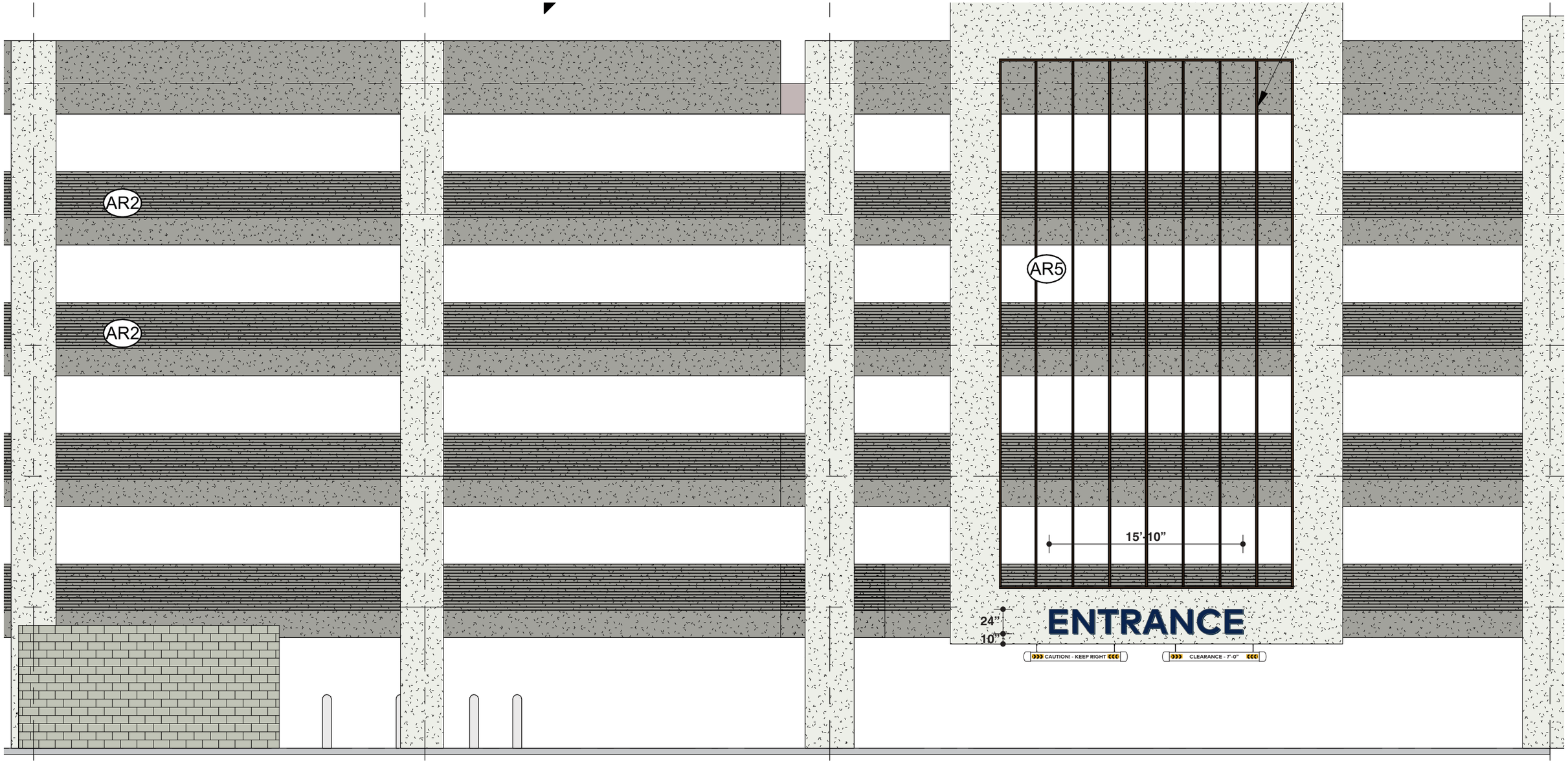
Project Manager: Trent M. Eckfeld

Drawn By: TJB

architectural identification incorporated

Corporate Office:
1170 Claycraft Road
Gahanna, OH 43230
Tel: 614-868-8400

Florida Branch Office:
2105 Tyrone Blvd. N.
St. Petersburg, FL 33710
Tel: 727-851-9544



Sign L.2 - Building Letters
Individually Mounted Channel Letters, Illuminated LED, Returns Painted to Match Matthews Paint Color Chrome Light (OR Approved Equivalent), Faces to Match HCA Blue, Letter Font and Colors to Match HCA Standards, See Specifications Page

SIGN L.2 - EAST ELEVATION

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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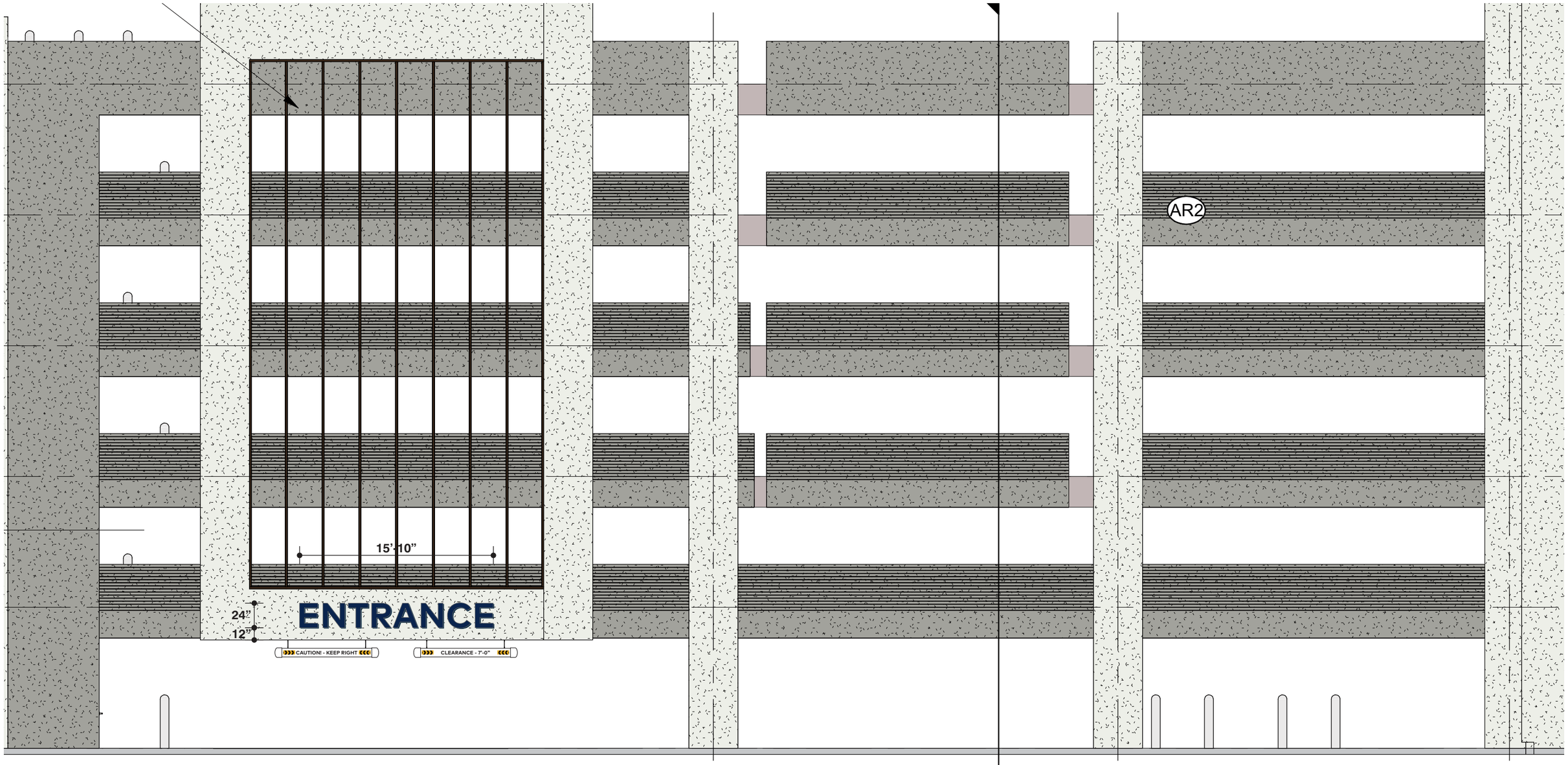
Project Manager: Trent M. Eckfeld

Drawn By: TJB

architectural identification incorporated

Corporate Office:
1170 Claycraft Road
Gahanna, OH 43230
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Florida Branch Office:
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St. Petersburg, FL 33710
Tel: 727-851-9544



Sign L.3 - Building Letters
Individually Mounted Channel Letters, Illuminated LED, Returns Painted to Match Matthews Paint Color Chrome Light (OR Approved Equivalent), Faces to Match HCA Blue, Letter Font and Colors to Match HCA Standards, See Specifications Page

SIGN L.3 - WEST ELEVATION

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 6-14-24

Scale: 1/8” = 1’-0”

Customer Approval:

Project Manager: Trent M. Eckfeld

Drawn By: TJB

architectural identification incorporated

Corporate Office:
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Florida Branch Office:
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Exterior Signage

CU.X Channel Letters - Unbranded

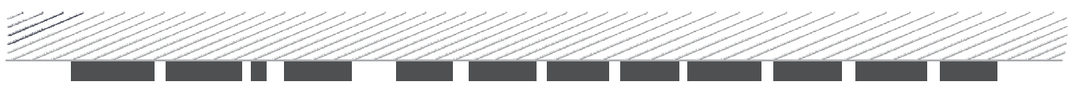
Application and Use

Channel Letters - Unbranded are illuminated letters used to mark and designate an entrance. Typically located on a facade or canopy directly above a building entrance, these letters identify the entrance by type or function (e.g. Main Entrance, EMERGENCY, AMBULANCE etc.). Unbranded Channel Letters may appear in different configurations and sizes based on the architectural conditions and available area on the building facade.

Sizing Guidelines

Overall sizes are typically based on available building facade area and legibility factors like viewing distance and sight lines.

As a rule, the recommended minimum letter height for unbranded channel letters is 12”.



Top View



Side Views

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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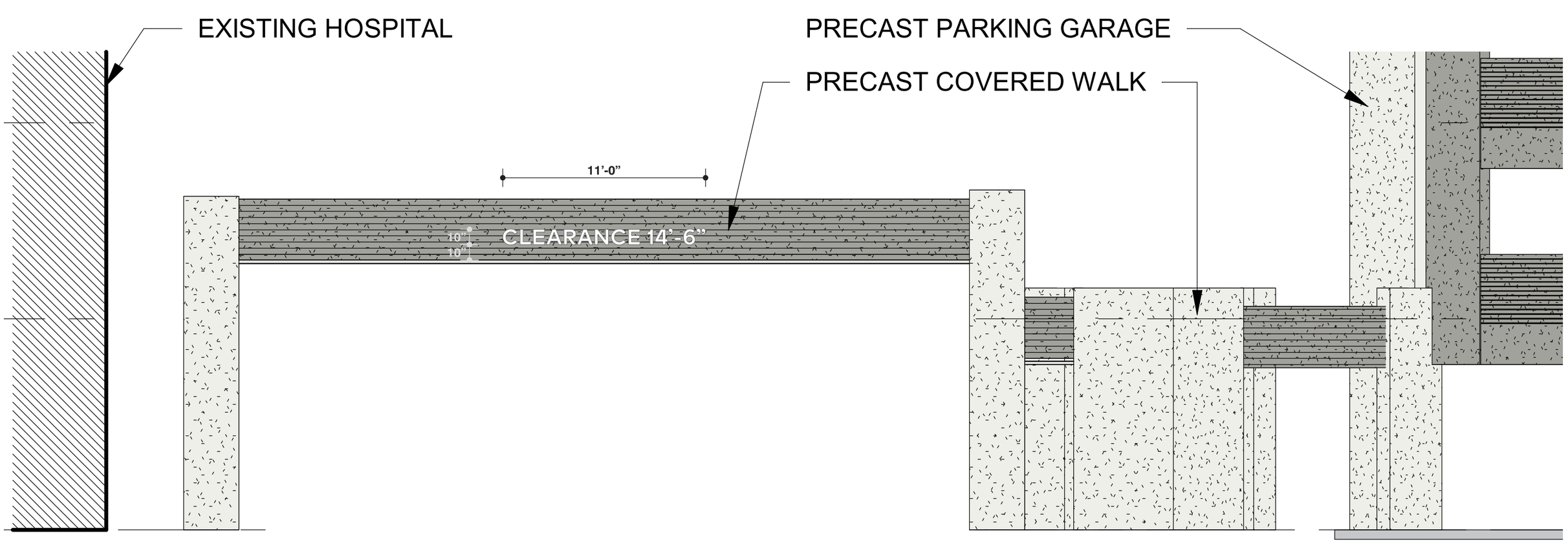
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Sign L.4 - Clearance Letters
Individually Mounted Letters, Non-Illuminated, Letters to be 1” Deep, Fabricated Metal Letters, Faces and Returns to be Painted White, Letter Font and Colors to Match HCA Standards, See Specifications Page

SIGN L.4 - EAST ELEVATION

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 6-14-24

Scale: 3/16” = 1’-0”

Customer Approval:

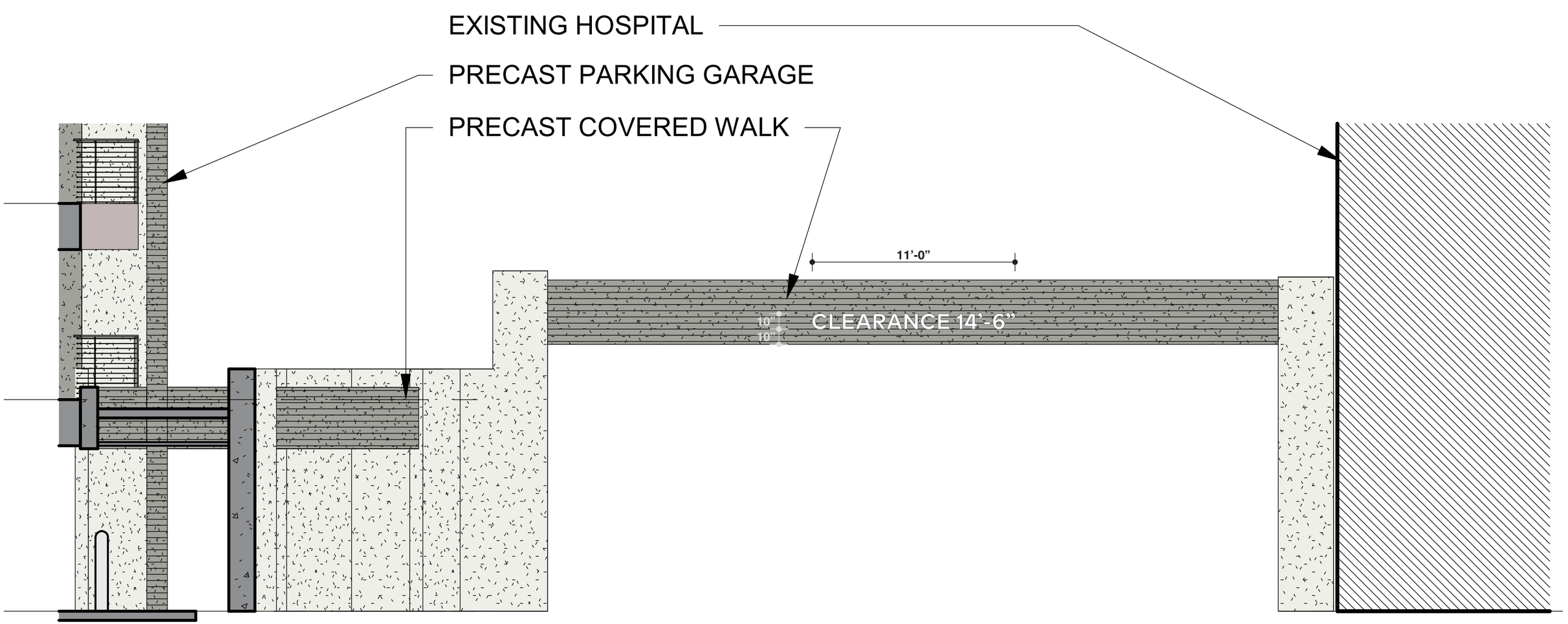
Project Manager: Trent M. Eckfeld

Drawn By: TJB

architectural identification incorporated

Corporate Office:
1170 Claycraft Road
Gahanna, OH 43230
Tel: 614-868-8400

Florida Branch Office:
2105 Tyrone Blvd. N.
St. Petersburg, FL 33710
Tel: 727-851-9544



Sign L.5 - Clearance Letters
Individually Mounted Letters, Non-Illuminated, Letters to be 1” Deep, Fabricated Metal Letters, Faces and Returns to be Painted White, Letter Font and Colors to Match HCA Standards, See Specifications Page

SIGN L.5 - WEST ELEVATION

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Exterior Signage

DL.X Dimensional Letters — Unbranded

Technical Specifications

1 **PAINTED LETTERS - ENTRY**

1” deep fabricated metal letters. Faces and returns painted to match HCA Navy.

2 **PAINTED LETTERS - EMERGENCY**

1” deep fabricated metal letters. Faces and returns painted to match HCA Crimson Red.

3 **PAINTED LETTERS - AMBULANCE**

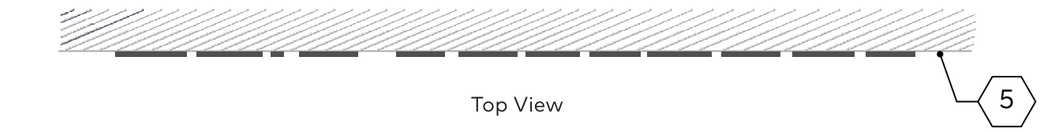
1” deep fabricated metal letters. Faces and returns painted to match HCA White.

4 **MOUNTING HARDWARE (NOT SHOWN)**

Pin mounted flush to wall complete with silicone.

5 **WALL**

Structure and substructure will vary by construction per location.



Top View



Front View - Typical Messages - Flush Mounted
(Scale not Specified)



Side Views

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 6-14-24

Scale: N.T.S.

Customer Approval:

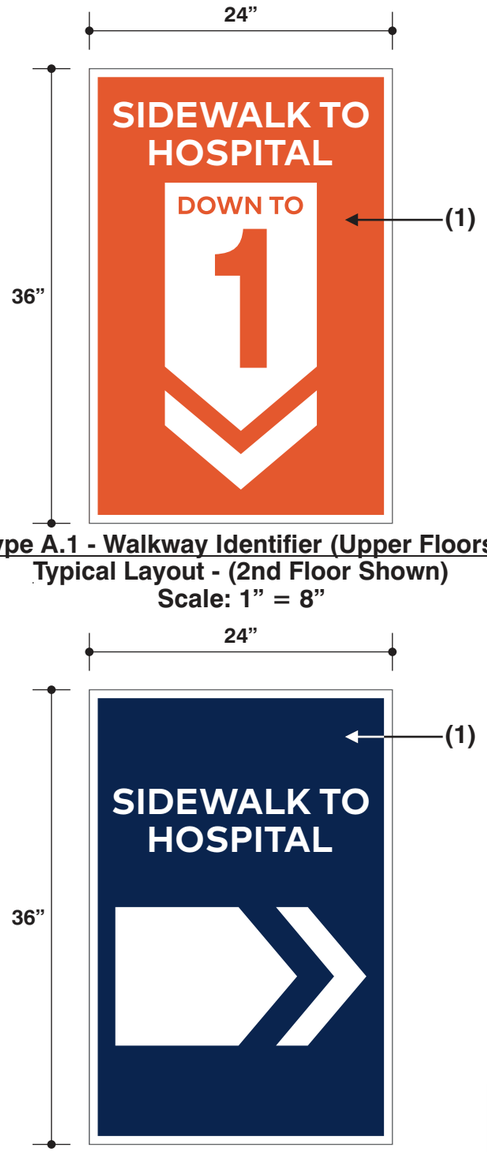
Project Manager: Trent M. Eckfeld

Drawn By: TJB

architectural identification incorporated

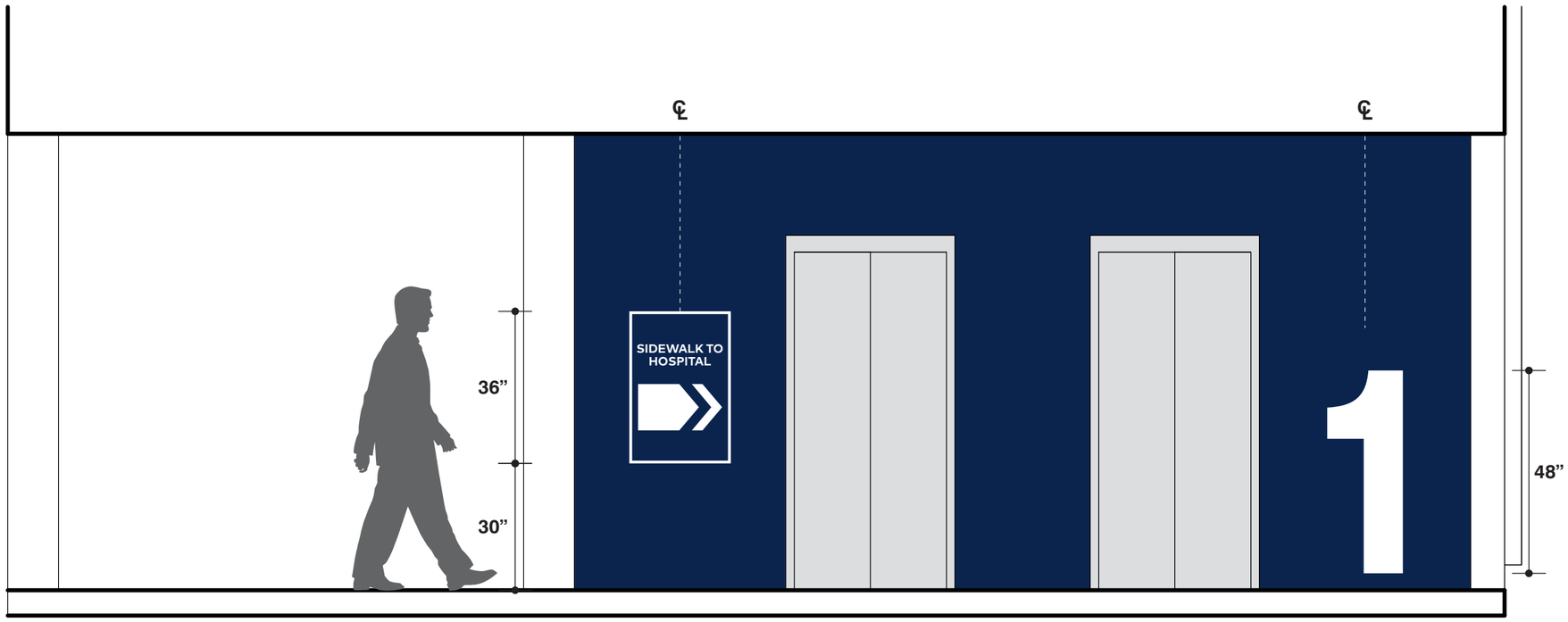
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Type A.1 - Walkway Identifier (Upper Floors)
Typical Layout - (2nd Floor Shown)
Scale: 1” = 8”

Type A.1 - Walkway Identifier
(1st Floor)
Scale: 1” = 8”



Type A.1 - Floor Identifier
Typical Layout - Scale: 3/8” = 1’-0”

Note: Wall and Number to be Painted to Match Panel Colors by Floor Number Font to Match Signs, Mark for HCA Bold, Painted by Others

NOTES:
(1) - 1/8” thick Aluminum Panel with First Surface Applied Digital Print on Reflective Vinyl to match:
1. HCA Blue PMS 289
2. HCA Orange PMS 7579
3. SW 6788 Capri
4. SW 6551 Purple Passage
5. SW 6905 Goldfinch
6. SW 7647 Crushed Ice

Font: Mark for HCA Bold
Stud Mounted Flush to Surface with all Penetrations Sealed with Silicone.

Sign Type: A.1
Floor Identifiers
Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 7-24-24

Scale: As Noted

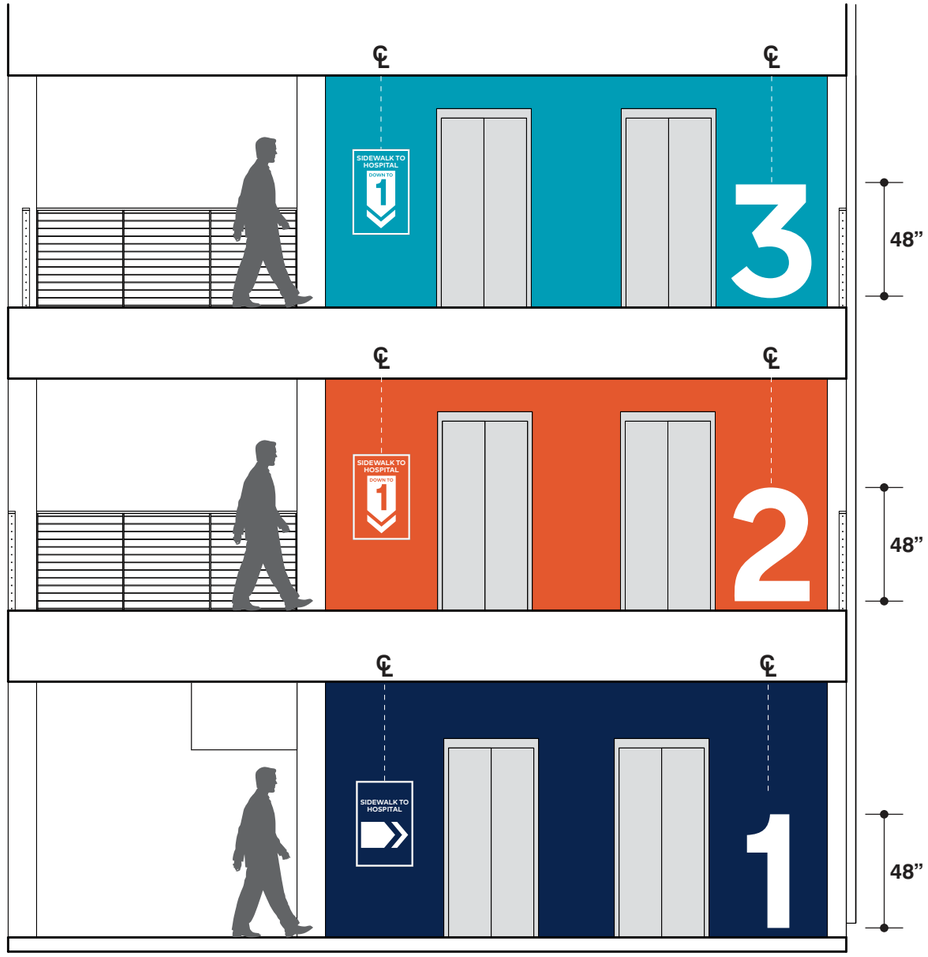
Customer Approval:

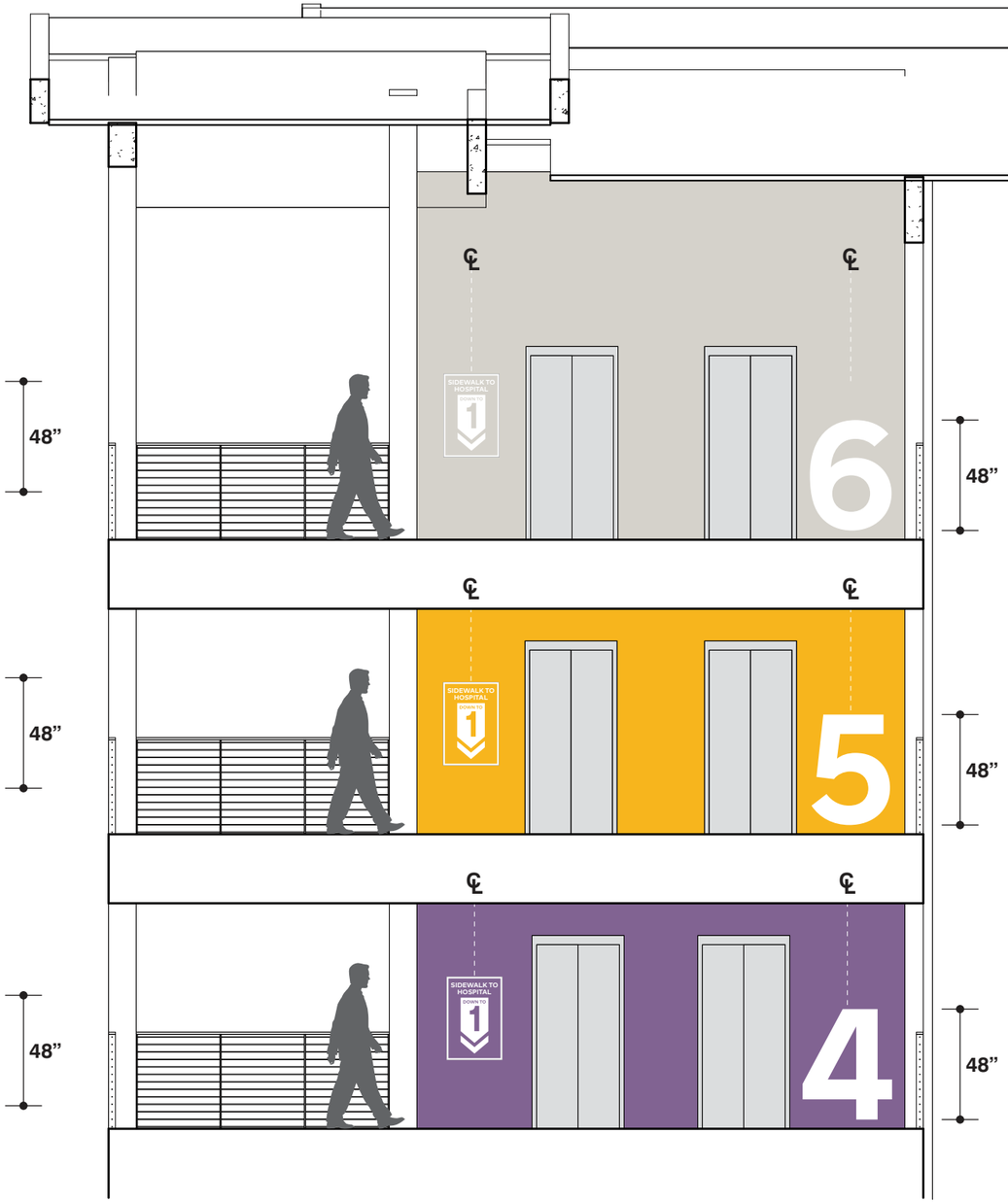
Project Manager: Trent M. Eckfeld
Drawn By: TJB

architectural identification incorporated

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Type A.1 - Floor Identifier (Elevator Lobbies)
Alternate Layouts - All Floor Layouts Shown

Sign Type: A.1
Floor Identifiers
Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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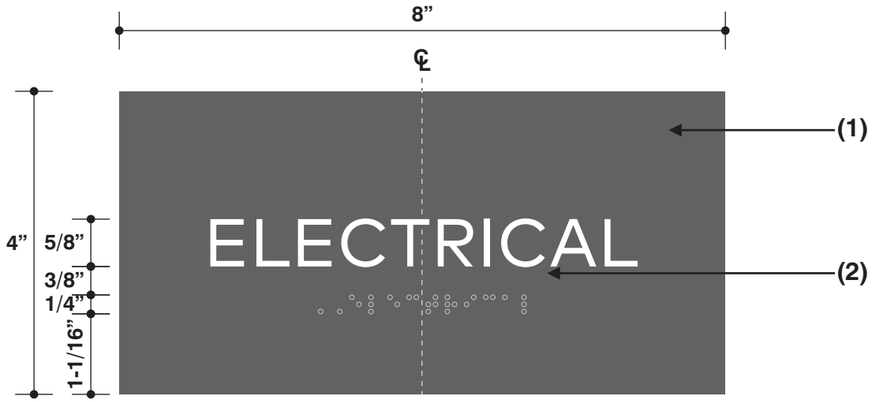
Project Manager: Trent M. Eckfeld

Drawn By: TJB

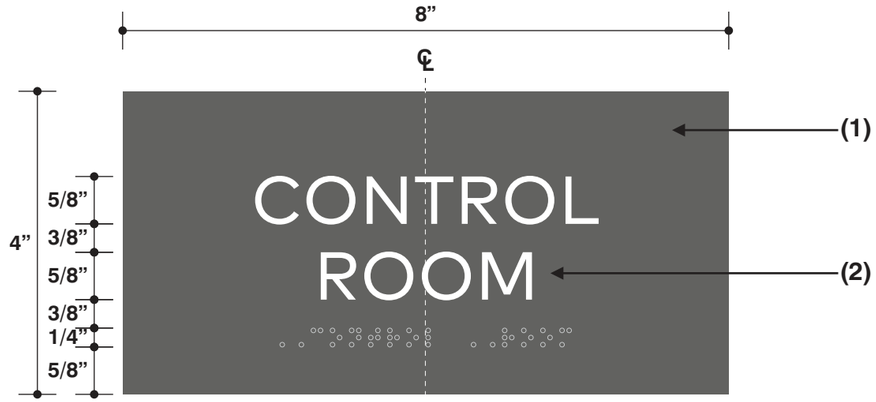
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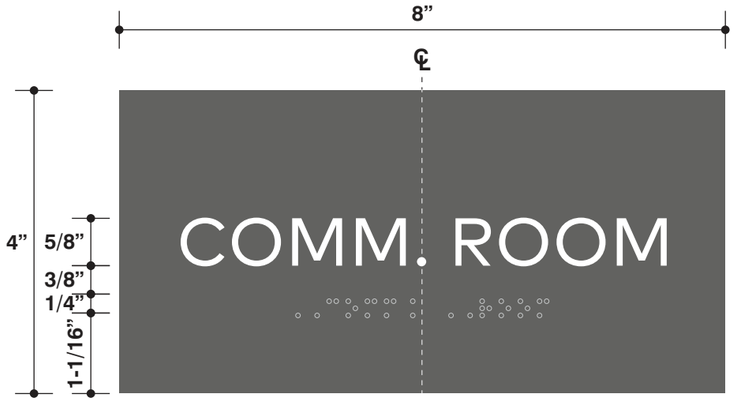
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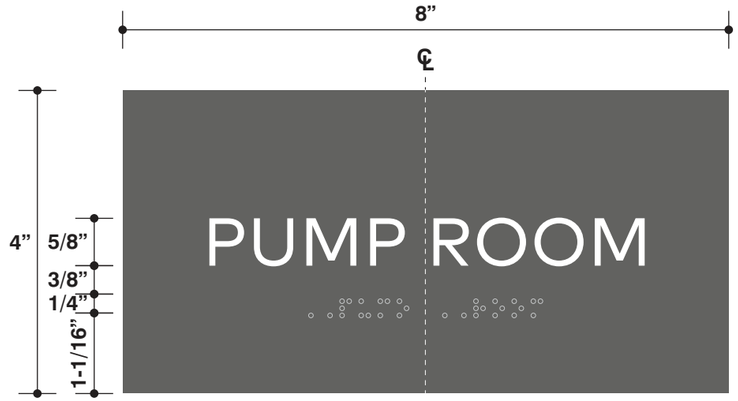
Type B - ADA Room ID
Typical Layout



Type B - ADA Room ID
Typical Layout



Type B - ADA Room ID
Typical Layout



Type B - ADA Room ID
Typical Layout

NOTES:
(1) - 1/8” Thick Aluminum with First Surface and Edges painted to match MP12416 Shipyard Gray.

(2) - Tip Screened Text White.

Font: Mark for HCA Bold
Mount 60” AFF to top of sign, 3” from door frame on latch side of door.
Signs mount with VHB tape and clear silicone.

Sign Type: B
ADA Room ID
Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 7-24-24

Scale: 1” = 2”

Customer Approval:

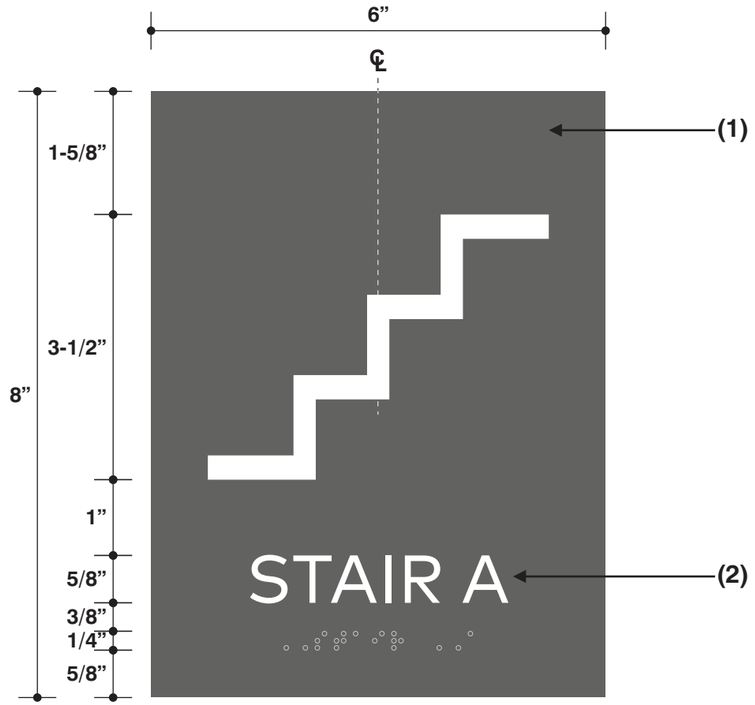
Project Manager: Trent M. Eckfeld

Drawn By: TJB

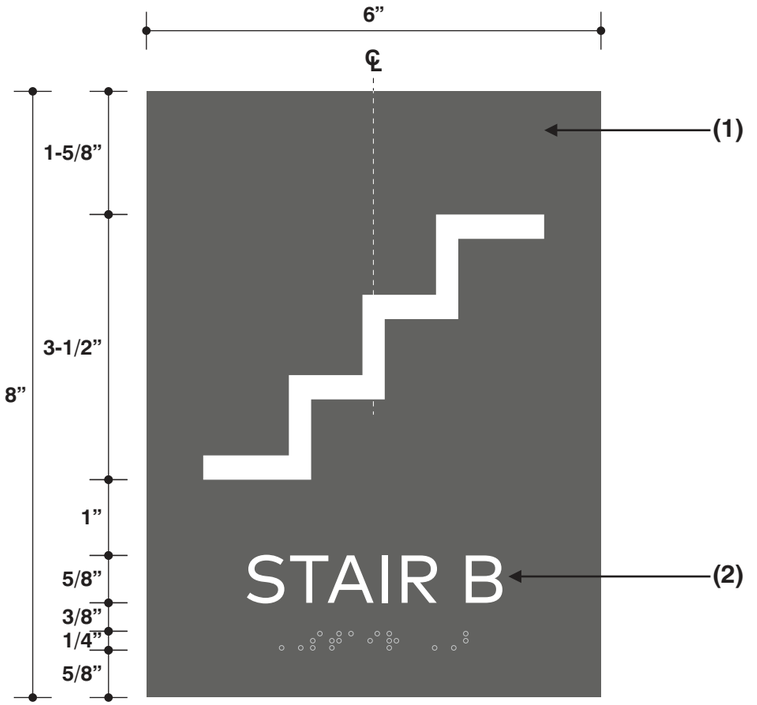
architectural identification incorporated

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Type B1 - ADA Stair Sign
Typical Layout



Type B1 - ADA Stair Sign
Typical Layout

NOTES:
(1) - 1/8” Thick Aluminum with First Surface and Edges painted to match MP12416 Shipyard Gray.

(2) - Tip Screened Text White.

Font: Mark for HCA Bold
Mount 60” AFF to top of sign, 3” from door frame on latch side of door.
Signs mount with VHB tape and clear silicone.

Sign Type: B1
ADA Stair ID
Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Date: 7-24-24

Scale: 1” = 2”

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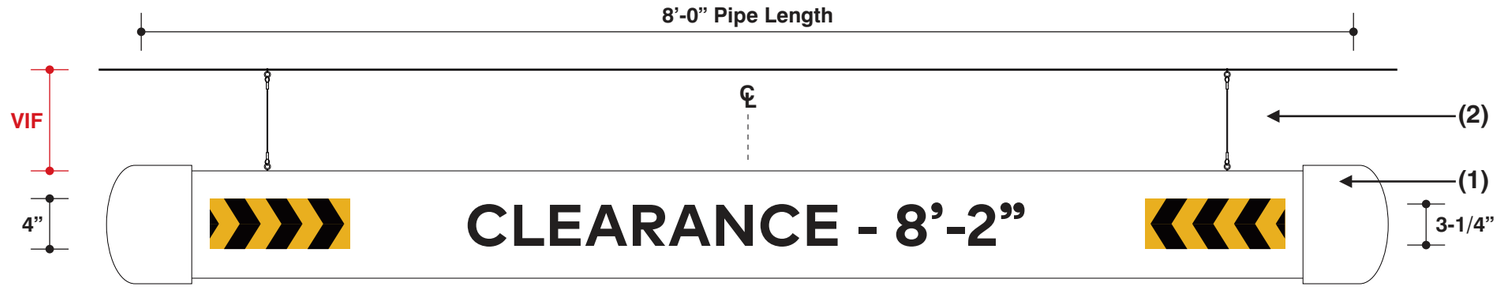
Project Manager: Trent M. Eckfeld

Drawn By: TJB

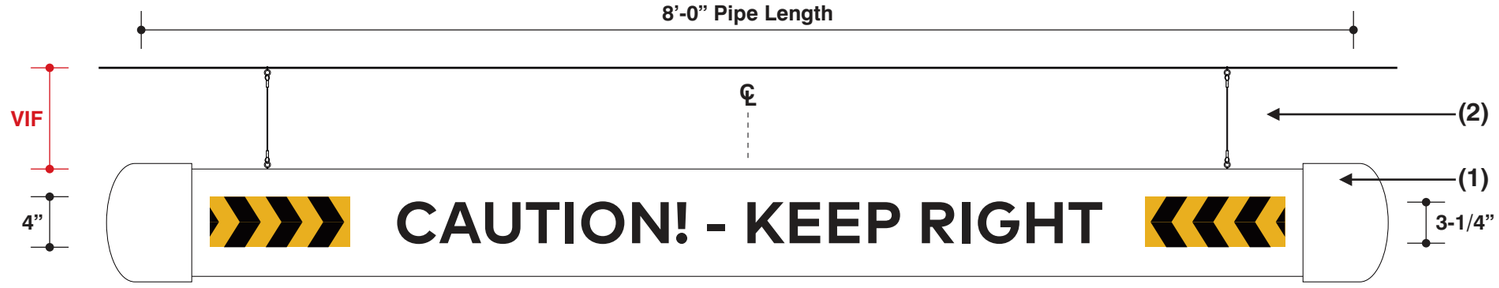
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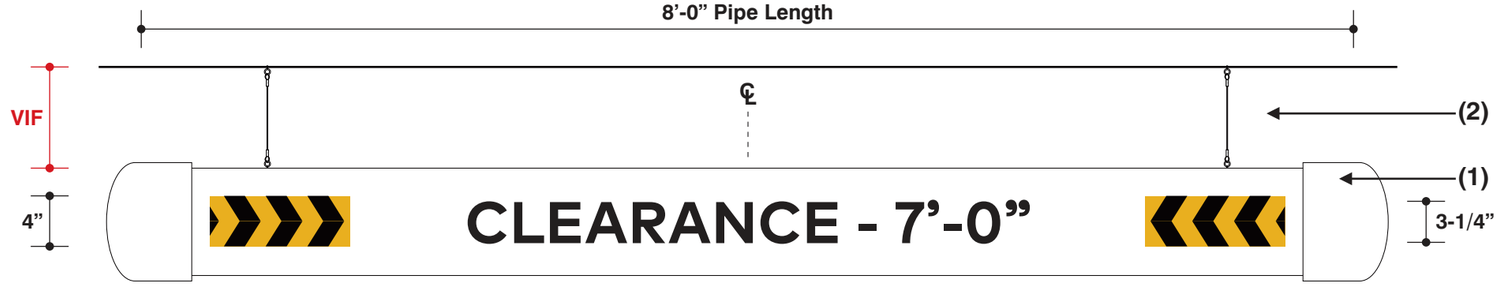
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Type E - Clearance Bar - Sign Location #E.1



Type E - Clearance Bar - Sign Location #E.2



Type E - Clearance Bar - Sign Location #E.3

NOTES:
(1) - 8” Diameter PVC Pipe with Capped Ends. All Surfaces Painted White, with Reflective Black, Yellow, Red and White Vinyl Graphics.

(2) - 1/8” SS Aircraft Cable with Eye Bolts Painted White and Aluminum Cable Crimps. Mount to Ceiling with Expansion Anchors.

Font: Mark for HCA Bold

Sign Type: E
Clearance Bar
Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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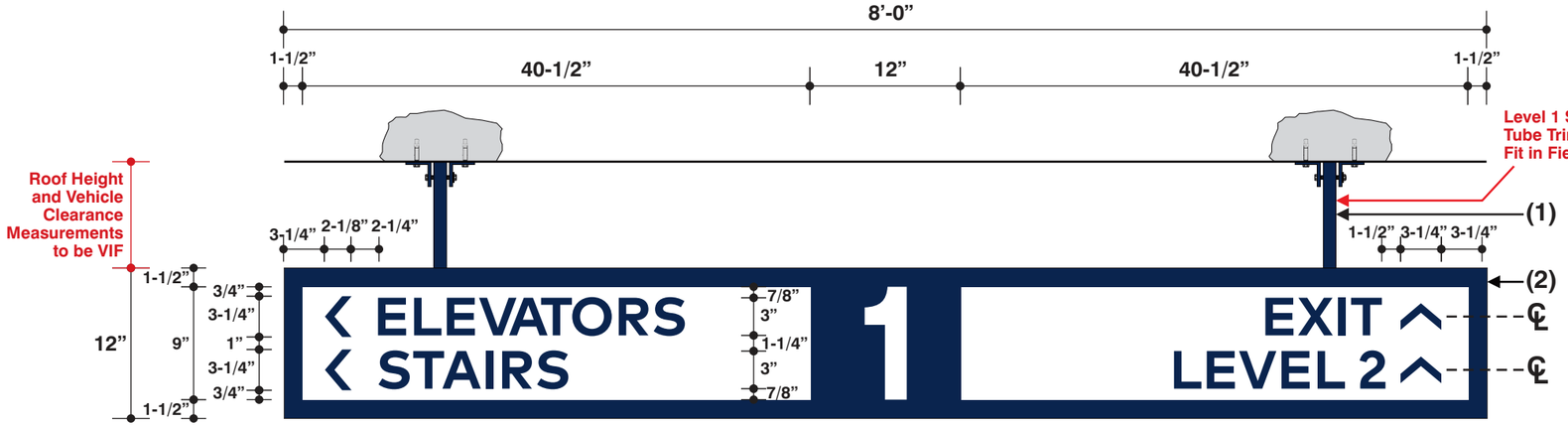
Project Manager: Trent M. Eckfeld

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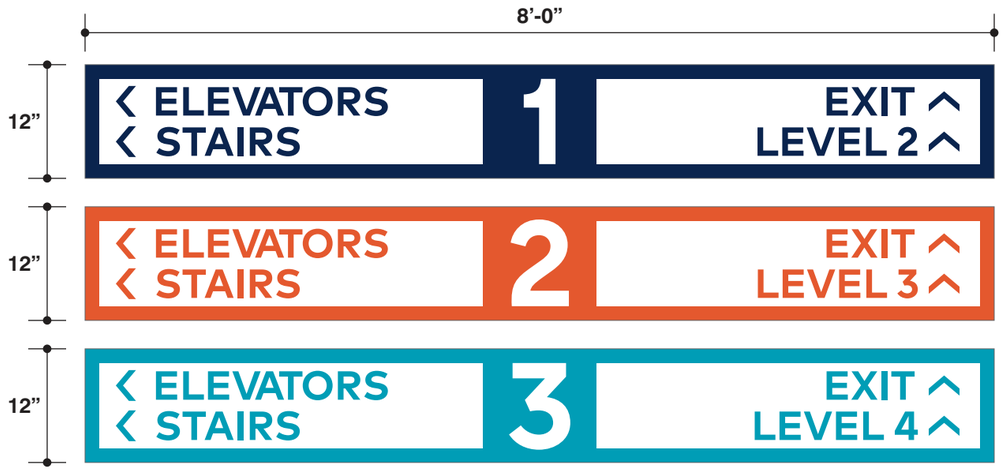
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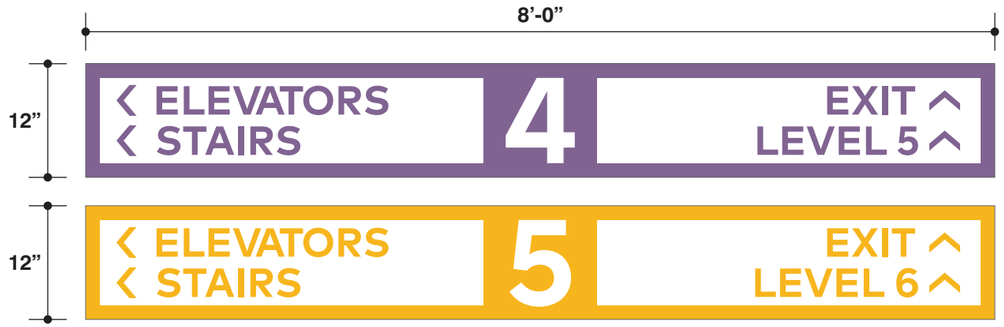
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Type F - Overhead Directional
Typical Layout - Scale: 1” = 1’-0”





Type F - Overhead Directional
Typical Layouts - Scale: 3/4” = 1’-0”

NOTES:
(1) - 1” Welded Aluminum Square Tube Frame with Mitered Corners. .090” Aluminum Faces Chemically Fastened to Frame with Lord Adhesive. All Visible Surfaces Painted:
1. HCA Blue PMS 289, 2. HCA Orange PMS 7579, 3. SW 6788 Capri, 4. SW 6551 Purple Passage, 5. SW 6905 Goldfinch, 6. SW 6705 High Strung

(2) - First surface applied Digital Print On Reflective to Vinyl to Match:
1. HCA Blue PMS 289, 2. HCA Orange PMS 7579, 3. SW 6788 Capri, 4. SW 6551 Purple Passage, 5. SW 6905 Goldfinch, 6. SW 6705 High Strung

Font: Mark for HCA Bold
Mounted to Structure using 2” x 2” x 1/4” Thick Aluminum Angles and Expansion Anchors.

Sign Type: F
Overhead Directional
Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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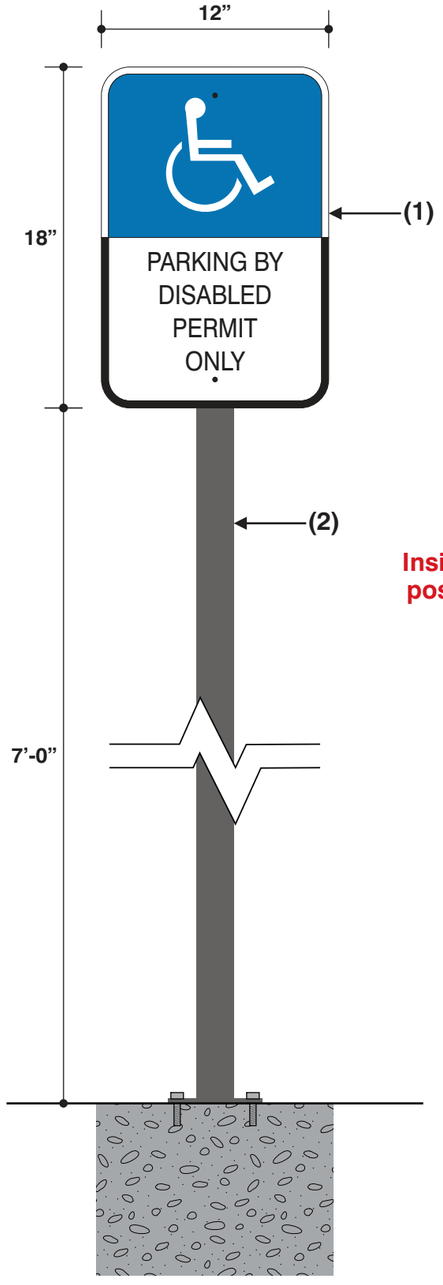
Project Manager: Trent M. Eckfeld

Drawn By: TJB

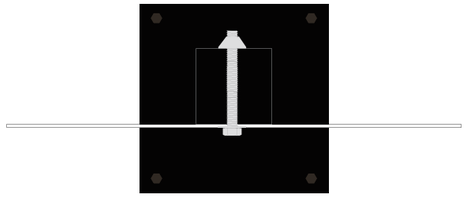
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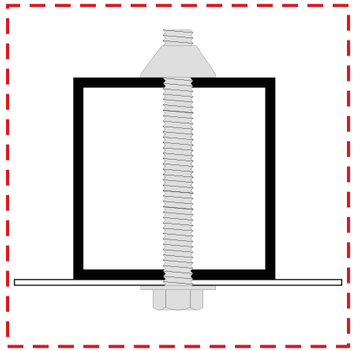


Post Mount (Front View)
Scale: 1” = 8”

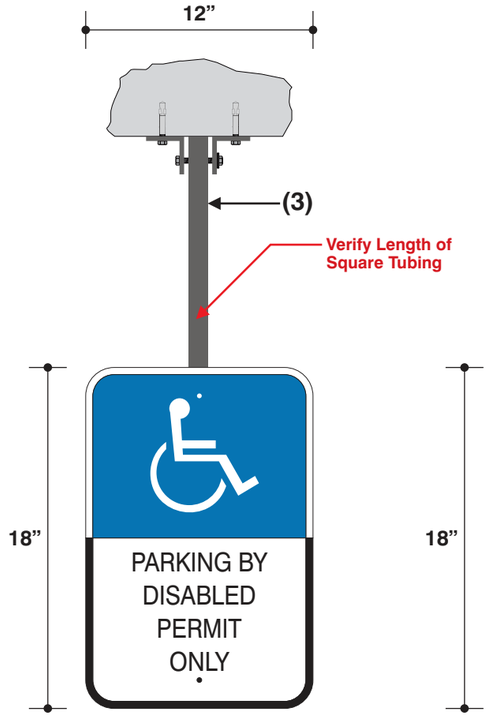


Post Mount (Top View)
Scale: 1” = 4”

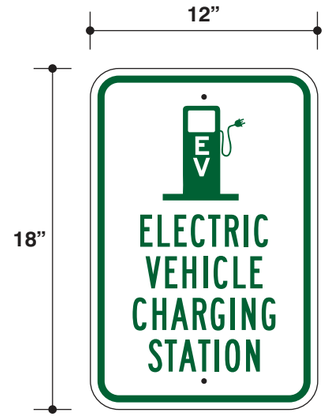
Inside view of post showing mounting hardware.



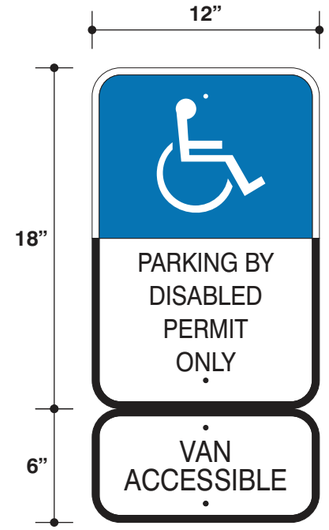
Post Mount (Detail View)
Scale: N.T.S.



Ceiling Mount (Front View)
Scale: 1” = 8”



EV Sign Layout (Front View)
Scale: 1” = 8”



Alternate Layout for Van Parking (Front View)
Scale: 1” = 8”

NOTES:
(1) - .080 Aluminum panel with first surface applied reflective vinyl graphics and lettering per O.C.G.A. standards.

(2) - 2” x 2” square aluminum post with 6” square 1/2” thick mounting plate welded to the post with all exposed surfaces painted MP12416 Shipyard Grey, Faceplate flush mounted to post with tamper-proof break-away bolt hardware.

(3) - 1” Welded Aluminum Square Tube Mounted to Structure using 2” x 2” x 1/4” Thick Aluminum Angles and Expansion Anchors. All Visible Surfaces Painted MP12416 Shipyard Grey,

Post Mount: Post is Bolted to Concrete Floor using Non-Corrosive Concrete Anchors.

Sign Type: F2

Parking Signs

Wall & Post Mounting - Interior Garage

Project: HCA Florida St. Lucie Hospital

Location: 1800 SE Tiffany Ave, Port St Lucie, FL 34952

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Scale: As Noted

Customer Approval:

Project Manager: Trent M. Eckfeld

Drawn By: TJB

architectural identification incorporated

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SECTION 142123.16 – MRL ELECTRIC TRACTION PASSENGER ELEVATORS

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. This Section includes traction passenger elevators.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Division 05 Section "Structural Steel Framing" for the following:

    a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills that are part of steel frame.

3. Division 05 Section "Metal Fabrications" for the following:
    a. Pit ladders.
4. Division 26 Sections for electrical service for elevators to and including disconnect switches at machine room door.
5. Division 27 Section "Communications Horizontal Cabling" for telephone service to elevators.
6. Division 28 Section "Fire Detection and Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.

1.3 DEFINITIONS

A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:

1. Car enclosures and hoistway entrances.
2. Operation, control, and signal systems.

B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control

station and standby power operation control panel. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

E. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

G. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain elevators through one source from a single manufacturer.

1. Provide major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.

1. Refer to Structural drawings for seismic requirements.

D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.7 COORDINATION

A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.

B. Furnish well casing and coordinate delivery with related excavation work.

C. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

D. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service.

a. Response Time: Two hours or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Otis Gen3 series Machine Room-Less elevator.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Otis Worldwide Corporation
2. KONE Inc.
3. Schindler Elevator Corporation
4. ThyssenKrupp Elevator

2.2 SYSTEMS AND COMPONENTS

A. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

B. Guide Rails: Dry, non-lubricated steel, fastened to the building with steel brackets.

C. Guides: Roller guides, with a minimum of three tires, shall be mounted on top and bottom of the car and counterweight frame and be held in contact with the guide rail by adjustable devices.

D. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

E. Machine: The hoisting machine shall be a compact gearless traction type, consisting of AC motor, brake and driving sheave mounted on a rigid bedplate in the top of the hoistway. A large diameter, forged shaft shall serve as a support for the motor armature and for the removable drive sheave and brake system. It shall be supported by roller bearings mounted in the machine housing.

F. Drive System:
1. The drive system shall be of the Variable Voltage Variable Frequency (VVVF) Non-Regenerative or Regenerative.
2. The system shall be a vector controlled pulse-width modulated AC drive. The variable voltage variable frequency drive shall convert the AC power supply using a two step process to a variable voltage variable frequency power supply for use by the hoist motor.
3. The speed control shall be by means of vector control providing independent excitation and torque current. A digital absolute velocity encoder shall be provided giving feedback to the controller on armature position and motor speed.

G. Motor/Machine:
1. The motor shall be AC, totally enclosed, non-ventilated with class "F" insulation. The motor armature shall be dynamically balanced and supported by roller bearings of ample capacity. The armature and driving sheave shall be properly balanced for smooth, high-speed elevator performance. The Machine shall be mounted in the top of the hoistway on structural steel beams or channels and bearing plates furnished by the elevator installer. Beams shall be securely fastened to the supports.
2. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.
3. Provide means for absorbing regenerated power when elevator system is operating on standby power.
4. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

H. Brake:
1. The brake shall be a spring applied electric brake, held open by an electro-magnet actuated by a digital brake controller and designed to make smooth, positive stops. The Brake shall be designed to automatically apply in the event of interruption of power supply from any cause. Operation and control of the brake shall be all digital. The setting and lifting of the brake shall be software based and all electronic. All adjustments and setup of the brake shall be made using a PC interface. No contactors or resistors shall be used in the actuation of the brake.

I. Ropes:
1. Provide Steel hoist cables of size and number to ensure proper wear qualities shall be used. Special wedge shackles shall be used.
2. Governor ropes shall be of iron construction
3. Any special tools, devices, software or equipment required for monitoring the wear of any means of suspension other than standard elevator steel cables shall be included with the installation of the equipment and become the property of the owner at time of elevator completion. This includes special ongoing monitoring systems, special tools and instruction needed to monitor the suspension system.

J. Counterweight:
   1. Counterbalance each elevator for smooth and economical operation by using iron or steel plate weights securely fastened in a steel counterweight frame. Counterweight shall equal the weight of the complete elevator car and approximately 40-45 percent of the specified capacity load.

K. Safety and Governor:
   1. Car safety shall be mounted on the bottom members of the car frame and be operated by a centrifugal speed governor. The governor shall be designed to cut off power to the motor and apply the brake whenever the governor indicates the car has excessive speed. The governor shall function when the car over speeds.

L. Emergency Terminal Limits:
   1. Place electric limit switches in the hoistway near the terminal landings. Limit switches shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.

M. Automatic Self-Leveling:
   1. Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

N. Fluid for Oil Buffers: If oil buffers are used, use only fire-resistant hydraulic fluid containing antioxidant, anticorrosive, antifoaming, and metal-passivating additives.

   1. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Hydro Safe (FR)" by Hydro Safe Oil Division, Inc.

O. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.

P. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Division 05 Section "Metal Fabrications" for materials and fabrication.

Q. Car Frame and Platform: Welded steel units.

2.3 OPERATION SYSTEMS

A. Group Automatic Operation: In addition to primary operation system features, provide the following operational features for elevators where indicated:
   1. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
   2. Card-Reader Operation at Patient-Staff elevators.
   3. Car-to-Lobby Feature at Public elevators.

2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.5 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

E. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.

F. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

2.6 CAR ENCLOSURES

A. General: Provide steel-framed car enclosures with nonremovable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
2. Provide finished car including materials and finishes specified below.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:

1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch nominal thickness.
2. Floor Finish: Specified in a Division 09.
3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard substrate with manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.

   a. Door Finish: Stainless steel panels: No. 4 brushed finish.
   b. Cab Sills: Extruded aluminum, mill finish.

7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
9. Metal Ceiling: Flush panels, with four low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
10. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.7 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.

1. Where gypsum board wall construction is indicated, provide self-supporting frames with reinforced head sections.

B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:
1. Sight Guards: Provide sight guards on doors matching door edges.
2. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.
3. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.8 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life incandescent lamps and acrylic or other permanent, nonyellowing translucent plastic diffusers or LEDs.

B. Swing-Return Car Control Stations: Provide car control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.

1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet and telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Division 28 Section "Fire Detection and Alarm."

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide manufacturer's standard wall-mounted units.
2. Provide units with flat faceplate for mounting with body of unit recessed in wall.
3. Equip units with buttons for calling elevator and for indicating desired direction of travel.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on car.

I. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above hoistway entrance at ground floor. Provide units with flat faceplate for mounting and with body of unit recessed in wall.

1. Integrate ground-floor hall lanterns with hall position indicators.

J. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

2.9 ELEVATORS

A. Public Elevators (1 Service):
1. Basis of Design: Otis Gen3 Peak – GEN5020
2. Type: Gearless Traction Machine Room-less, Passenger
3. Rated Load: 5000 lb.
4. Rated Speed: 350 fpm.
5. Operation System: Group Automatic.
6. Power: 480 volts
7. Travel: 53’-4”
8. Landings: 6
9. Openings:
   a. Front: As indicated on drawings.
   b. Rear: 1 on Level P1
10. Auxiliary Operations:
    a. Nuisance call cancel.
11. Car Enclosures:

    a. Inside Width: 8’-5” from side wall to side wall.
    b. Inside Depth: 10’-1” from back wall to front wall (return panels).
    c. Inside Height: 8’-0” to underside of ceiling.
    d. Side and Rear Wall Panels: Plastic laminate.
    e. Reveals: Stainless steel, satin.
    f. Door Faces (Interior): Stainless steel, satin.
    g. Door Sills: Aluminum, mill finish.
    h. Ceiling: Satin stainless steel, No. 4 finish.
    i. Handrails: 1-1/2 inches (38 mm) round satin stainless steel, No. 4 finish, at rear of car.
    j. Floor recessed and prepared to receive ceramic tile (specified in Division 09).
    k. Floor Thickness, Including Setting Materials: 3/8” above plywood subfloor.

12. Hoistway Entrances:

    a. Width: 48 inches.
    b. Height: 84 inches.
    c. Type: Two Speed.
    d. Fire-Protection Rating: 2 hour with 30-minute temperature rise of 450 deg F (250 deg C).

B. Public Elevators (1 Passenger):
1. Basis of Design: Otis Gen3 Peak – GEN5020
2. Type: Gearless Traction Machine Room-less, Passenger

3. Rated Load: 3500 lb.
4. Rated Speed: 350 fpm.
5. Operation System: Group Automatic.
6. Power: 120 volts
7. Travel: 53'-4"
8. Landings: 6
9. Openings:
    a. Front: As indicated on drawings.
    b. Rear: 0
10. Auxiliary Operations:
    a. Nuisance call cancel.
11. Car Enclosures:

    a. Inside Width: 8'-4" from side wall to side wall.
    b. Inside Depth: 10'-1" from back wall to front wall (return panels).
    c. Inside Height: 6'-11" to underside of ceiling.
    d. Side and Rear Wall Panels: Plastic laminate.
    e. Reveals: Stainless steel, satin.
    f. Door Faces (Interior): Stainless steel, satin.
    g. Door Sills: Aluminum, mill finish.
    h. Ceiling: Satin stainless steel, No. 4 finish.
    i. Handrails: 1-1/2 inches (38 mm) round satin stainless steel, No. 4 finish, at rear of car.
    j. Floor recessed and prepared to receive ceramic tile (specified in Division 09).
    k. Floor Thickness, Including Setting Materials: 3/8" above plywood subfloor.

12. Hoistway Entrances:

    a. Width: 48 inches.
    b. Height: 84 inches.
    c. Type: Two Speed.
    d. Fire-Protection Rating: 2 hour with 30-minute temperature rise of 450 deg F (250 deg C).

13. Additional Requirements:

    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
    b. Provide blanket hooks and one complete set of full-height protective blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

    1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance or indicating that dimensions and conditions were found to be satisfactory.
    2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch, up or down, regardless of load and direction of travel.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Operating Test: Load each elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for each elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.

2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s). Refer to Division 01 Section "Demonstration and Training."

B. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

C. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION 142100

SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 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.

1.2 RELATED WORK

A. Field painting of exposed pipe.

1.3 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.

1.4 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division.

1.5 CODES

A. Comply with all pertinent local, state, and national codes.

1.6 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.

1.7 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.

1.8 PROJECT MAINTENANCE MANUALS

A. Prior to final acceptance of project, provide Owner with bound maintenance manuals.

1.9 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

2.1 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

3.1 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.

3.2 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.

3.3 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.

3.4 CLEANING

A. Repair damaged factory finishes covering all bare places and scratches.

3.5 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 210500

SECTION 211000 - WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 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.

1.2 SCOPE OF WORK

A. Shop drawings.

B. Valves including system valves.

C. Pipe, fittings, interior.

D. Hangers, supports and sleeves.

E. Testing and flushing.

F. Fire Department connection.

G. Fire valve and hose cabinets.

H. 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.

I. Unless otherwise noted on the drawings or these specifications, the entire project shall be fully protected, excluding no spaces.

1.3 DESIGN REQUIREMENTS

A. Install system(s) in accordance with the drawings, specifications, and requirements of NFPA 13 and NFPA 14.

B. Furnish material and labor necessary to fully comply with the drawings and specifications and with the rules, regulations, and ordinances.

C. Include in sprinkler system design the following requirements:

1. Provide a 3/4" ball drip for all types of fire department connections. Route discharge to outside of building.

1.4 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.

1.5 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, 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 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. Valves - Type and Manufacturer, interior and exterior.

2. Piping and fittings.

E. 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.

1.6 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 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.

1.7 APPLICABLE CODES

A. NFPA 13

B. NFPA 14

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products listed indicate standard.

2.2 VALVES

A. Acceptable Valve Manufacturers: Ames, Nibco, Anvil, Mueller, Kennedy, Wilkins.

B. Interior Valves:

1. 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.

2. Butterfly valves shall not be accepted.

C. Hi-Rise System Valves:

1. Gate valves: Iron body, O.S.&Y. gate valve, 300 WWP, Kennedy Valve 7168SS.

2.3 PIPE AND FITTINGS

A. 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.

B. 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 shall be listed for use with sprinkler systems.

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.

2.4 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.

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.

2.5 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.

2.6 FIRE EXTINGUISHERS

A. Fire Extinguisher Cabinet (ABC Extinguisher)

1. Croker-Standard, Figure Number 1618 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 (CO_2 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.

PART 3 - EXECUTION

3.1 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.

3.2 PIPE INSTALLATION

A. 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.

B. 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

C. 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.

D. 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.

E. 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.

F. 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.)

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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 211000

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 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.

1.2 RELATED WORK

A. Electrical power and interlock and control wiring and conduit.

B. Field painting of equipment, and piping.

1.3 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 224300.

C. Innovation Memorandum No. 7: All piping, valves, pipe fittings and related products to be purchased from Ferguson Enterprises. Refer to Section 221116.

1.4 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.

1.5 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this Division, including water and sewage connections.

1.6 CODES

A. Comply with all pertinent local, state, and national codes.

1.7 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. American Gas Association (AGA).
2. CISPI Standard 301.
3. ASTM A 74.

1.8 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. 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. Complete equipment and piping systems in entire building.
    b. Firestop systems.

1.9 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:

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. 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

2.1 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

3.1 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.

3.2 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.

3.3 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal piping at penetrations of roofs and outside walls.

3.4 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.

3.5 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.

1. Domestic cold water - dark blue.

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.

3.6 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:

1. 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.
2. 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.
3. 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.

3.7 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 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.

E. Conduct air or smoke test if in opinion of Designer reasonable cause exists to suspect leakage or low quality workmanship.

F. 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.

END OF SECTION 220500

SECTION 220719 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 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.

F. "Contractor's Option" referred to in Materials below indicates optional materials which may be used as equals.

1.2 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.

1.3 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.

1.4 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. State of Florida Energy Code.

PART 2 - PRODUCTS

2.1 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. 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 cold water piping: 1/2" thick.

b. Horizontal rainwater leaders, overflow leaders, and roof drain bodies: 1" thick.

c. Horizontal runs of waste lines carrying cold condensate from air conditioning equipment: 1" thick.

2.2 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.

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 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

3.1 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.

3.2 INSTALLATION OF PIPE AND EQUIPMENT COVERING

A. Where fiberglass 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.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING AND VALVES

PART 1 - GENERAL

1.1 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. 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

2.1 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.

2.2 AQUATHERM GREEN PIPE

A. Pipe shall be manufactured from a PR-R resin (Fusiolen) meeting the requirements of ASTM F 2389 as manufactured by Aquatherm. All pipe shall be made in an extrusion process. Domestic hot water shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

B. Fittings shall be manufactured from a PP-R resin (Fusiolen) meeting the requirements of ASTM F 2389 as manufactured by Aquatherm. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11. Install fittings and joints using socket fusion, elecrofusion, or butt-fusion as applicable. All fusion-well joints shall be made in accordance with the pipe and fitting manufacture's specifications and product standards.

C. Manufacturer shall warrant pipe and fittings for 10 years to be free of defects in materials or manufacturing.

D. Warranty shall cover labor and material cost of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system do to defects in materials or manufacturing.

E. 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 or alternative UV protection.

2.3 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 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. 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.

2.4 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. 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.

C. 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.

D. Support copper pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

E. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

F. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

G. 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.

H. 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.

I. Attention is called to pipe spring isolation specified to be furnished by this Contractor.

J. 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

K. 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.

L. See Insulation Section for requirements at pipe hangers.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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 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.

3.5 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.6 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 221116

SECTION 221400 - STORM DRAINAGE

PART 1 - GENERAL

1.1 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.

PART 2 - PRODUCTS

2.1 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.

2.2 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.

2.3 HANGERS

A. 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.

B. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

C. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

D. 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.

E. 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.

F. Attention is called to pipe spring isolation specified to be furnished by this Contractor.

G. 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.

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.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.5 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 221400

SECTION 221429 - STORM DRAINAGE SUMP PUMPS

PART 1 - GENERAL AND PRODUCTS

1.1 SUMP PUMP, SUBMERSIBLE

A. Acceptable Manufacturers: Weil, Chicago, Worthington, Federal, or Swaby.

B. Provide pump ¾ horsepower motor, 115-volt, single phase, all bronze and complete with grounded power cord for connection to receptacle.

PART 2 - EXECUTION

2.1 INSTALLATION

A. Verify location and clearance requirements.

B. Install in accordance with manufacturers' published installation instructions.

C. Sump pump, pedestal mounted: Vent basin to exterior.

2.2 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 221429

SECTION 224300 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 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. 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.

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

2.1 FIXTURES

P801 Wall Hydrant, Exterior:
Zurn Z-1341, wall faucet with vacuum breaker
Install 18" above finished grade

P902 Area Drain:
Zurn ZN-534-C-Y, nickel bronze grate, under deck clamp, sediment bucket

PART 3 - EXECUTION

3.1 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.

B. 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.

END OF SECTION 224300

SECTION 230500 - COMMON WORK RESULTS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 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. Seismic bracing and anchorage for equipment, ductwork, and piping.
5. General Commissioning Refer to Section 019113.

1.2 RELATED WORK

A. Electrical power and interlock wiring and conduit.

B. Kitchen equipment.

C. Laboratory equipment.

D. Field painting of equipment, ductwork, and piping.

1.3 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. 13: All building automation systems to be purchased from Johnson Controls**.** Refer to Section 230923.

1.4 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.

1.5 PERMITS

A. Secure and pay for permits, licenses, and inspections for work under this division.

1.6 CODES

A. Comply with all pertinent local, state, and national codes. Refer to Division 01.

1.7 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).

1.8 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. Kitchen hood and grease exhaust ductwork systems.

    d. Concrete pads and foundations.

    e. Equipment room layouts with actual equipment, piping and duct.

    f. Roof layouts.

    g. Trench locations and sizes.

    h. Dimensioned floor drain locations.

    i. Congested areas (i.e. above ceilings adjacent to powerhouse or equipment rooms, etc.).

1.9 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.

1.13 EXISTING SERVICES

A. Maintain existing services in operation during construction. Coordinate and schedule all service interruptions with Owner.

1.14 OWNER NOTIFICATION

A. Notify Owner two weeks prior to activation of central chilled water and steam service to project.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide materials and equipment of domestic manufacture bearing the U.L. label when such label is available.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 FLASHING, COUNTERFLASHING, AND SEALING

A. Flash, counterflash, and seal ductwork and piping at penetrations of roofs and outside walls.

3.4 TRENCHING, EXCAVATION AND BACKFILLING

A. Trenching and excavation of rock to be as described in Division 02.

B. 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.

3.5 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. Provide steam strainer and steam trap for steam equipment. 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.

3.6 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. 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, chilled water, heating hot water, steam and steam condensate and natural gas.

D. Paint piping exposed in equipment rooms in accordance with the following schedule. Paint to be Sherwin Williams Metaltex or approved substitute.

HCA Piping Color Table (New Facilities)	
Piping	Color Description
Low Temp Supply	Dark Purple
Low Temp Return	Light Purple
Chilled Water Supply	Dark Blue
Chilled Water Return	Light Blue
Condenser Water Supply	Bright Green
Condenser Water Return	Dark Green
Hot Water Supply	Bright Red
Hot Water Return	Dark Red

HCA Piping Color Table (New Facilities)	
Piping	Color Description
Condensate	Dark Orange
Steam	Bright Orange
Natural Gas	Bright Yellow
Fuel Oil	Brown
Domestic Water	Blue

E. Include design operating pressures in psig for steam and compressed air services.

F. Control compressed air and buried lines need not be marked.

G. 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.

H. 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.

3.7 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.

3.8 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 compressed air piping with Nitrogen at 100 psi for two hours without leaks.

E. Test HVAC systems water piping and steam supply and steam condensate return piping at a water pressure of 125 psig for two hours without leaks.

F. 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 230500

SECTION 230533 - HEAT TRACING FOR HYDRONIC PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install a complete U.L. listed system of heaters, components, and controls to prevent pipelines indicated on drawings from freezing.

PART 2 - PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

A. Provide self-regulating type heat tracing consisting of two (2) 16 AWG nickel coated-copper bus wires embedded in parallel in a radiation-crosslinked polymer core that varies its power output to respond to temperature all along its length, allowing the heater to be crossed over itself without overheating, to be used directly on plastic pipe, and to be cut to length in the field. The heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket. The heater shall be equivalent to Raychem XL-Trace, Chromalox Rapid-Trace, or approved equal.

B. To prevent overheating, the heater shall have a self-regulating index of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heater output going from 50 degree F. pipe temperature operation to 140 degree F. pipe temperature operation.

C. The heater shall operate on a line voltage of 277 volts without the use of transformers.

D. The heater shall be sized according to the following table. The required heater output rating is in watts per foot of pipe length at 40 degrees F.

Pipe Size	Heater Minimum Watts Per Foot
3 inch and less	5
4 to 6	8
8	10
10 to 16	16
18 and larger	20

E. Power connection, end seal, splice, and tee kit components shall be provided for installation in the field.

F. The system shall be controlled by an ambient sensing thermostat set at 40 degrees F. either directly or through an appropriate contactor.

G. Ground fault circuit breaker shall be provided as required by Section 427-22 of the National Electric Code.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install heater in strict accordance with manufacturers' published installation instructions and Article 427 of the National Electric Code.

B. Apply the heater spirally on the pipe after piping has been successfully pressure tested. Secure the heater to piping with cable ties or fiberglass tape. Heat tracing shall be applied to pipe before applying insulation. See Section 230710 for insulation requirements.

C. Apply "electric traced" signs to the outside of the thermal insulation at least once every 50 feet.

3.2 TESTS

A. After installation and before and after installing the thermal insulation, subject heater to testing using a 5000 VDC megger. Minimum insulation resistance should be 20 megohms regardless of length.

B. The installer shall test both heating cable bus wires to verify the connection of any splices or tees.

END OF SECTION 230533

SECTION 230549 - BASIC MATERIALS AND METHODS FOR HVAC

PART 1 - GENERAL

1.1 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

2.1 VIBRATION ISOLATION

A. Isolate equipment as shown on drawings and as specified herein with factory-fabricated vibration isolators in accordance with recommendations in the latest edition of ASHRAE Applications Handbook. Isolators shall be manufactured by Kinetics, Mason Industries, or approved substitute. Provide isolators by a single manufacturer. Provide isolators of proper sizes and weight loading to meet the requirements. Provide isolators as follows:

1. Floor-mounted fiberglass or neoprene rubber pads, Kinetics Model KIP.

2.2 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.

2.3 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.

2.4 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".

2.5 ROOF PIPE SUPPORTS

A. Support horizontal piping across roof with Miro Industries Roof Pillow Block Pipestands or ThyCurb or Custom Curb Pipe Support Curbs.

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION 230549

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 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.

1.2 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. 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.

3. 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.

1.3 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.

1.4 DOCUMENTS

A. The contractor shall furnish to the TAB firm electronic copied (PDF) of the following:

1. Mechanical specifications.

2. Mechanical drawings.

3. All pertinent addenda and change orders.

4. 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

3.1 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.

3.2 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.

3.3 THE TAB REPORT

A. TAB activities shall culminate in a report to be provided in an electronic copy (PDF) 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.

3.4 ACTUAL TESTING AND BALANCING PROCEDURES

A. Controls:

1. 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.

B. Capacity and Performance Test:

1. 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.

2. 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.

C. 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.

D. 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.

3.5 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.

3.6 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 insure that satisfactory conditions are being maintained.

3.7 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 230593

SECTION 230710 - INSULATION

PART 1 - GENERAL

1.1 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 and valves 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. "Contractor's Option" referred to in Materials below indicates optional materials which may be used as equals.

1.2 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.

1.3 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.

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.

1.4 APPLICABLE CODES AND STANDARDS

A. ASTM E-84.

B. U.L. 723.

C. NFPA 90-A.

D. ASHRAE 90.1

E. International Energy Conservation Code.

PART 2 - PRODUCTS

2.1 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. 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.

2.2 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.
3. Contractor 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.
4. PVC fitting covers over blanket fiberglass are not acceptable for steam, gravity steam condensate, and steam boiler/deaerator piping services.
5. Insulation is not required for steam traps, steam, hot condensate, and hot water system strainers, relief valves, and steam pressure reducing valves. Insulate piping to within 3" of uninsulated items.

B. For pipe fittings, valves, strainers, air separators, and other irregular surfaces, in systems operating below 60 degrees F., when exposed to view inside building or in equipment rooms, cover insulation with white colored glass mesh embedded in white, fungus resistant vapor barrier coating Foster 30-80 AF. Coating shall meet ASTM D 5590 with 0 growth rating.

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 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.

E. 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

3.1 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. 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.

3.2 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. 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.
    e. For steam and steam condensate systems, two layers of precut fiberglass inserts shall be applied to fittings. Secure first layer by wrapping with fiberglass yarn.

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 230710

SECTION 230923 - DIRECT DIGITAL CONTROL/BUILDING AUTOMATION SYSTEM (DDC/BAS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Direct Digital Control/Building Automation Systems (DDC/BAS) shall be Johnson Controls. For pricing contact:

1. Johnson Controls Metasys
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 JCI 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.

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.

1.2 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

2.1 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. Web addressable server.

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.

2.2 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.

2.3 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.

2.4 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.

2.5 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. 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)

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

2.6 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.

2.7 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. 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.

D. 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.

E. 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.

F. Transformers: Provide all 24-volt control transformers necessary to convert 120-volt line voltage power to control voltage at control devices.

G. 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.

H. Pressure Switches: Pressure switches shall have contact action and pole configuration as required by application, U.L. listing, and adjustable setpoint.

I. 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

3.1 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 <u>power</u> 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.

3.2 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.

3.3 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.

3.4 WARRANTY SERVICE

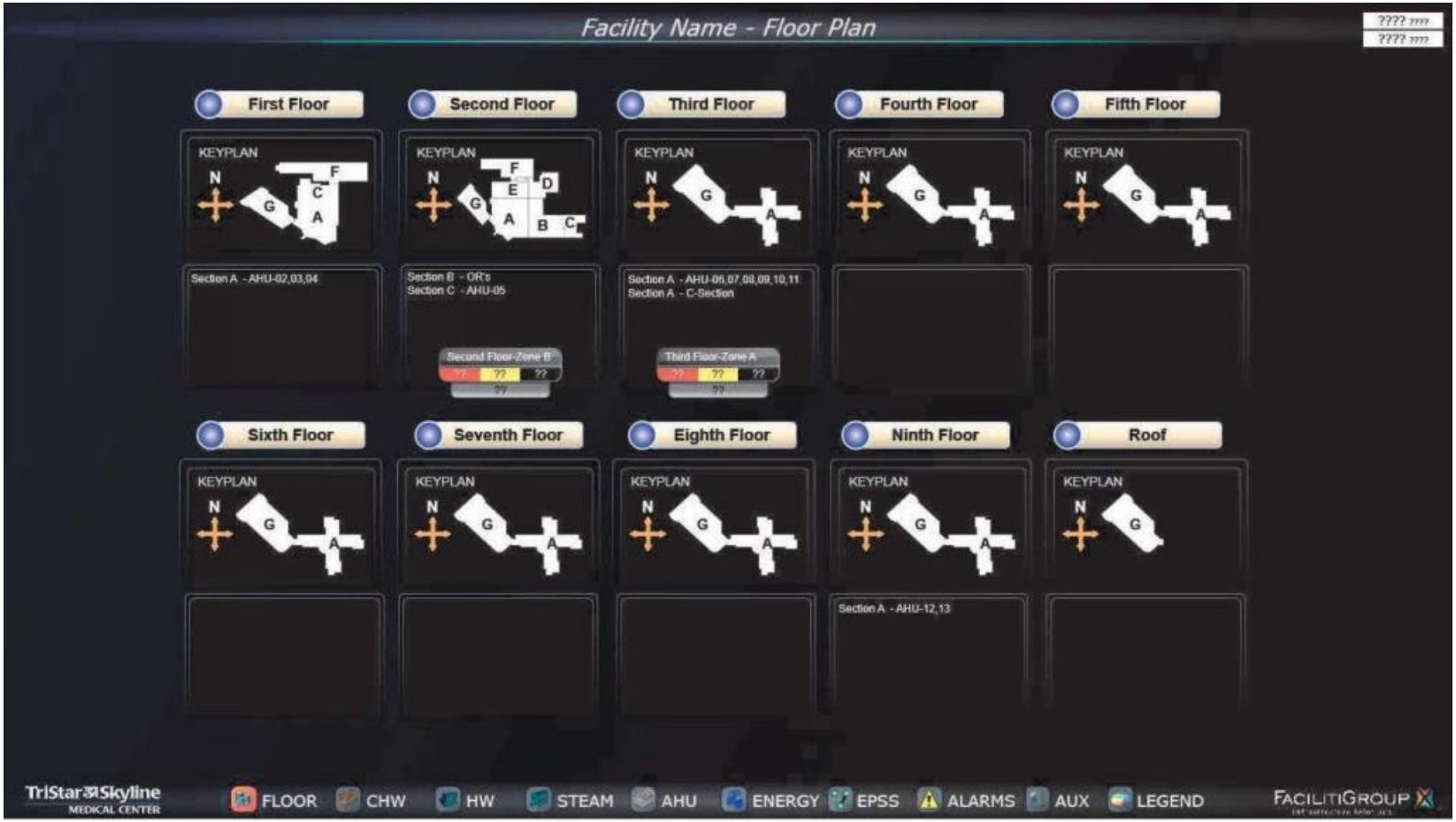
A. Warranty servicing shall be for a period not less than 24 months after final acceptance of the job by the owner and include the following provisions:

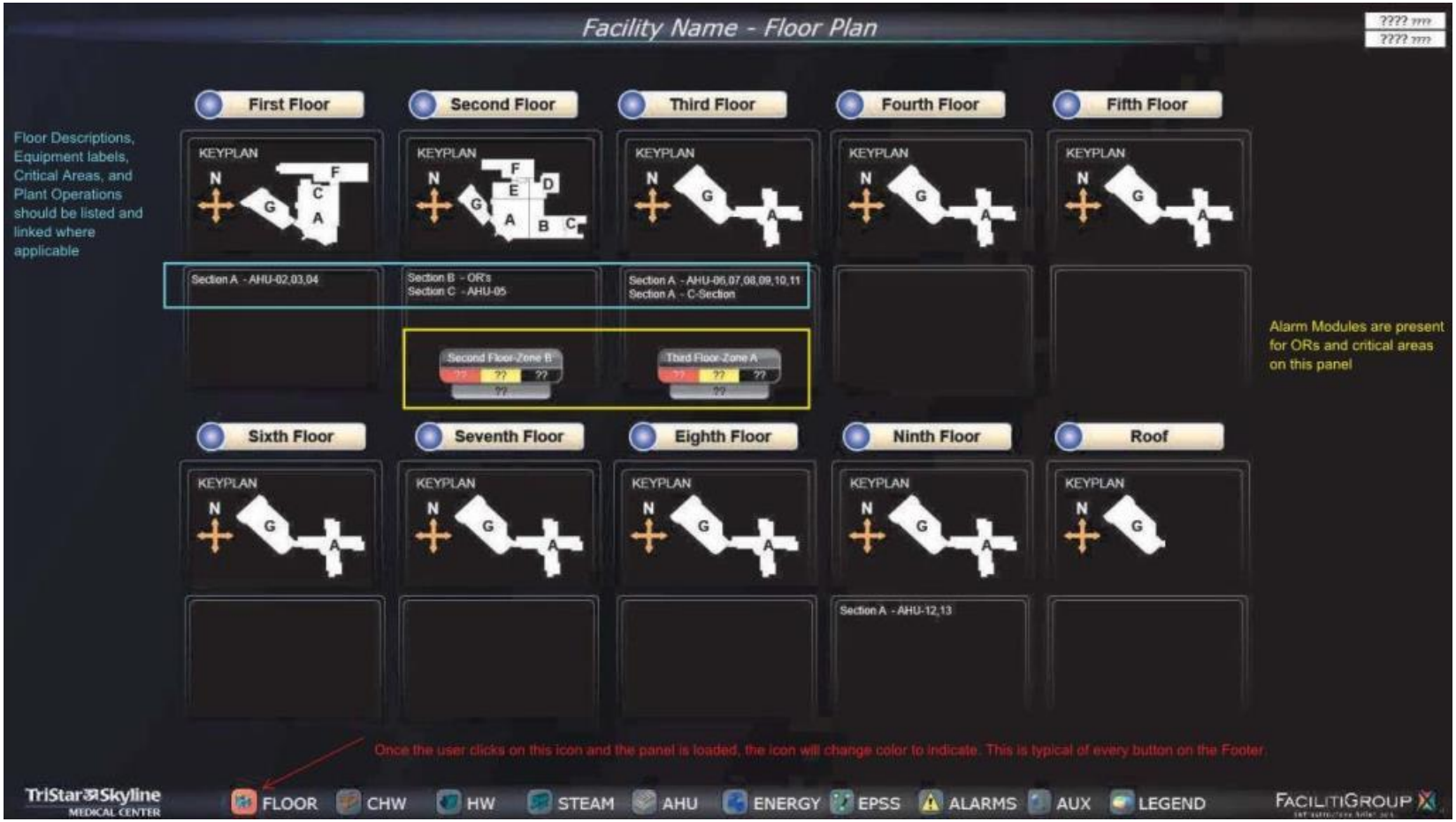
1. Emergency maintenance service on regular working hour basis during warranty.
2. Replacing defective parts and components as required.
3. Servicing by factory trained and employed service representatives of system manufacturer.
4. Maintaining of system programming.

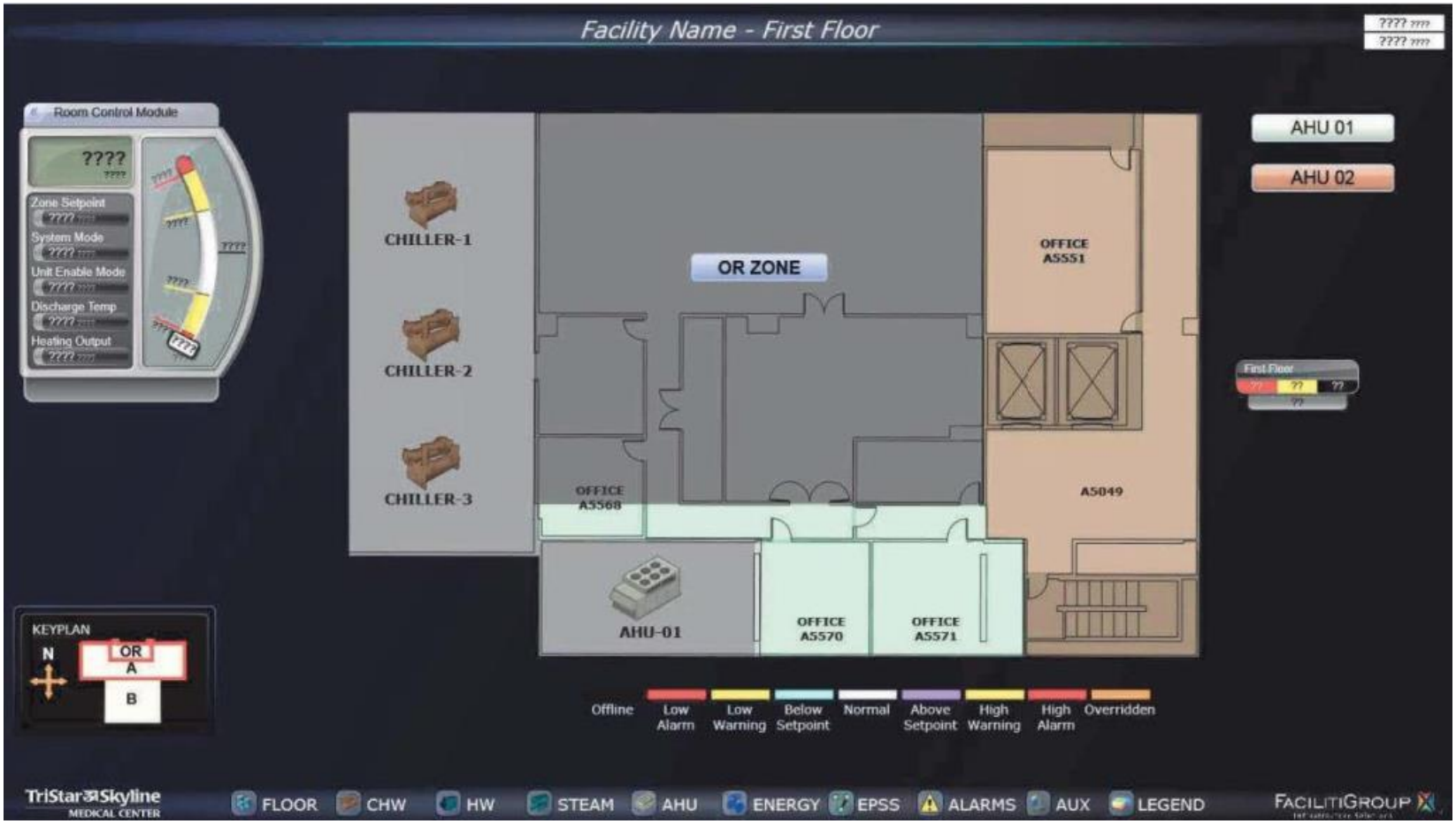
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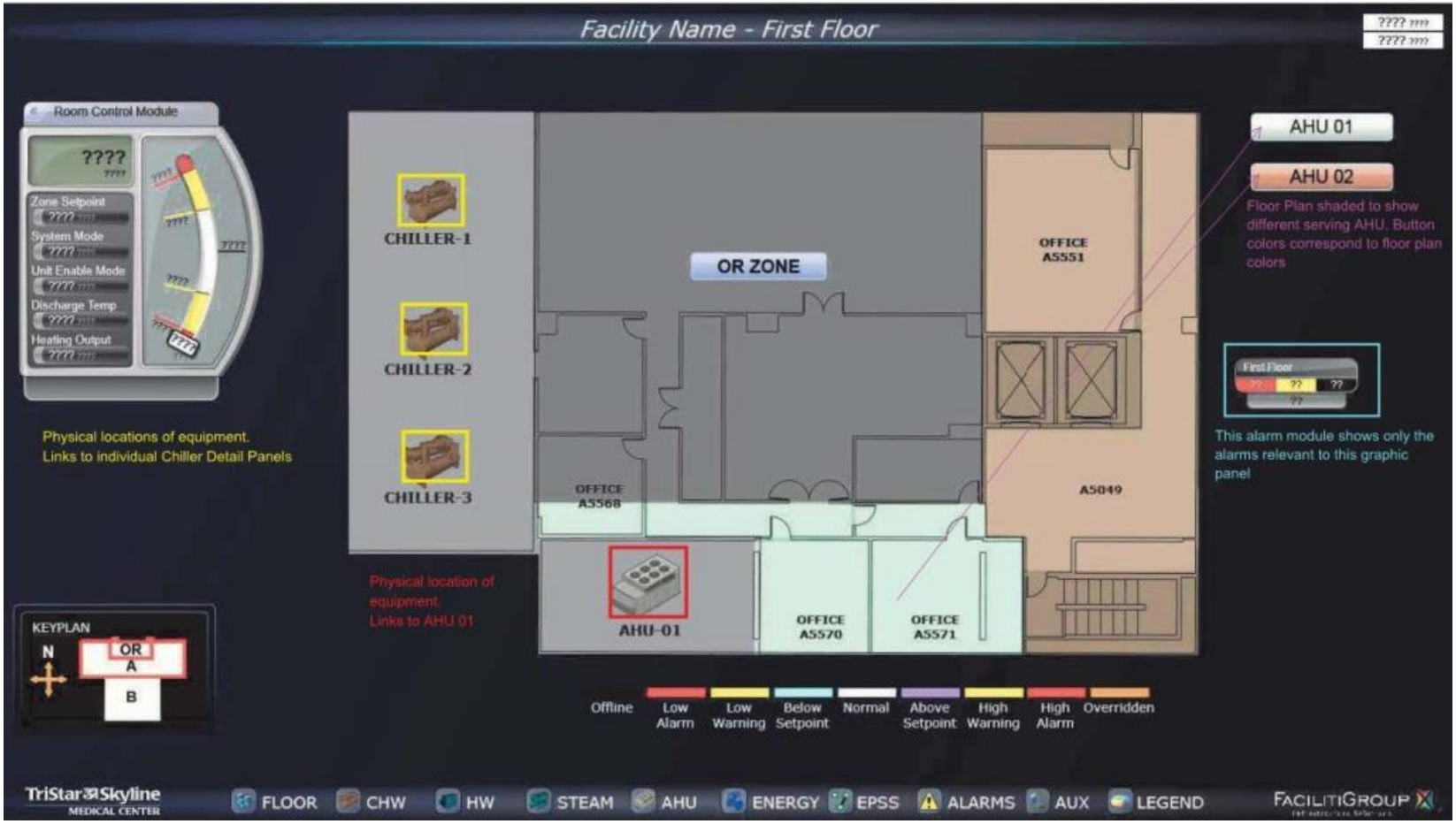

FACILITIGROUP
Infrastructure Solutions
TriStar Skyline
MEDICAL CENTER
Johnson Controls
Chilled Water System
CH-1
CH-2
Supply Temp
% RLA
kW / Ton
Condenser Water System
CT-1
CT-2
Speed
delta T
Tons
Chilled Water System
CH-3
CH-4
Supply Temp
% RLA
kW / Ton
extra box to be deleted if not used
Air Handlers
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
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

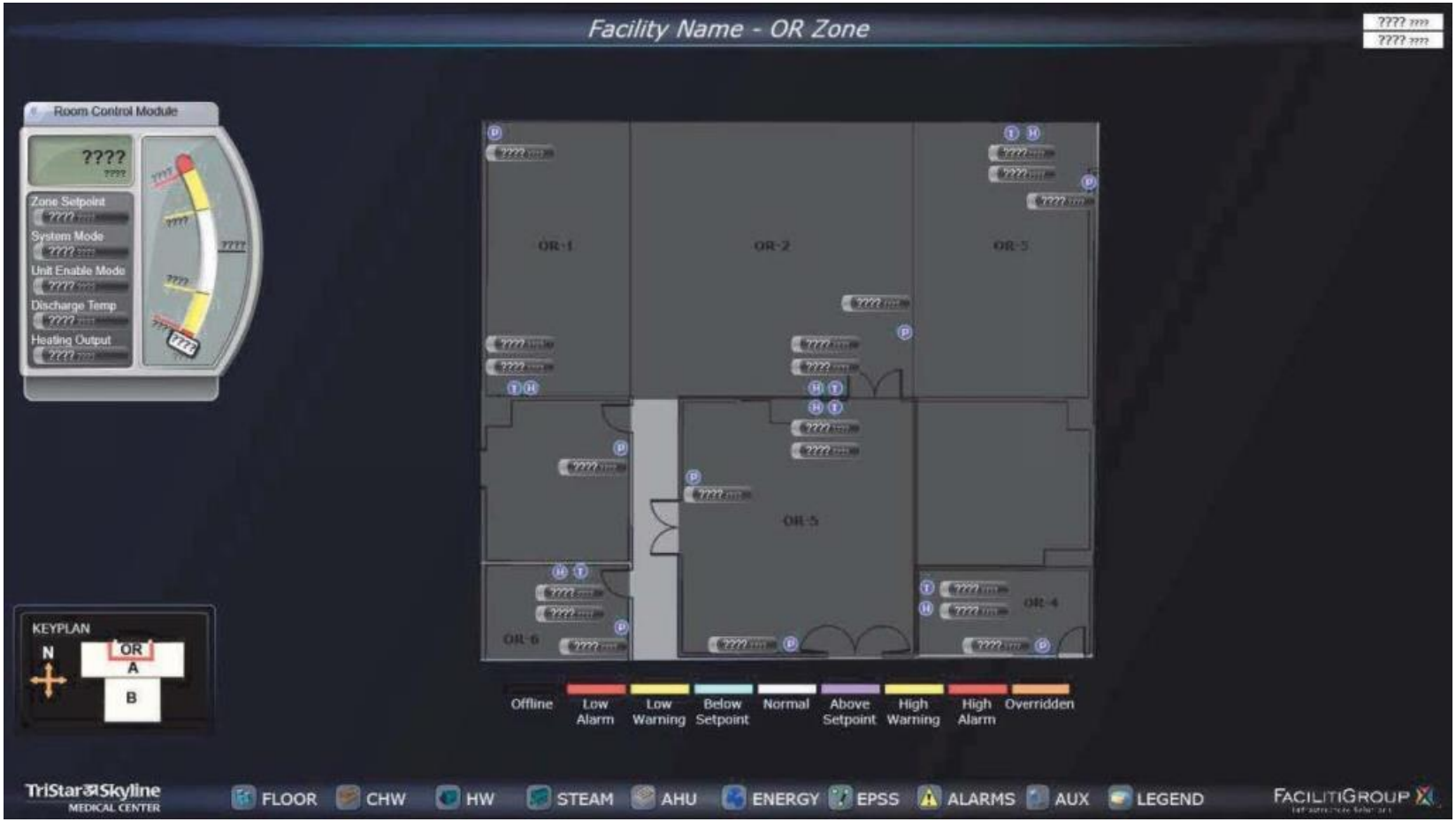

Outside Air Temperature
Outside Air Relative Humidity
Typical of ALL panels
Links to facility's Energy portal on HCAFI.com
FACILITIGROUP
Infrastructure Solutions
TriStar Skyline
MEDICAL CENTER
Links to Facility Public Website
Johnson Controls
Links to Contact Panel for JCI Rep, Energy Service Center, 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 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
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
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

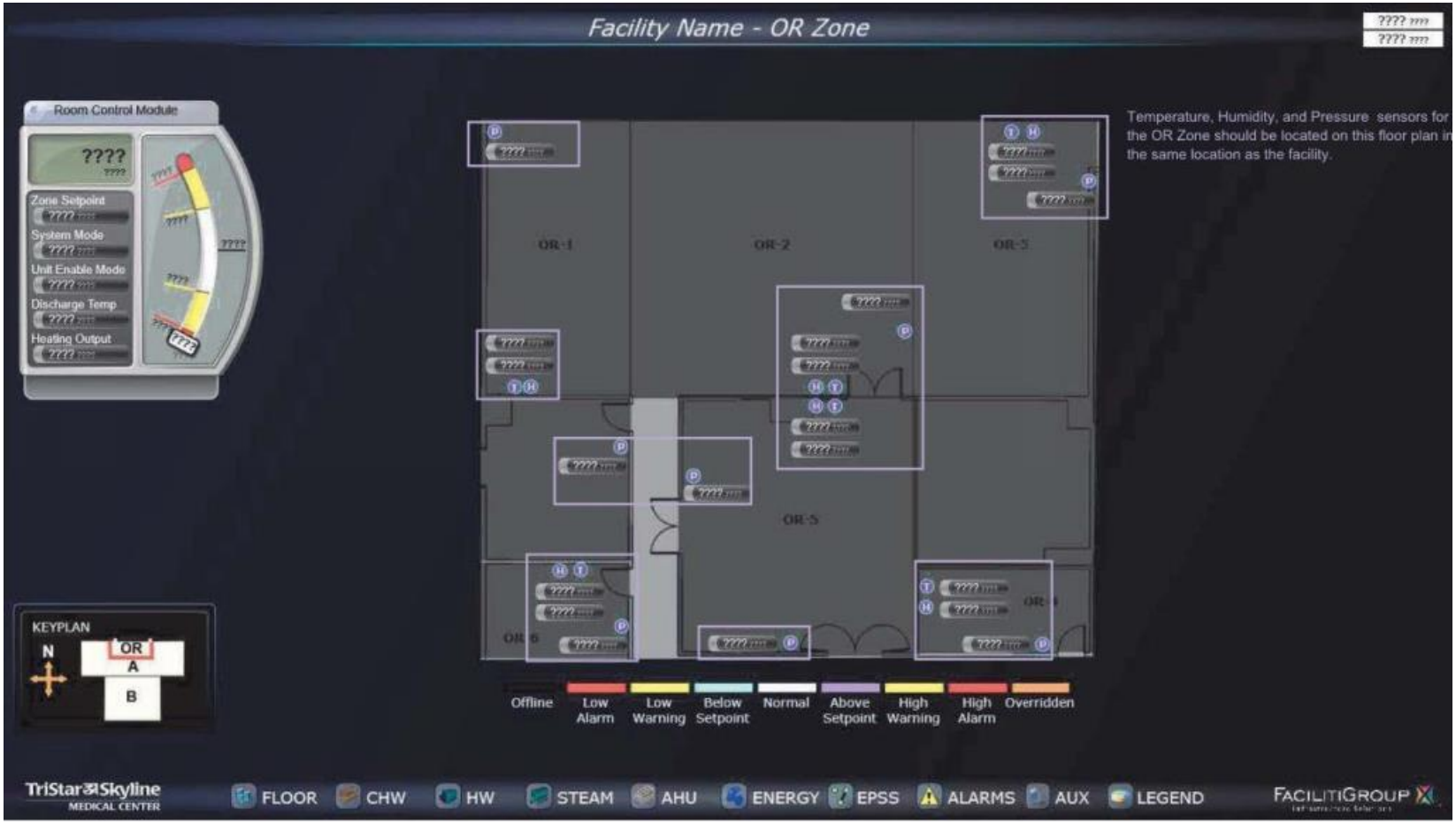

Facility Name - Floor Plan
???? ????
???? ????
First Floor
Second Floor
Third Floor
Fourth Floor
Fifth Floor
KEYPLAN
Section A - AHU-02,03,04
Section B - OR's
Section C - AHU-05
Second Floor-Zone B
Section A - AHU-06,07,08,09,10,11
Section A - C-Section
Third Floor-Zone A
Sixth Floor
Seventh Floor
Eighth Floor
Ninth Floor
Roof
Section A - AHU-12,13
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

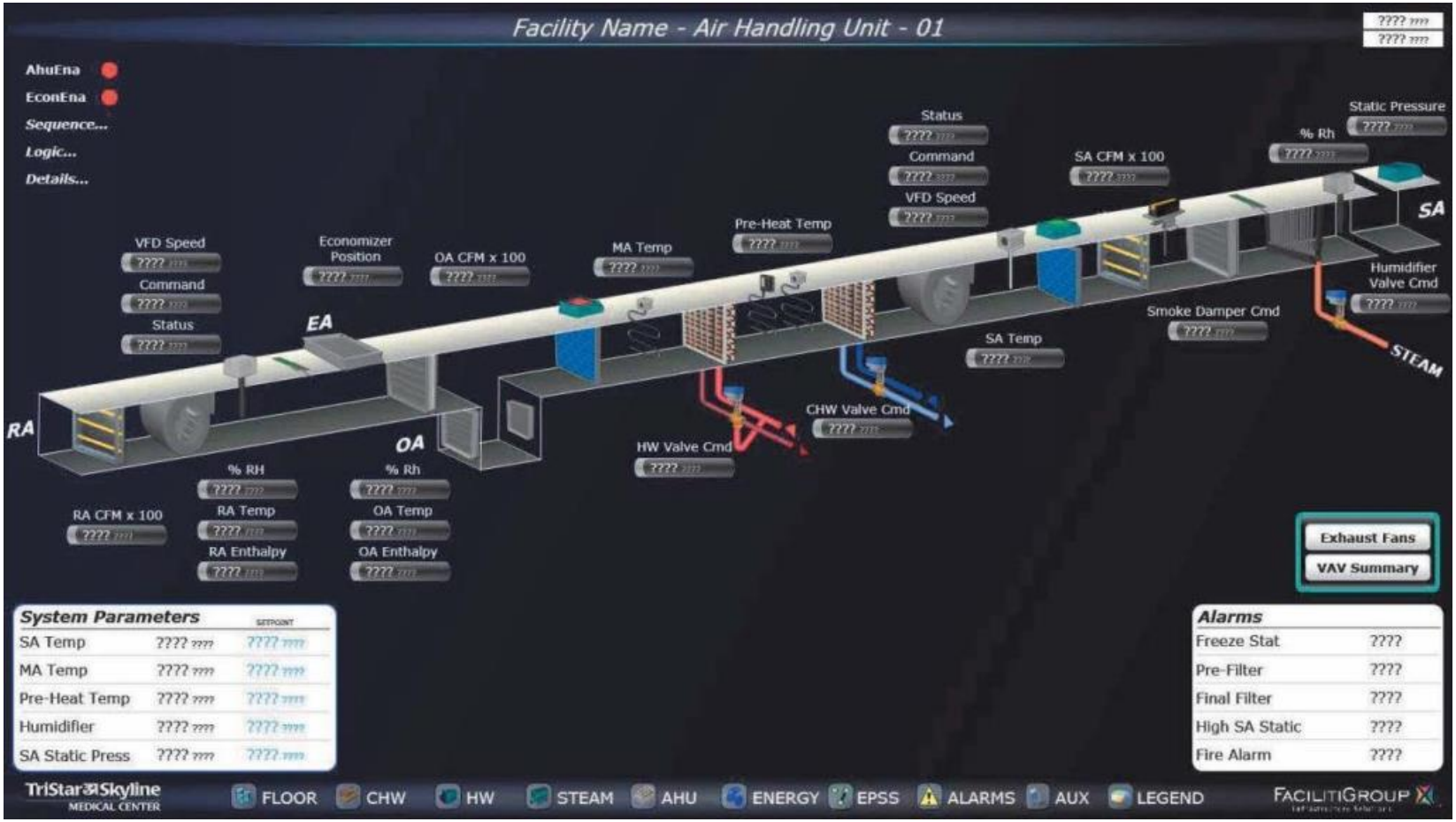

Facility Name - Floor Plan
???? ????
???? ????
First Floor
Second Floor
Third Floor
Fourth Floor
Fifth Floor
Floor Descriptions, Equipment labels, Critical Areas, and Plant Operations should be listed and linked where applicable
KEYPLAN
Section A - AHU-02,03,04
Section B - OR's
Section C - AHU-05
Section 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

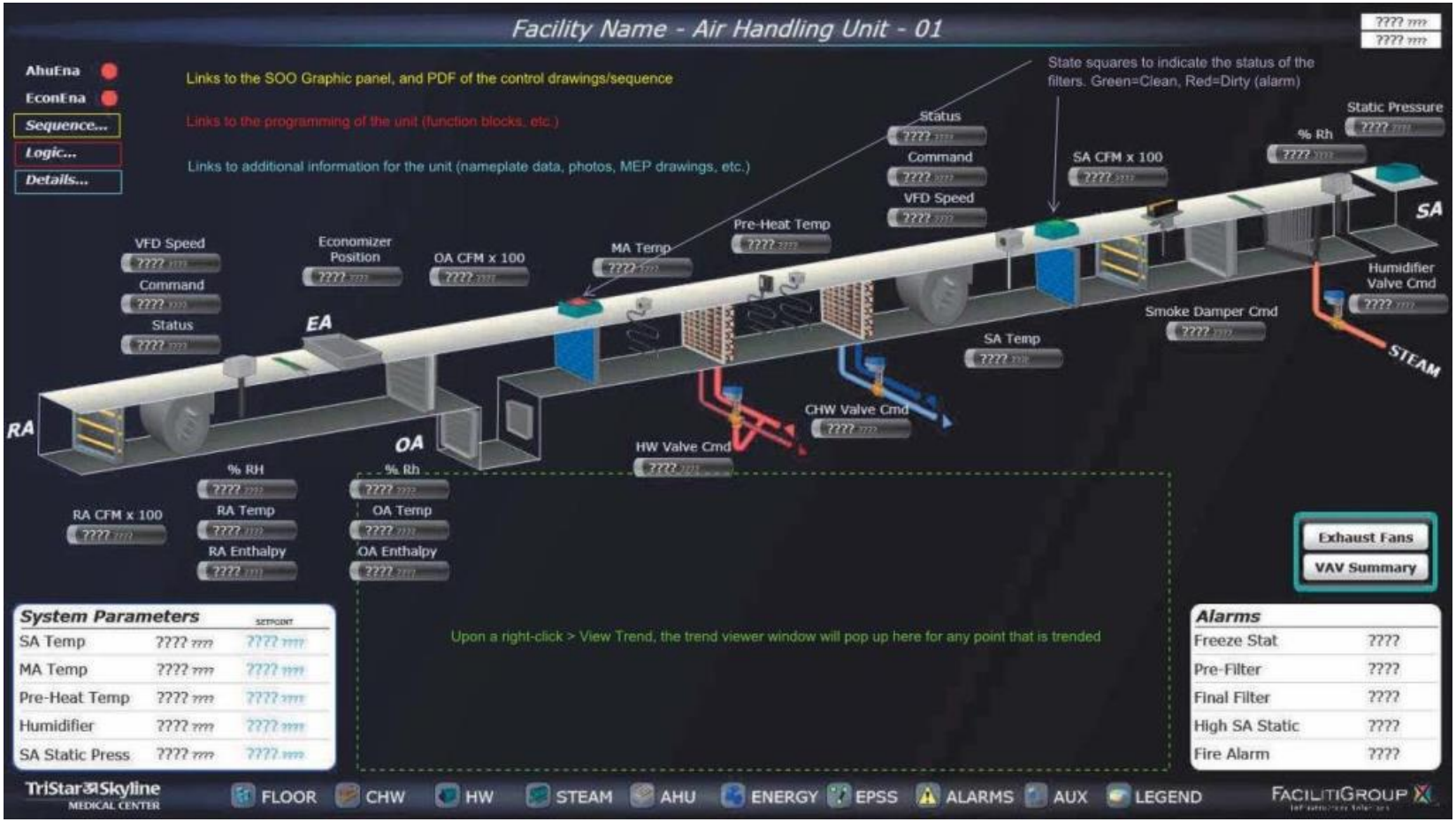

Facility Name - First Floor
Room Control Module
Zone Setpoint
System Mode
Unit Enable Mode
Discharge Temp
Heating Output
CHILLER-1
CHILLER-2
CHILLER-3
OR ZONE
OFFICE A5551
A5049
OFFICE A5568
AHU-01
OFFICE A5570
OFFICE A5571
AHU 01
AHU 02
First Floor
KEYPLAN
N
OR A
B
Offline
Low Alarm
Low Warning
Below Setpoint
Normal
Above Setpoint
High Warning
High Alarm
Overridden
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

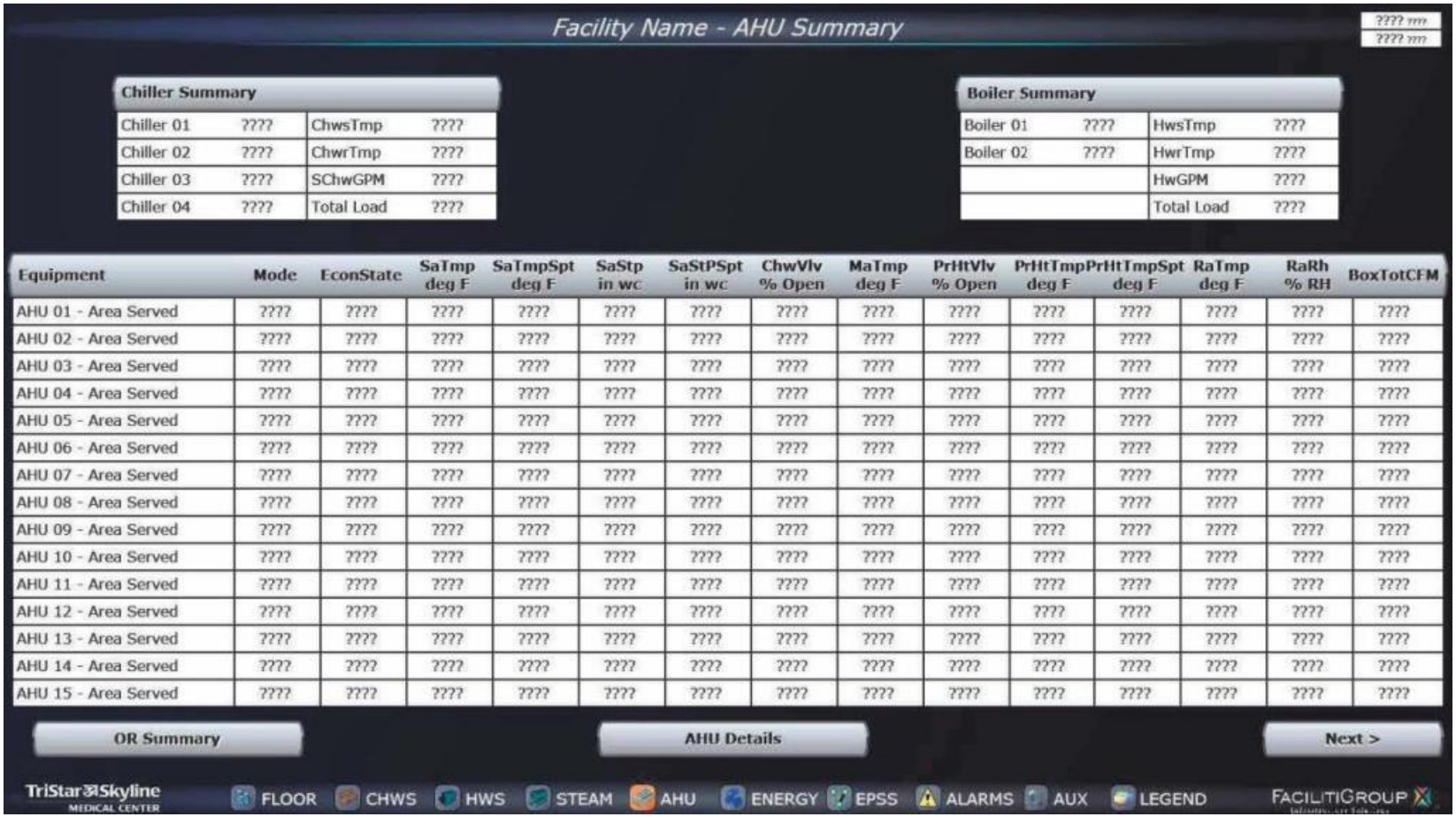

Facility Name - First Floor
Room Control Module
Zone Setpoint
System Mode
Unit Enable Mode
Discharge Temp
Heating Output
Physical locations of equipment.
Links to individual Chiller Detail Panels
CHILLER-1
CHILLER-2
CHILLER-3
OR ZONE
OFFICE A5551
OFFICE A5568
A5049
AHU-01
OFFICE A5570
OFFICE A5571
Physical 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
First Floor
This alarm module shows only the alarms relevant to this graphic panel
KEYPLAN
N
OR
A
B
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

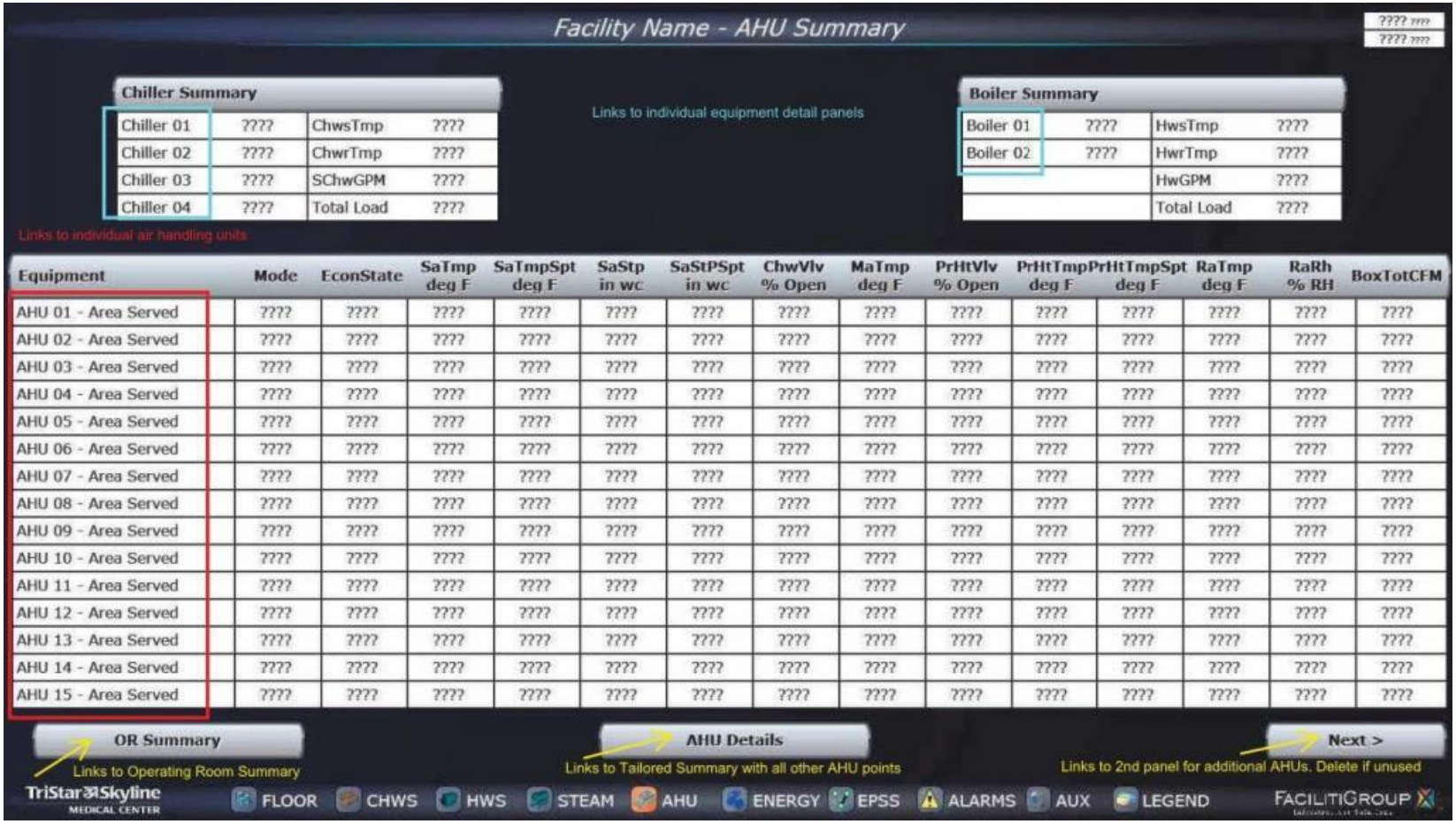

Facility Name - OR Zone
Room Control Module
Zone Setpoint
System Mode
Unit Enable Mode
Discharge Temp
Heating Output
KEYPLAN
N
OR
A
B
OR-1
OR-2
OR-3
OR-5
OR-4
OR-6
Offline
Low Alarm
Low Warning
Below Setpoint
Normal
Above Setpoint
High Warning
High Alarm
Overridden
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

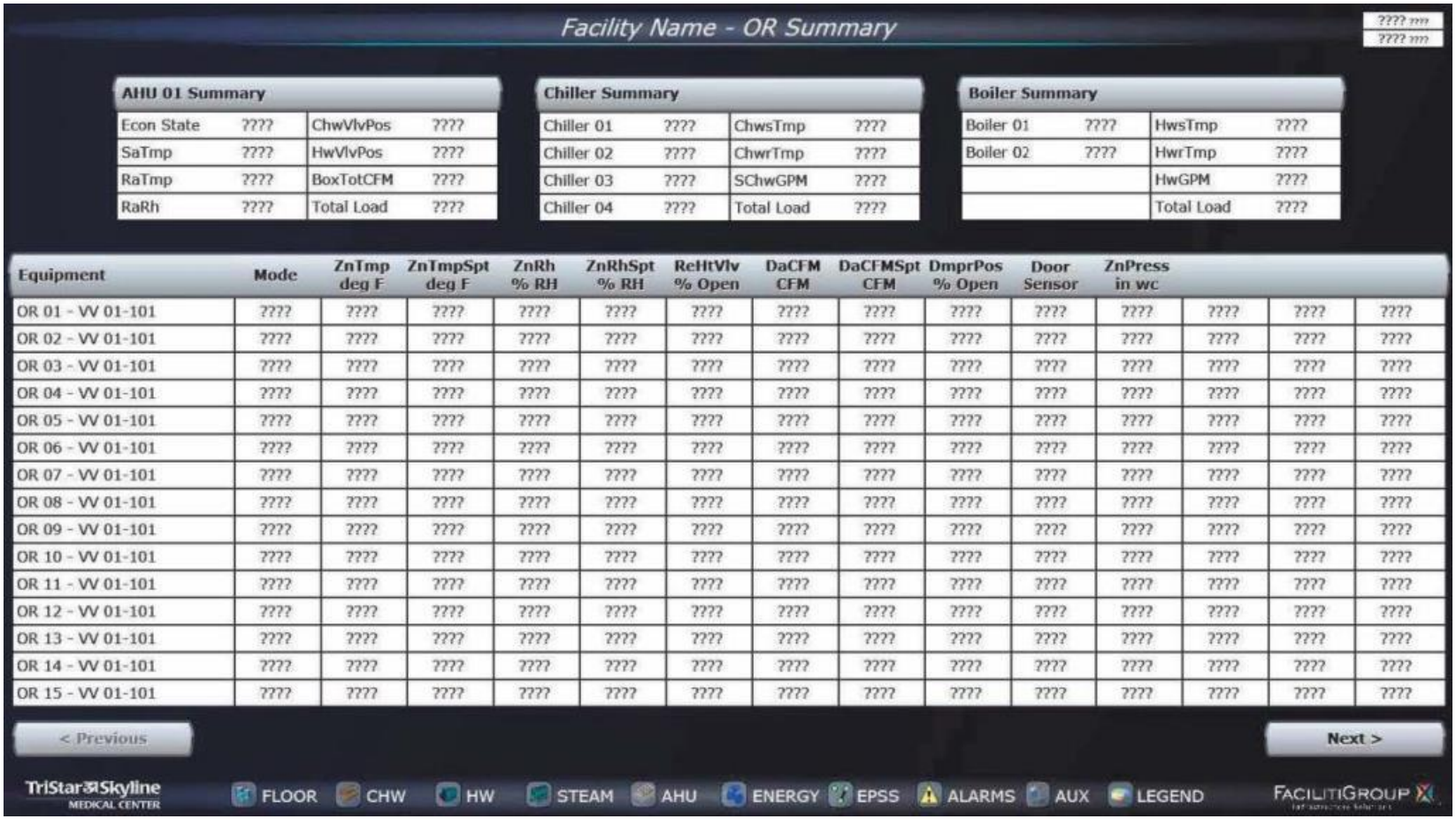

Facility Name - OR Zone
Room Control Module
Zone Setpoint
System Mode
Unit Enable Mode
Discharge Temp
Heating Output
Temperature, Humidity, and Pressure sensors for the OR Zone should be located on this floor plan in the same location as the facility.
OR-1
OR-2
OR-3
OR-5
KEYPLAN
N
OR
A
B
Offline
Low 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

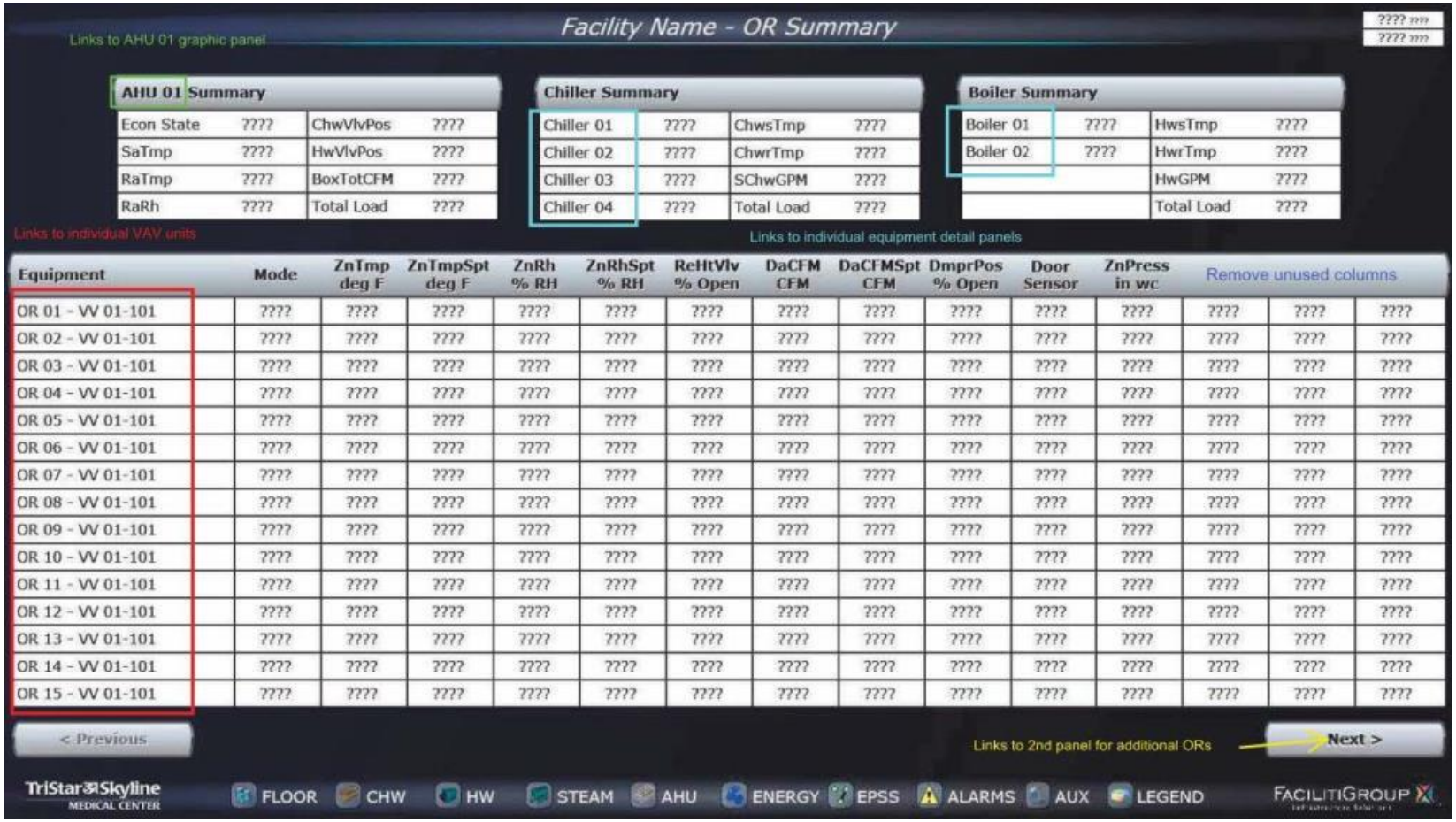

Facility Name - Air Handling Unit - 01
AhuEna
EconEna
Sequence...
Logic...
Details...
Status
Command
VFD Speed
SA CFM x 100
% Rh
Static Pressure
SA
VFD Speed
Command
Status
Economizer Position
OA CFM x 100
MA Temp
Pre-Heat Temp
EA
Humidifier Valve Cmd
Smoke Damper Cmd
SA Temp
STEAM
CHW Valve Cmd
HW Valve 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
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

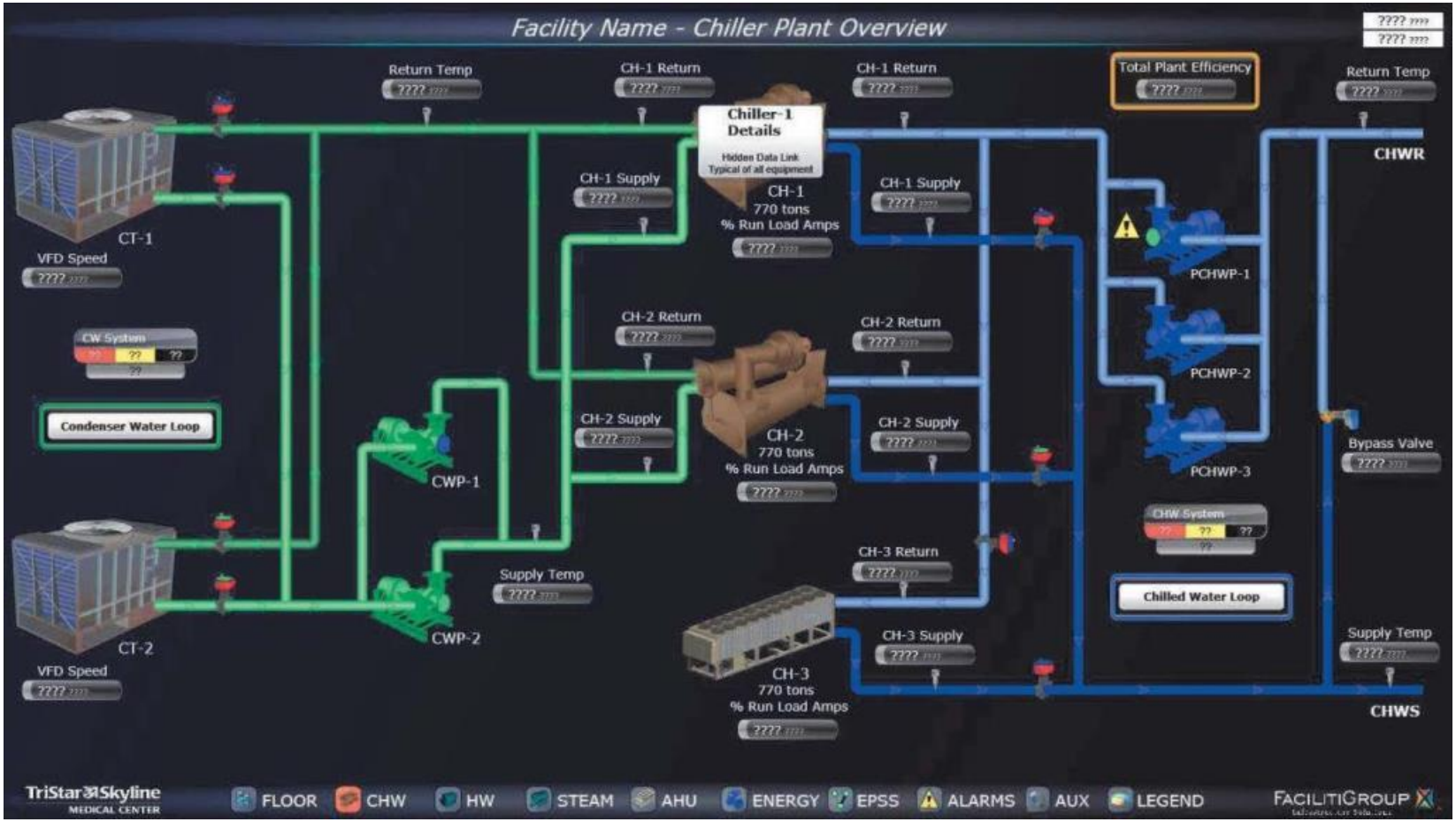

Facility Name - Air Handling Unit - 01
AhuEna
EconEna
Sequence...
Logic...
Details...
Links to the SOO Graphic panel, and PDF of the control drawings/sequence
Links to the programming of the unit (function blocks, etc.)
Links to additional information for the unit (nameplate data, photos, MEP drawings, 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
Economizer Position
OA CFM x 100
MA Temp
Pre-Heat Temp
EA
Humidifier Valve Cmd
Smoke Damper Cmd
SA Temp
STEAM
RA
OA
CHW Valve Cmd
HW Valve Cmd
% 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

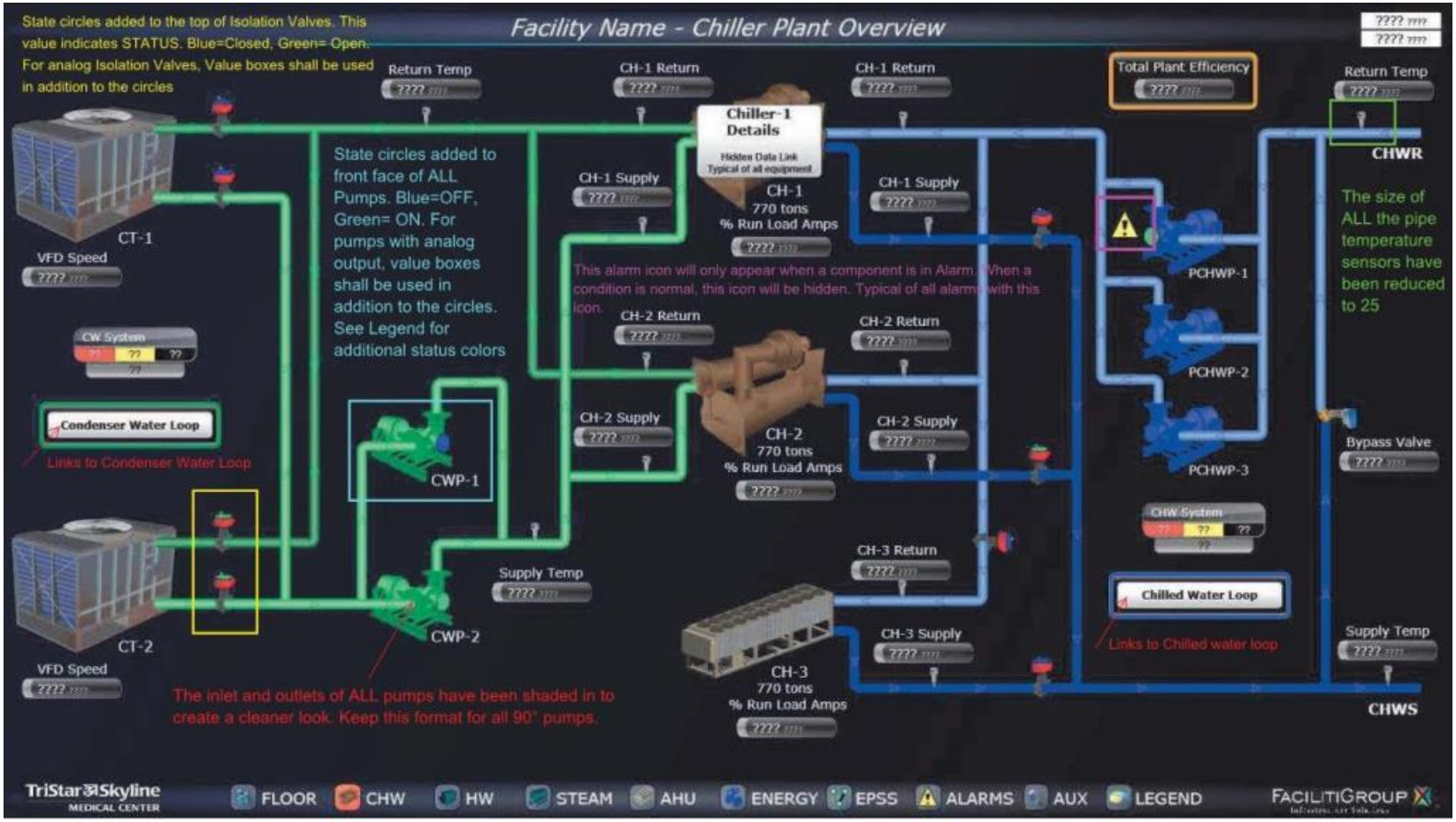

Facility Name - AHU Summary
???? ????
???? ????
Chiller Summary
Chiller 01 ???? ChwsTmp ????
Chiller 02 ???? ChwrTmp ????
Chiller 03 ???? SChwGPM ????
Chiller 04 ???? Total Load ????
Boiler Summary
Boiler 01 ???? HwsTmp ????
Boiler 02 ???? HwrTmp ????
HwGPM ????
Total Load ????
Equipment | Mode | EconState | 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

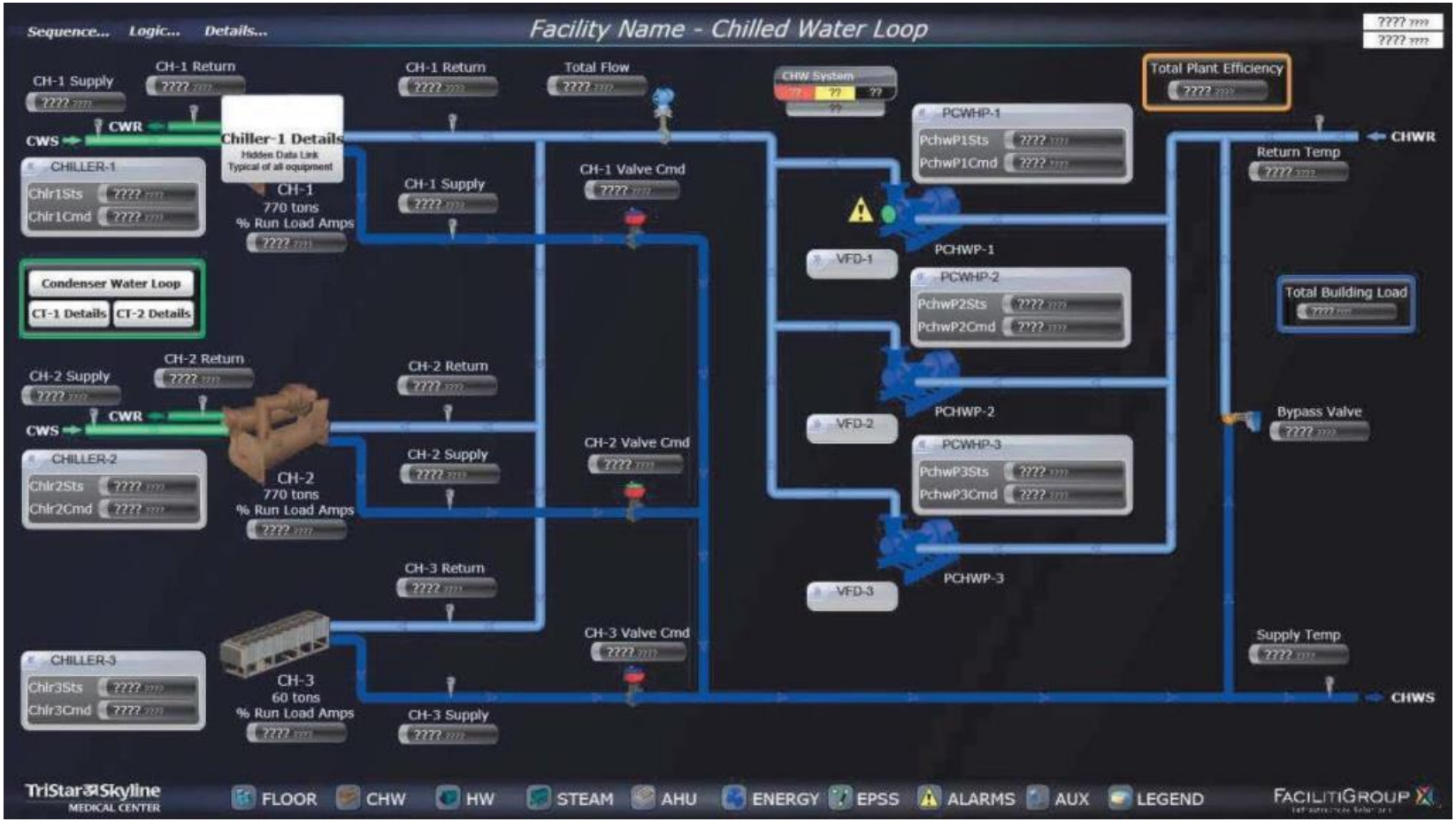

Facility Name - AHU Summary
???? ????
???? ????
Chiller Summary
Chiller 01 ???? ChwsTmp ????
Chiller 02 ???? ChwrTmp ????
Chiller 03 ???? SChwGPM ????
Chiller 04 ???? Total Load ????
Links to individual equipment detail panels
Boiler Summary
Boiler 01 ???? HwsTmp ????
Boiler 02 ???? HwrTmp ????
HwGPM ????
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

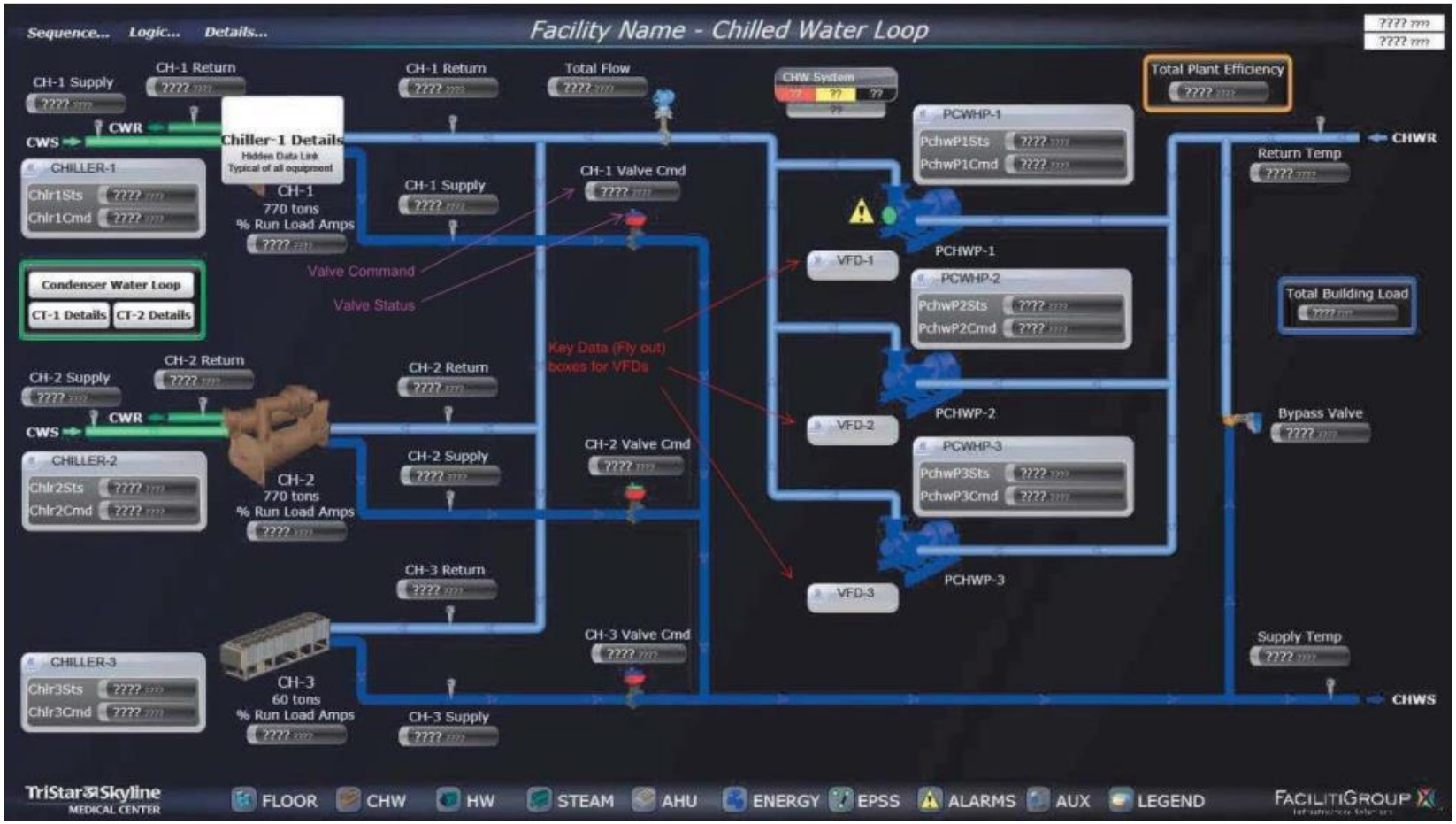

Facility Name - OR Summary
???? ????
???? ????
AHU 01 Summary
Econ State ???? ChwVlvPos ????
SaTmp ???? HwVlvPos ????
RaTmp ???? BoxTotCFM ????
RaRh ???? Total Load ????
Chiller Summary
Chiller 01 ???? ChwsTmp ????
Chiller 02 ???? ChwrTmp ????
Chiller 03 ???? SChwGPM ????
Chiller 04 ???? Total Load ????
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 >
TriStar Skyline MEDICAL CENTER
FLOOR CHW HW STEAM AHU ENERGY EPSS ALARMS AUX LEGEND
FACILITIGROUP

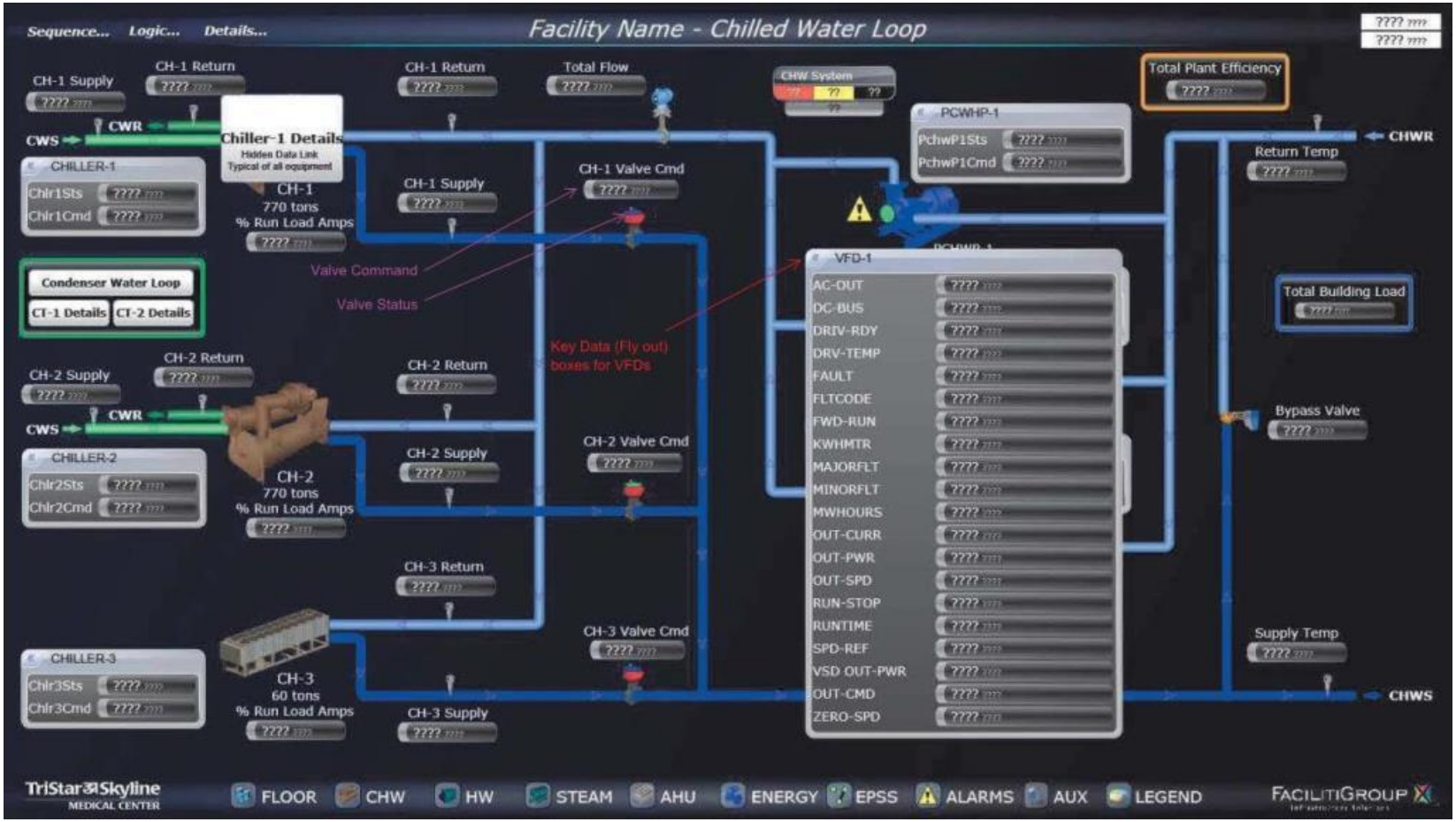

Facility Name - OR Summary
Links to AHU 01 graphic panel
???? ????
???? ????
AHU 01 Summary
Econ State ???? ChwVlvPos ????
SaTmp ???? HwVlvPos ????
RaTmp ???? BoxTotCFM ????
RaRh ???? Total Load ????
Chiller Summary
Chiller 01 ???? ChwsTmp ????
Chiller 02 ???? ChwrTmp ????
Chiller 03 ???? SChwGPM ????
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
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
Remove unused columns
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 >
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
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AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

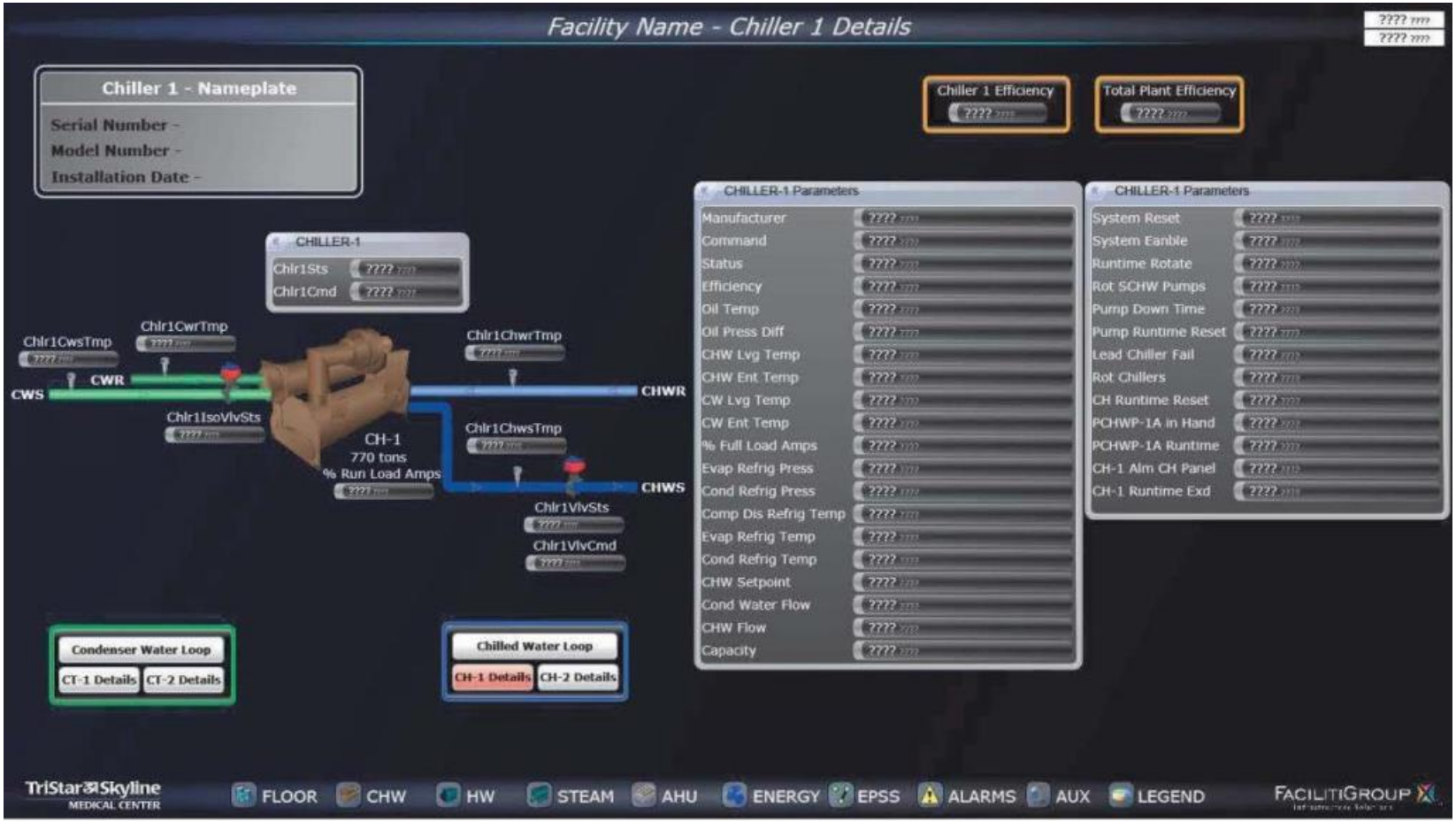

Facility Name - Chiller Plant Overview
Return Temp
CH-1 Return
CH-1 Return
Total Plant Efficiency
Return Temp
CHWR
Chiller-1 Details
Hidden Data Link Typical of all equipment
CH-1
770 tons
% Run Load Amps
CH-1 Supply
CH-1 Supply
CT-1
VFD Speed
PCHWP-1
CW System
CH-2 Return
CH-2 Return
PCHWP-2
Condenser Water Loop
CH-2 Supply
CH-2 Supply
CH-2
770 tons
% Run Load Amps
Bypass Valve
CWP-1
PCHWP-3
CHW System
CH-3 Return
Supply Temp
Chilled Water Loop
CWP-2
CH-3 Supply
Supply Temp
CT-2
VFD Speed
CH-3
770 tons
% Run Load Amps
CHWS
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
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STEAM
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ENERGY
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ALARMS
AUX
LEGEND
FACILITIGROUP

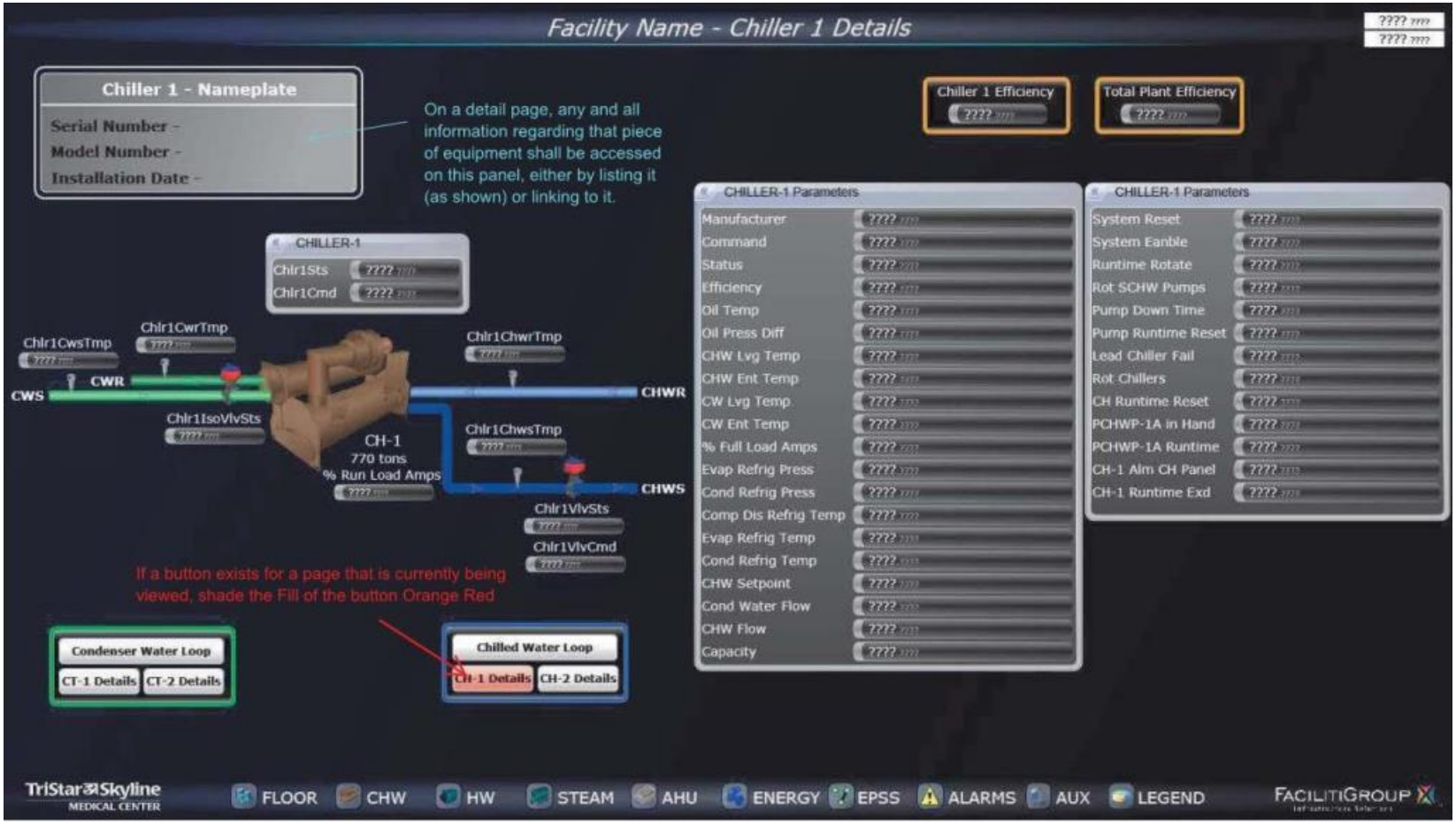

State circles added to the top of Isolation Valves. This value indicates STATUS. Blue=Closed, Green= Open.
For analog Isolation Valves, Value boxes shall be used in addition to the circles
Facility Name - Chiller Plant Overview
Return Temp
CH-1 Return
CH-1 Return
Total Plant Efficiency
Return Temp
CHWR
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CH-1
770 tons
% Run Load Amps
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
CH-1 Supply
CH-1 Supply
PCHWP-1
The size of ALL the pipe temperature sensors have been reduced to 25
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.
CW System
CH-2 Return
CH-2 Return
PCHWP-2
Condenser Water Loop
Links to 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
Supply Temp
Chilled Water Loop
Links to Chilled water loop
Supply Temp
CT-2
VFD Speed
CWP-2
CH-3
770 tons
% Run Load Amps
CH-3 Supply
The inlet and outlets of ALL pumps have been shaded in to create a cleaner look. Keep this format for all 90° pumps.
CHWS
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

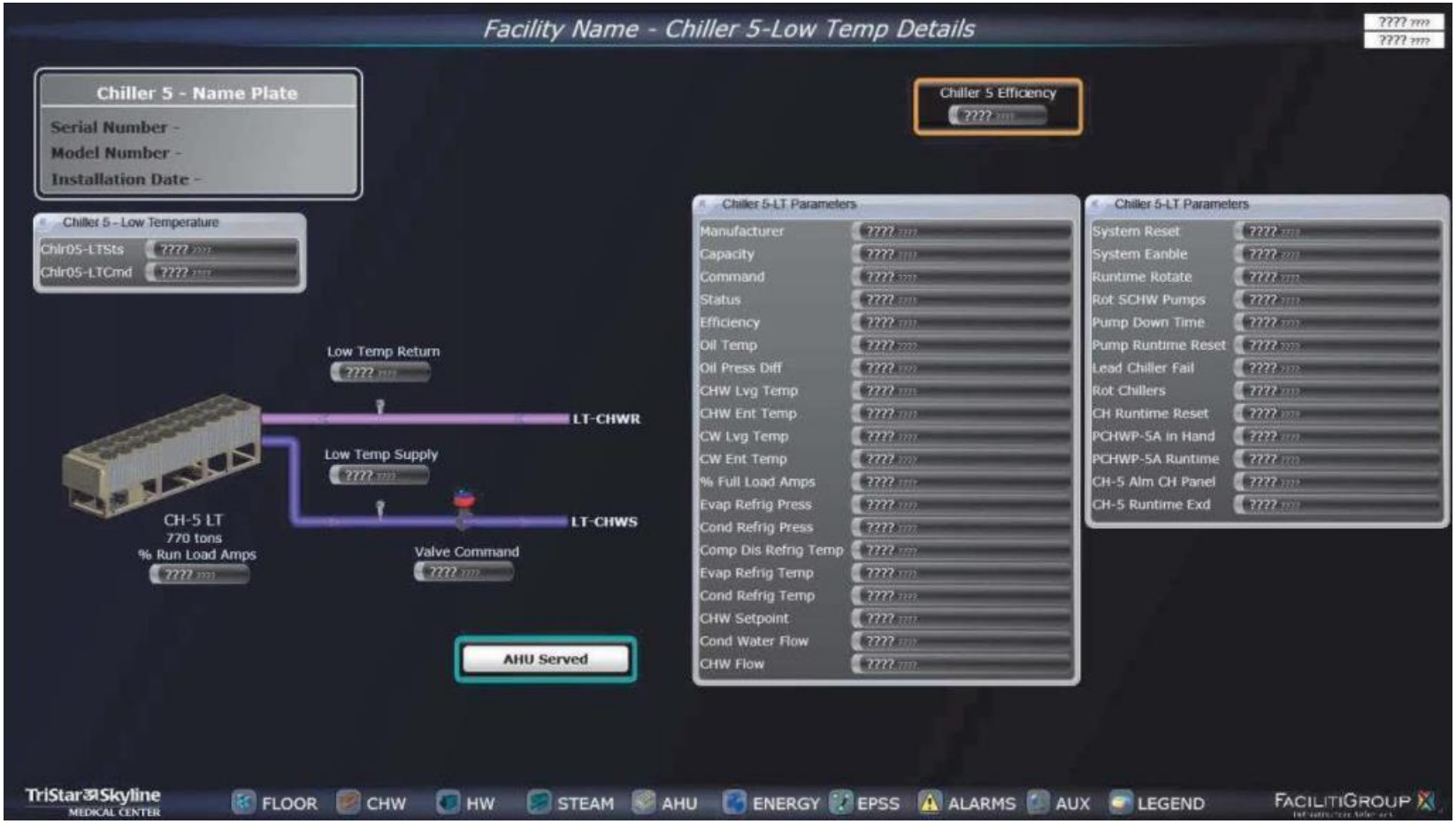

Sequence...
Logic...
Details...
Facility Name - Chilled Water Loop
CH-1 Supply
CH-1 Return
CWS
CWR
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CHILLER-1
Chlr1Sts
Chlr1Cmd
CH-1
770 tons
% Run Load Amps
CH-1 Return
Total Flow
CH-1 Supply
CH-1 Valve Cmd
Condenser Water Loop
CT-1 Details
CT-2 Details
CH-2 Return
CH-2 Supply
CWS
CWR
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 Valve Cmd
CH-3 Supply
CHW System
PCWHP-1
PchwP1Sts
PchwP1Cmd
PCHWP-1
VFD-1
PCWHP-2
PchwP2Sts
PchwP2Cmd
PCHWP-2
VFD-2
PCWHP-3
PchwP3Sts
PchwP3Cmd
PCHWP-3
VFD-3
Total Plant Efficiency
CHWR
Return Temp
Total Building Load
Bypass Valve
Supply Temp
CHWS
TriStar Skyline
MEDICAL CENTER
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FACILITIGROUP

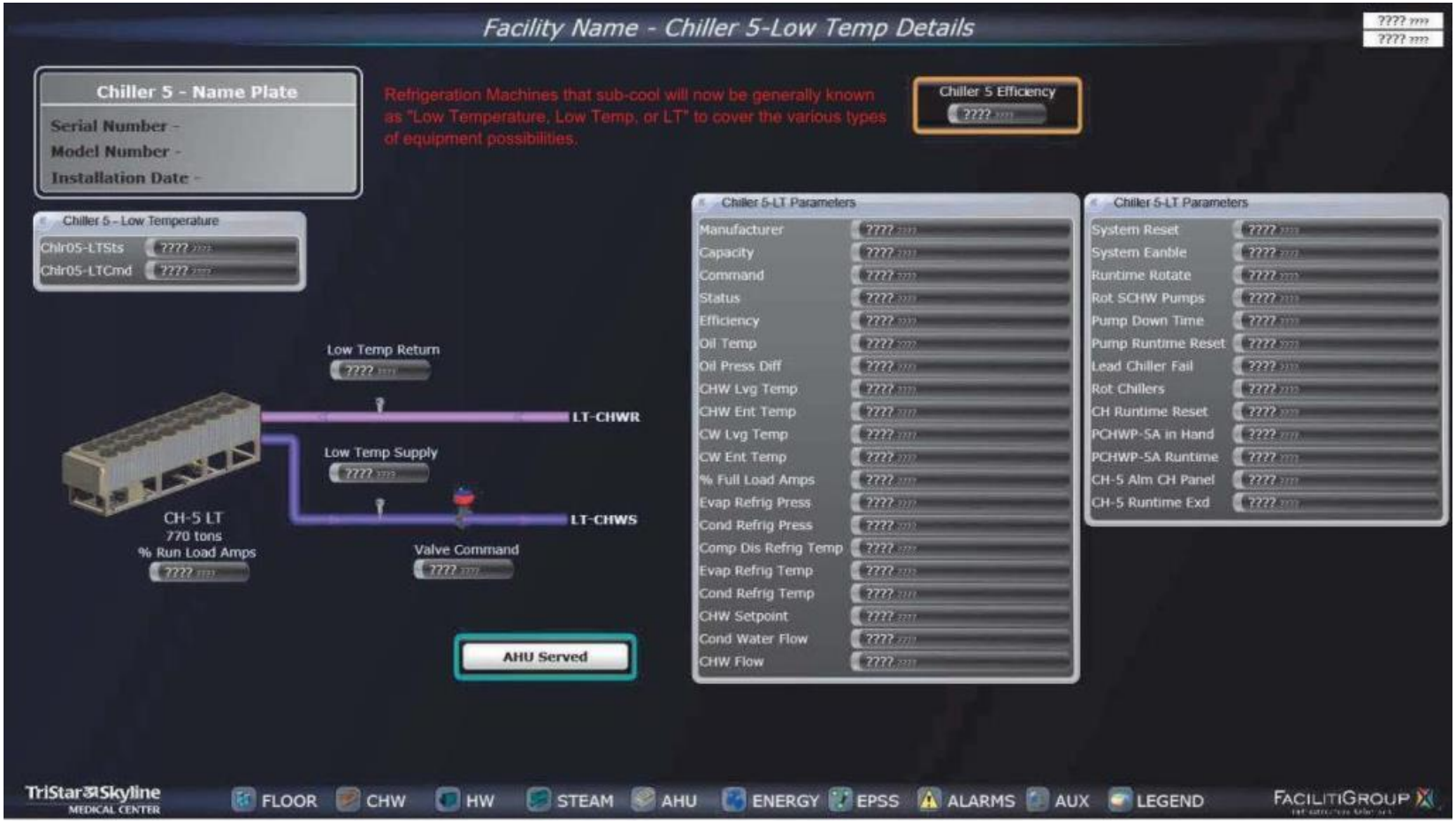

Sequence...
Logic...
Details...
Facility Name - Chilled Water Loop
CH-1 Supply
CH-1 Return
CWS
CWR
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CHILLER-1
Chlr1Sts
Chlr1Cmd
CH-1
770 tons
% Run Load Amps
CH-1 Return
Total Flow
CH-1 Supply
CH-1 Valve Cmd
Valve Command
Valve Status
Condenser Water Loop
CT-1 Details
CT-2 Details
CH-2 Return
CH-2 Supply
CWS
CWR
CHILLER-2
Chlr2Sts
Chlr2Cmd
CH-2
770 tons
% Run Load Amps
CH-2 Return
CH-2 Supply
CH-2 Valve Cmd
Key Data (Fly out)
boxes for VFDs
CH-3 Return
CHILLER-3
Chlr3Sts
Chlr3Cmd
CH-3
60 tons
% Run Load Amps
CH-3 Supply
CH-3 Valve Cmd
CHW System
PCWHP-1
PchwP1Sts
PchwP1Cmd
PCHWP-1
VFD-1
PCWHP-2
PchwP2Sts
PchwP2Cmd
PCHWP-2
VFD-2
PCWHP-3
PchwP3Sts
PchwP3Cmd
PCHWP-3
VFD-3
Total Plant Efficiency
CHWR
Return Temp
Total Building Load
Bypass Valve
Supply Temp
CHWS
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
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STEAM
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ENERGY
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LEGEND
FACILITIGROUP

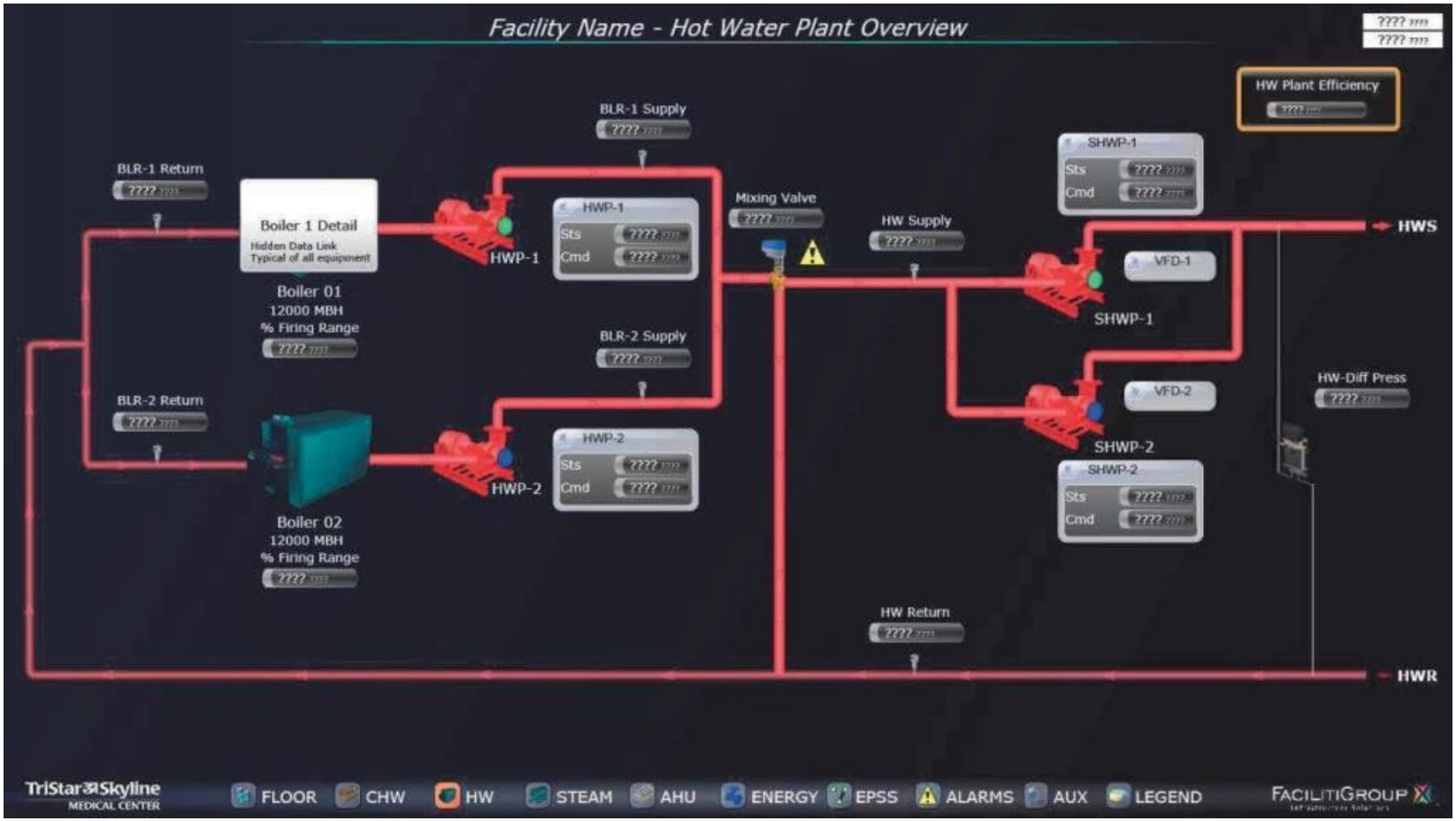

Sequence... Logic... Details...
Facility Name - Chilled Water Loop
CH-1 Supply
CH-1 Return
CWS
CWR
Chiller-1 Details
Hidden Data Link
Typical of all equipment
CHILLER-1
Chlr1Sts
Chlr1Cmd
CH-1
770 tons
% Run Load Amps
CH-1 Return
Total Flow
CH-1 Supply
CH-1 Valve Cmd
Valve Command
Valve Status
Condenser Water Loop
CT-1 Details
CT-2 Details
CH-2 Return
CH-2 Supply
CWS
CWR
CHILLER-2
Chlr2Sts
Chlr2Cmd
CH-2
770 tons
% Run Load Amps
CH-2 Return
CH-2 Supply
CH-2 Valve Cmd
Key Data (Fly out) boxes for VFDs
CH-3 Return
CHILLER-3
Chlr3Sts
Chlr3Cmd
CH-3
60 tons
% Run Load Amps
CH-3 Supply
CH-3 Valve Cmd
CHW System
PCWHP-1
PchwP1Sts
PchwP1Cmd
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
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

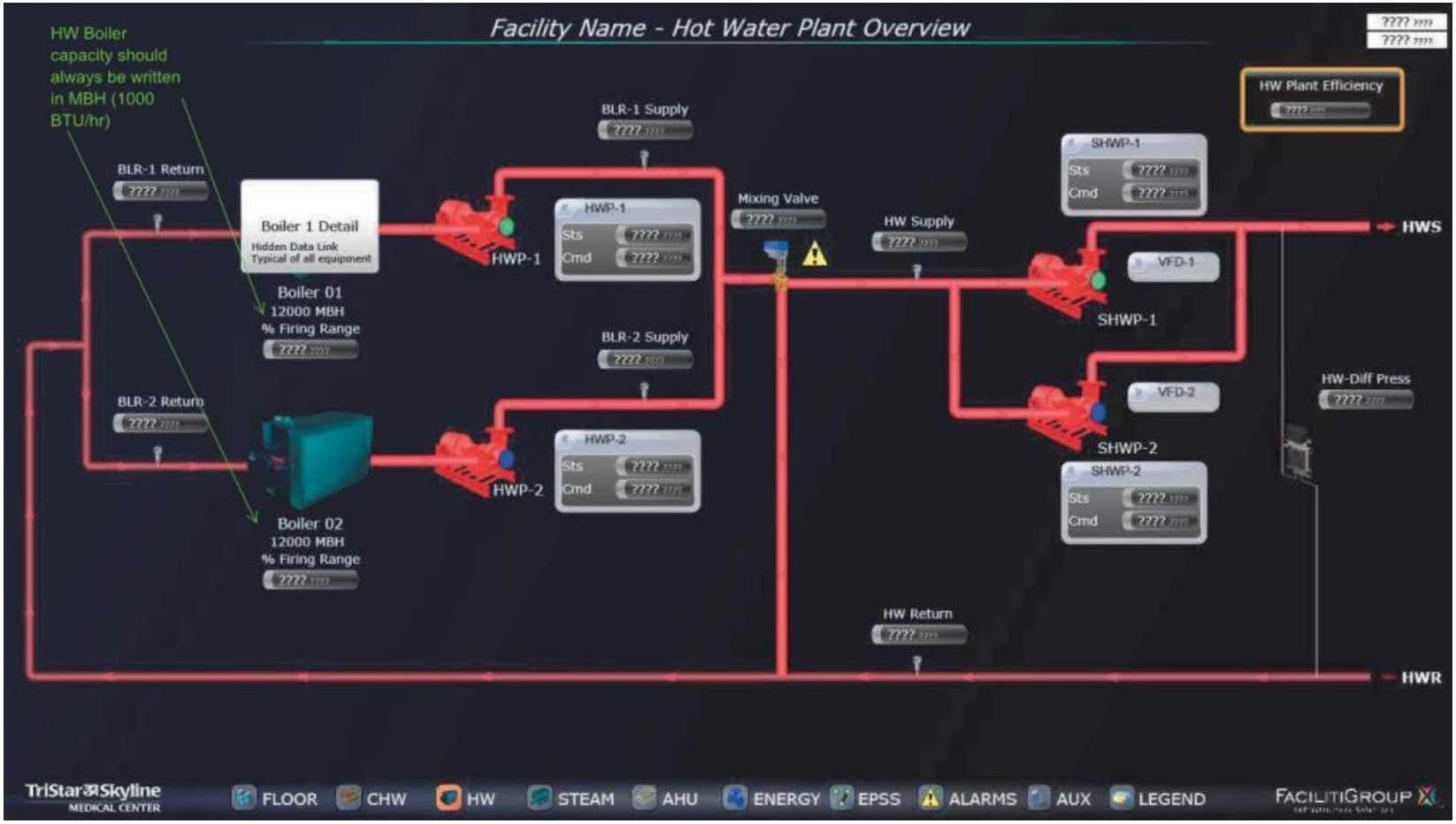

Facility Name - Chiller 1 Details
Chiller 1 - Nameplate
Serial Number -
Model Number -
Installation Date -
Chiller 1 Efficiency
Total Plant Efficiency
CHILLER-1
Chlr1Sts
Chlr1Cmd
Chlr1CwsTmp
Chlr1CwrTmp
Chlr1ChwrTmp
CWS
CWR
CHWR
Chlr1IsoVlvSts
CH-1
770 tons
% Run Load Amps
Chlr1ChwsTmp
CHWS
Chlr1VlvSts
Chlr1VlvCmd
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
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

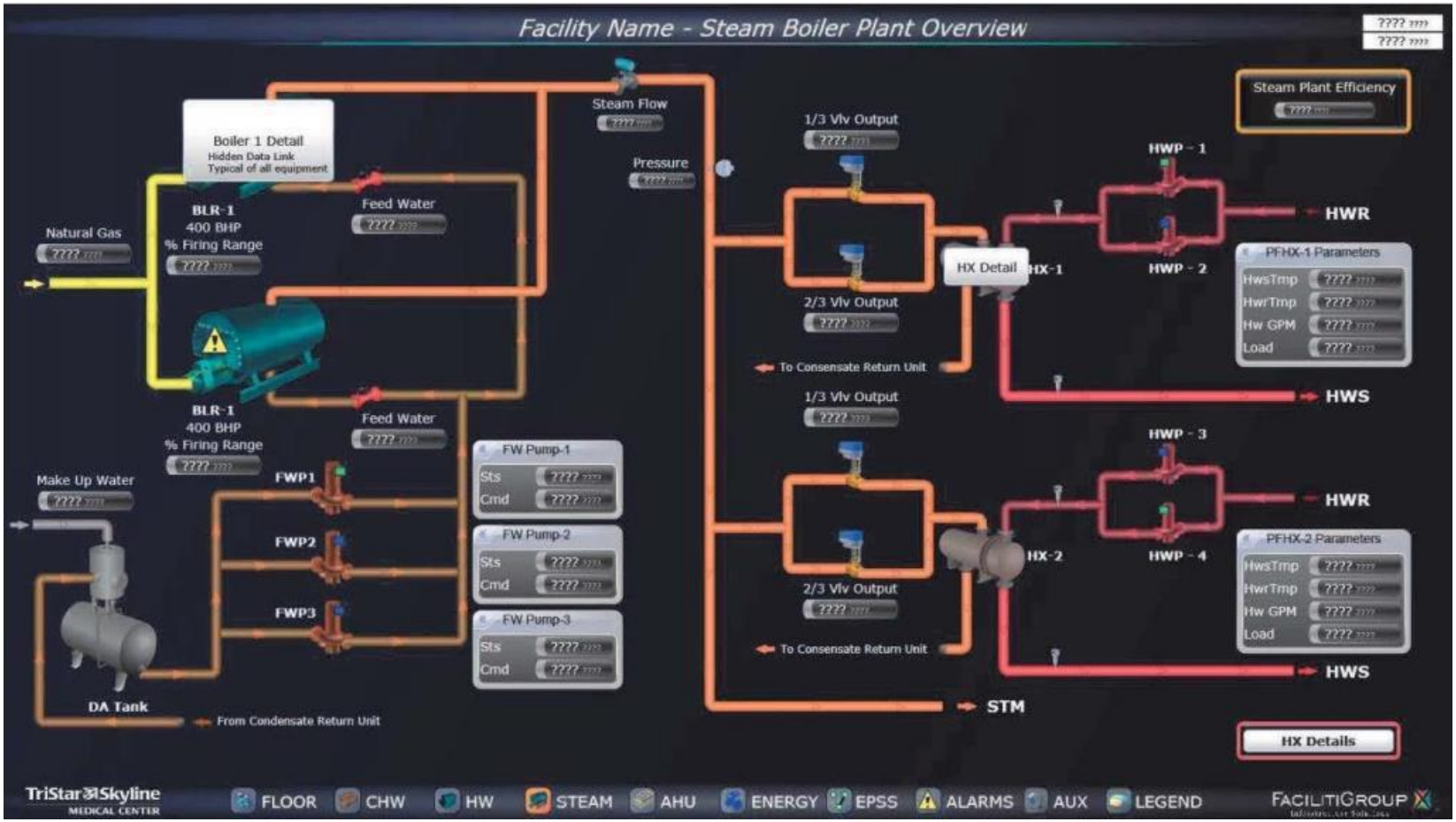

Facility Name - Chiller 1 Details
Chiller 1 - Nameplate
Serial Number -
Model Number -
Installation Date -
On a detail page, any and all information regarding that piece of equipment shall be accessed on this panel, either by listing it (as shown) or linking to it.
Chiller 1 Efficiency
Total Plant Efficiency
CHILLER-1
Chlr1Sts
Chlr1Cmd
Chlr1CwsTmp
Chlr1CwrTmp
Chlr1ChwrTmp
CWS
CWR
CHWR
Chlr1IsoVlvSts
CH-1
770 tons
% Run Load Amps
Chlr1ChwsTmp
CHWS
Chlr1VlvSts
Chlr1VlvCmd
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
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

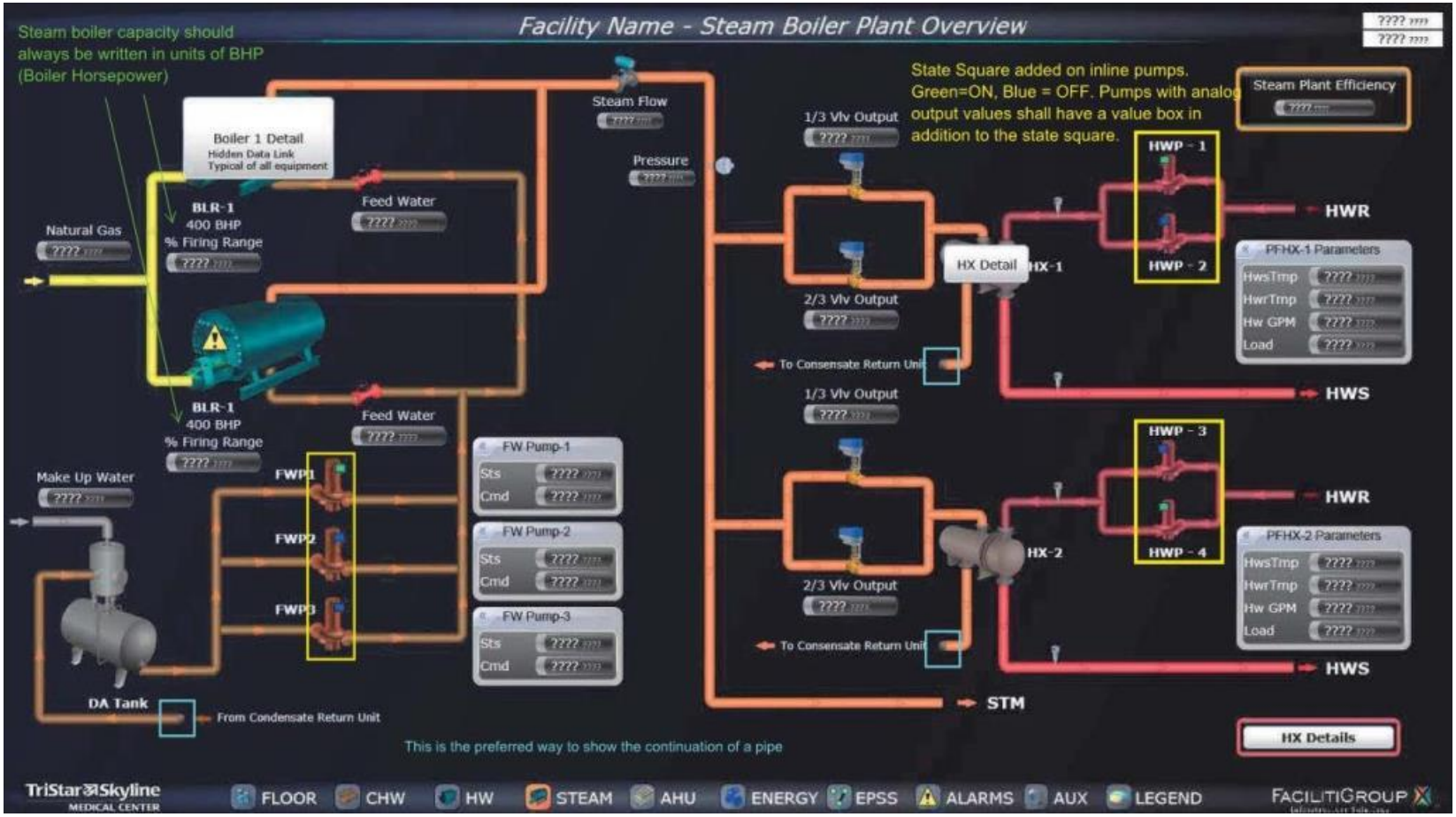

Facility Name - Chiller 5-Low Temp Details
Chiller 5 - Name Plate
Serial Number -
Model Number -
Installation Date -
Chiller 5 Efficiency
Chiller 5 - Low Temperature
Chlr05-LTSts
Chlr05-LTCmd
Low Temp Return
LT-CHWR
Low Temp Supply
LT-CHWS
CH-5 LT
770 tons
% Run Load Amps
Valve Command
AHU Served
Chiller 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
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

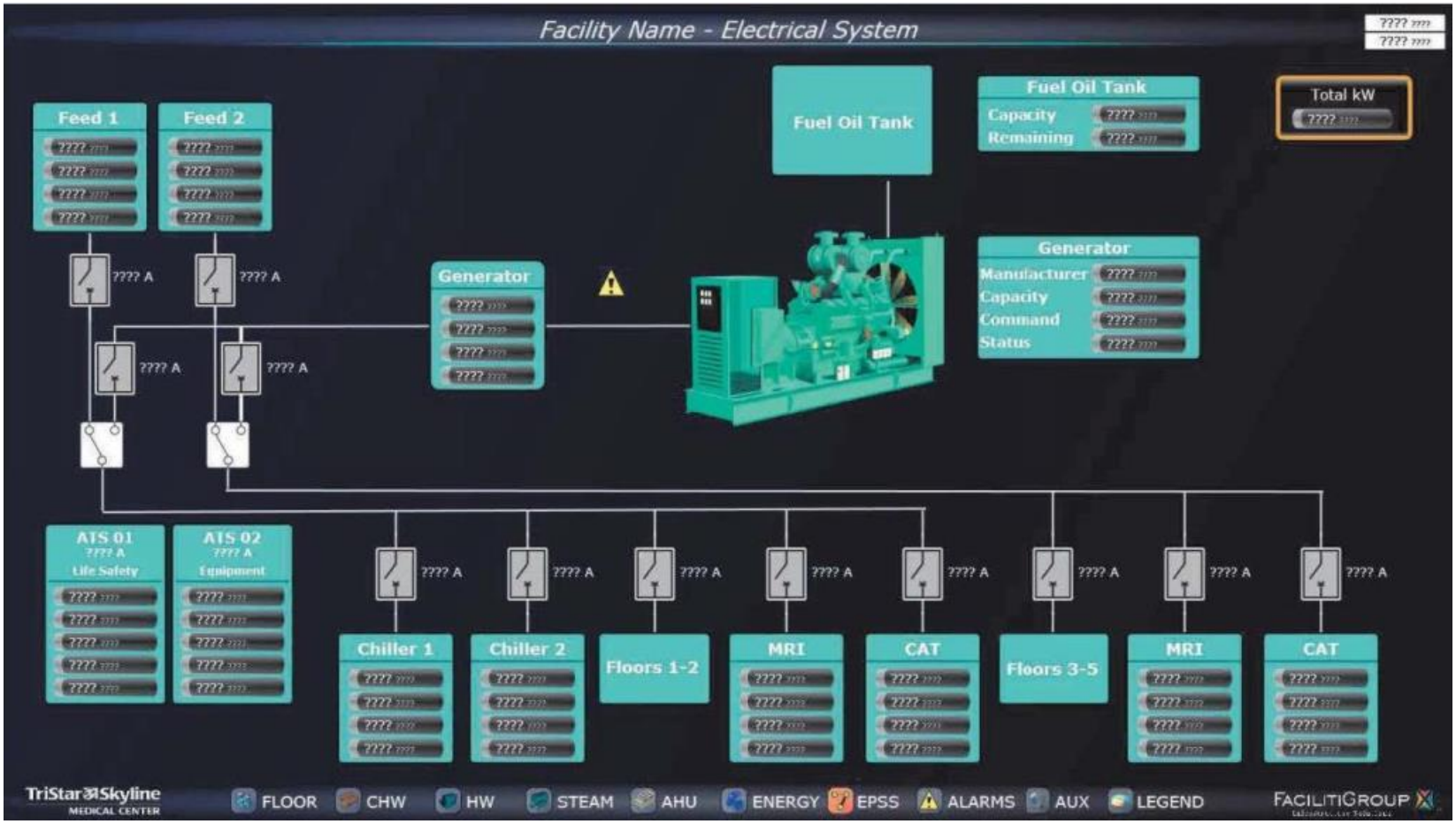

Facility Name - Chiller 5-Low Temp Details
Chiller 5 - Name Plate
Serial Number -
Model Number -
Installation Date -
Refrigeration Machines that sub-cool will now be generally known as "Low Temperature, Low Temp, or LT" to cover the various types of equipment possibilities.
Chiller 5 Efficiency
Chiller 5 - Low Temperature
Chlr05-LTSts
Chlr05-LTCmd
Low Temp Return
LT-CHWR
Low Temp Supply
LT-CHWS
CH-5 LT
770 tons
% Run Load Amps
Valve Command
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
TriStar Skyline MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

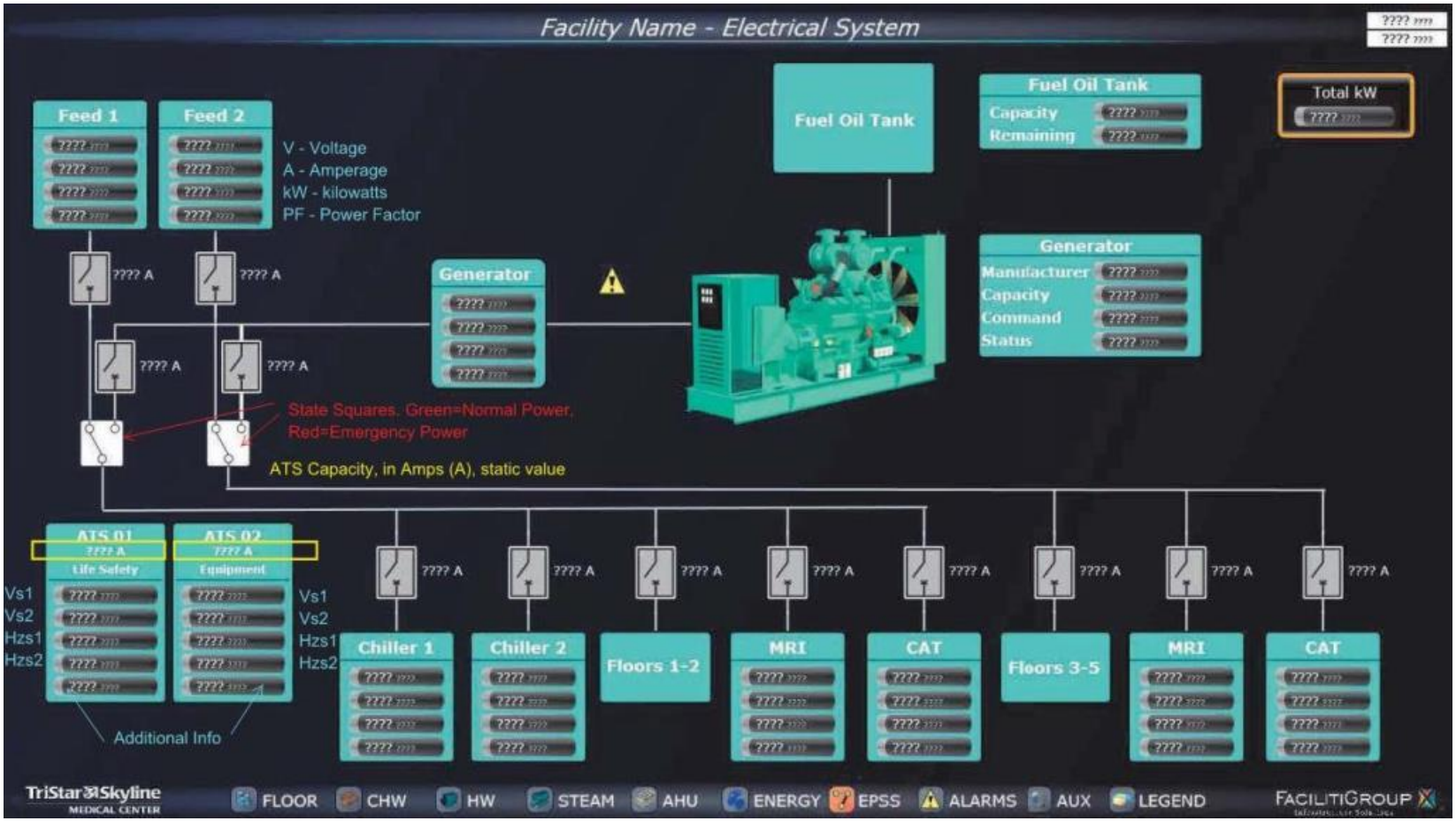

Facility Name - Hot Water Plant Overview
HW Plant Efficiency
BLR-1 Supply
BLR-1 Return
Boiler 1 Detail
Hidden Data Link
Typical of all equipment
Boiler 01
12000 MBH
% Firing Range
HWP-1
Sts
Cmd
Mixing Valve
HW Supply
SHWP-1
HWS
VFD-1
SHWP-1
BLR-2 Supply
BLR-2 Return
HWP-2
Boiler 02
12000 MBH
% Firing Range
VFD-2
SHWP-2
HW-Diff Press
HW Return
HWR
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

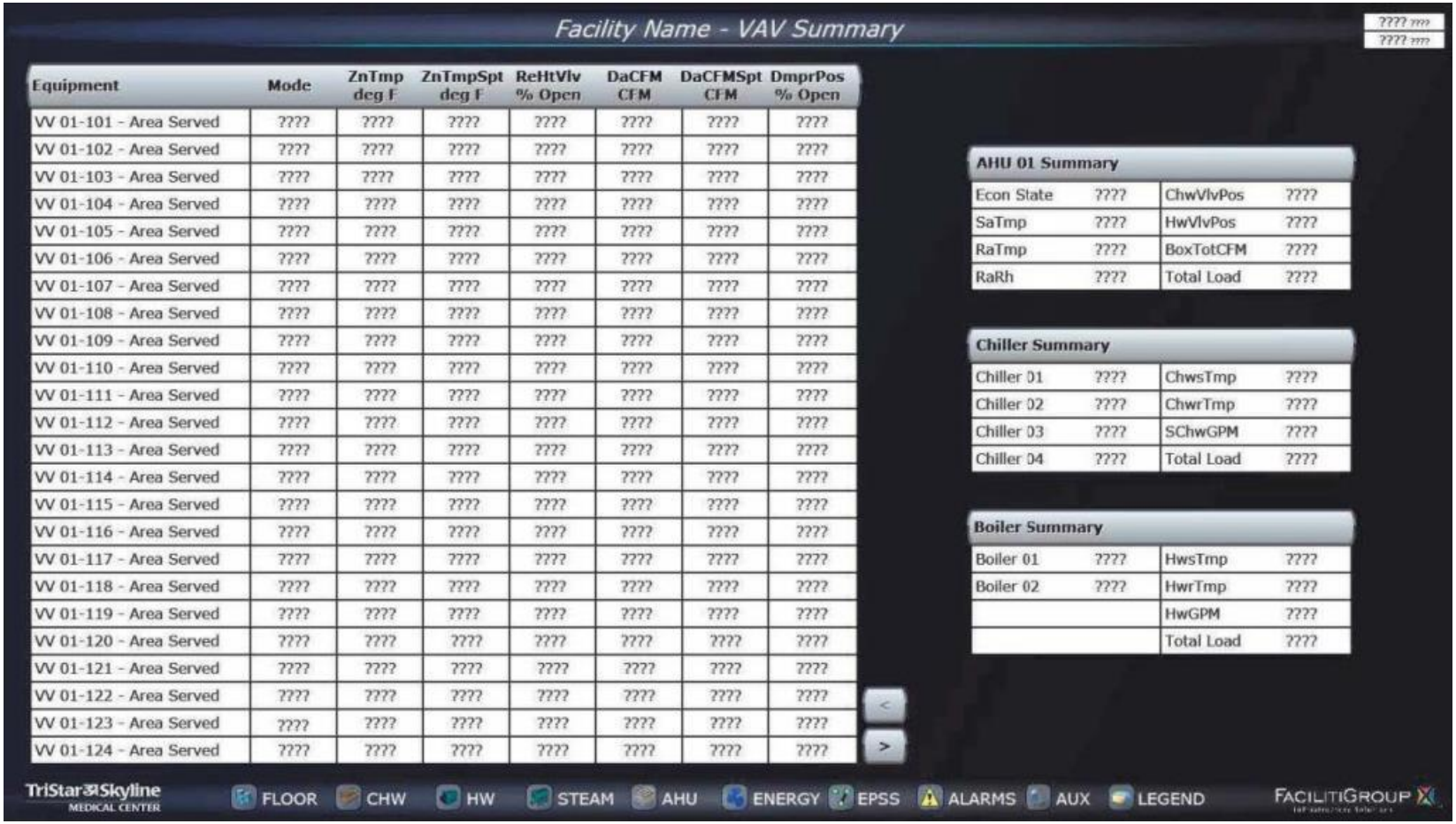

Facility Name - Hot Water Plant Overview
HW Boiler capacity should always be written in MBH (1000 BTU/hr)
HW Plant Efficiency
BLR-1 Supply
BLR-1 Return
Boiler 1 Detail
Hidden Data Link
Typical of all equipment
Boiler 01
12000 MBH
% Firing Range
HWP-1
Sts
Cmd
Mixing Valve
HW Supply
SHWP-1
VFD-1
HWS
BLR-2 Supply
BLR-2 Return
Boiler 02
12000 MBH
% Firing Range
HWP-2
VFD-2
SHWP-2
HW-Diff Press
HW Return
HWR
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP

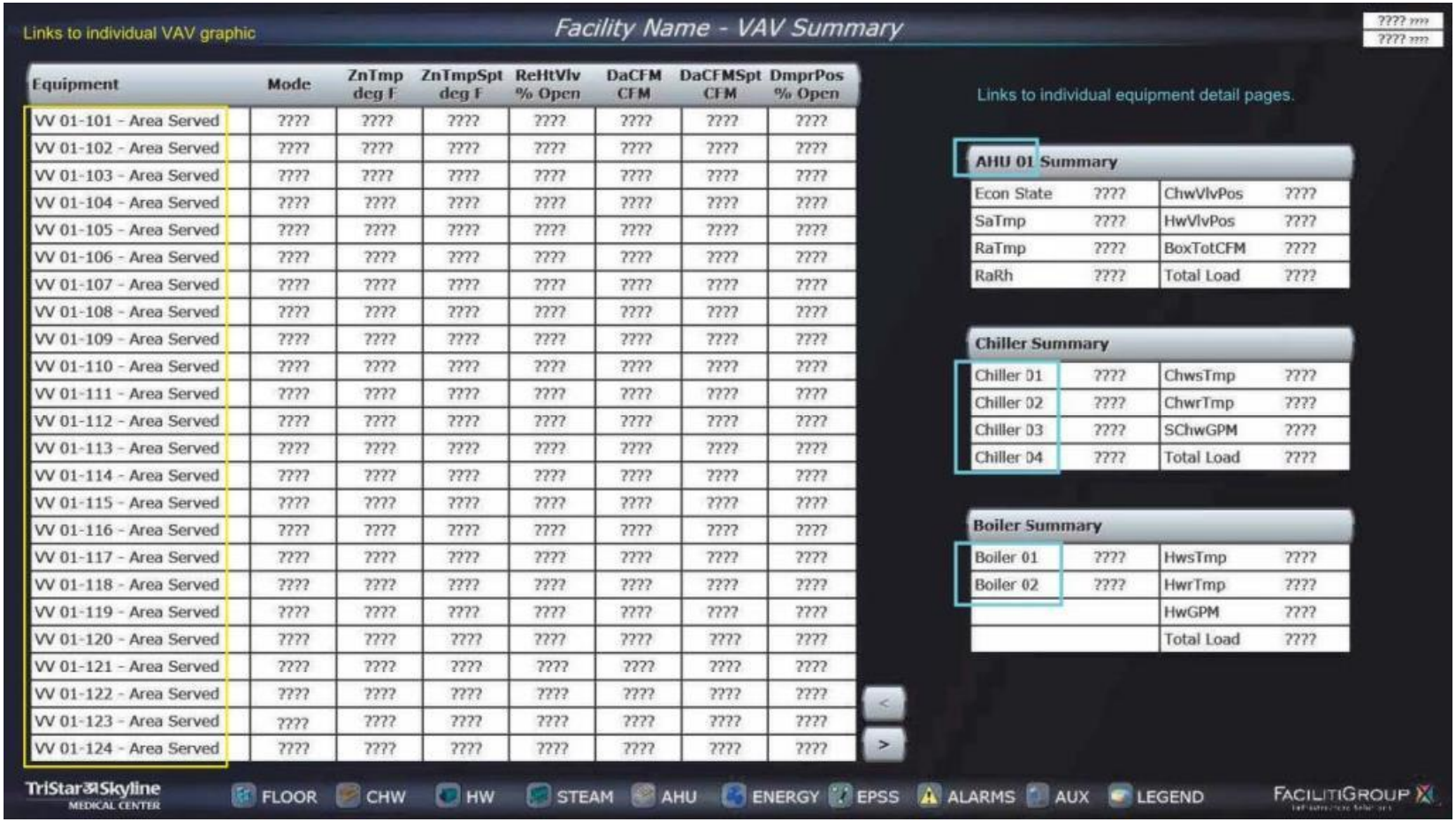

Facility Name - Steam Boiler Plant Overview
Steam Flow
Pressure
Boiler 1 Detail
Hidden Data Link
Typical of all equipment
BLR-1
400 BHP
% Firing Range
Feed Water
Natural Gas
BLR-1
400 BHP
% Firing Range
Feed Water
Make Up Water
FWP1
FWP2
FWP3
FW Pump-1
Sts
Cmd
FW Pump-2
Sts
Cmd
FW Pump-3
Sts
Cmd
DA Tank
From Condensate Return Unit
1/3 Vlv Output
2/3 Vlv Output
To Consensate Return Unit
HX Detail
HX-1
HWP - 1
HWP - 2
HWR
HWS
PFHX-1 Parameters
HwsTmp
HwrTmp
Hw GPM
Load
1/3 Vlv Output
2/3 Vlv Output
To Consensate Return Unit
HX-2
HWP - 3
HWP - 4
HWR
HWS
PFHX-2 Parameters
HwsTmp
HwrTmp
Hw GPM
Load
STM
Steam Plant Efficiency
HX Details
TriStar Skyline
MEDICAL CENTER
FLOOR
CHW
HW
STEAM
AHU
ENERGY
EPSS
ALARMS
AUX
LEGEND
FACILITIGROUP


Facility Name - Steam Boiler Plant Overview
Steam boiler capacity should always be written in units of BHP (Boiler Horsepower)
Boiler 1 Detail
Hidden Data Link
Typical of all equipment
Steam Flow
Pressure
Feed Water
Natural Gas
BLR-1
400 BHP
% Firing Range
Make Up Water
FWP1
FWP2
FWP3
FW Pump-1
FW Pump-2
FW Pump-3
Sts
Cmd
DA Tank
From Condensate Return Unit
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.
1/3 Vlv Output
2/3 Vlv Output
HX Detail
HX-1
HX-2
HWP - 1
HWP - 2
HWP - 3
HWP - 4
HWR
HWS
To Consensate Return Unit
PFHX-1 Parameters
PFHX-2 Parameters
HwsTmp
HwrTmp
Hw GPM
Load
Steam Plant Efficiency
STM
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


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
Generator
Manufacturer
Capacity
Command
Status
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 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 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

2.1 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

2.2 STEEL PIPES NOT APPLICABLE

2.3 STEEL PIPE FITTINGS NOT APPLICABLE

2.4 COPPER PIPES

A. Type "L" hard-drawn seamless copper tubing, ASTM B-88: NOT APPLICABLE

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:

1. Provide sweat fittings, ASTM B-62, dimensions conforming to ANSI B16.22, wrought copper, with sweep patterns for copper tubing.

2. 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.

2.5 PP-RCT PIPE NOT APPLICABLE

2.6 VALVES NOT APPLICABLE

A. Gate Valves: NOT APPLICABLE

B. Globe Valves: NOT APPLICABLE

C. Ball Valves: NOT APPLICABLE

D. Butterfly Valves: NOT APPLICABLE

E. Check Valves: NOT APPLICABLE

2.7 STRAINERS NOT APPLICABLE

2.8 HANGERS

A. Non-insulated steel piping 1/2" thru 24" with no longitudinal movement to be Grinnell Figure 260, MSS SP-69 Type 1, adjustable clevis hanger.

B. Insulated steel piping 1/2" thru 24", galvanized piping 1/2" thru 24", 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. Support copper pipe risers by Grinnell Figure CT-121C, MSS SP-69 TYPE 8, plastic coated riser clamps at floor penetrations.

D. Support three or more parallel lines by trapeze hangers utilizing Unistrut channel or equal in bottom mounting arrangement with rod hanging support.

E. Adequately size hangers on insulated piping for insulation to pass continuously through hangers. Insulated piping to be supported outside insulation covering.

F. 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.

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.

PART 3 - EXECUTION

3.1 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. Fusion Welding of Joints

1. Install fittings and joints using socket-fusion or butt-fusion as applicable for the fitting or joint type and as recognized by DVS. All fusion-weld joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.

2. Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.

3. Prior to joining, the pipe and fittings shall be prepared in accordance with ASTM F 2389 and the manufacturer's specifications.

4. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.

3.2 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.

3.3 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. Copper pipes thru masonry walls

3.4 PIPING IN TRANSFORMER, ELECTRICAL, AND ELEVATOR EQUIPMENT ROOMS

A. Refer to drawings. No water piping permitted in transformer, electrical, or elevator equipment rooms.

3.5 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.

3.6 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.

3.7 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 232113

SECTION 232300 - REFRIGERANT PIPING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Refrigeration piping, valves and fittings to connect remote condensers to split system heat pump systems.

1.2 SAFETY CODE

A. Comply with the requirements of ANSI B9.1, Code for Refrigerant Systems.

PART 2 - PRODUCTS

2.1 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.

2.2 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 232113.

H. Insulation: Insulate piping as specified in Section 230710.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 CHARGING SYSTEM

A. When system dehydration is complete and all leaks are corrected, charge system with refrigerant.

END OF SECTION 232300

SECTION 238143 - AIR-COOLED SPLIT SYSTEM HEAT PUMP

PART 1 - GENERAL

1.1 WORK INCLUDED

A. System to consist of fan-coil indoor unit in combination with direct-expansion air-to-air electric heat pump outdoor unit York/JCI. Both indoor and outdoor unit to be UL listed and AHRI certified.

1. For pricing contact:

a. Johnson Controls, Inc.
Contact: Kevin P. Tolbert
email: BE-HCA@jci.com
954-734-0792

B. Manufacturers to review the allowable space for the indoor and outdoor units considering service access, filter access, airflow clearances, and refrigerant and condensate piping to ensure adequate clearance exists for their units prior to submitting bid. Contractor shall not be allowed an extra should the low bidder prove to have unacceptable clearance.

PART 2 - PRODUCTS

2.1 INDOOR UNIT

A. Indoor unit cabinet to be constructed of heavy gauge galvanized steel internally insulated with 1" thickness, minimum 3/4 lb. density fiberglass insulation. Indoor unit cabinet to be phosphatized and finished with baked-on enamel paint.

B. Construct coil with aluminum plate fins mechanically bonded to copper tubing with brazed joints. Coil to be 3-row minimum.

C. Drain pan to be welded galvanized steel and insulated.

D. Fan to be statically and dynamically balanced, forward curved centrifugal type. Fan motor to be permanently lubricated and include internal overload protection. Provide fans with drive necessary to satisfy static pressure requirements.

E. Provide throwaway type filter, clean and unused at the time building is turned over to Owner. Provide one spare set of filters to Owner at job completion.

F. Provide auxiliary electric resistance heater.

2.2 OUTDOOR UNIT

A. Outdoor unit to contain compressor with crankcase heater, automatically reversible oil pump, suction line accumulator, and internal and external motor protection.

B. Outdoor unit fan to be vertical discharge propeller type direct driven by factory-lubricated motor.

C. Outdoor unit coil to be constructed of aluminum fins mechanically bonded to copper tubing with brazed joints.

2.3 CONTROLS AND PROTECTIVE DEVICES

A. Controls to include a high pressure switch, low pressure switch and pressure relief device. Compressor motor to have thermal and current sensitive overload devices. Outdoor unit to incorporate positive acting timer to prevent compressor short cycling. Device shall prevent compressor from restarting for a 5-minute period. Automatic defrost control to sense frost accumulation and defrost when necessary. A 24-volt transformer to be factory installed and wired on outdoor units for external control circuit.

B. System control accessories shall include the following:

1. Start capacitor and relay.

2. Automatic changeover heating/cooling thermostat with 2-stage heating (second stage heat to be electric heat) and fan auto/on switch.

3. Head pressure control for cooling operation down to 0 degrees F outdoor temperature.

2.4 SYSTEM ACCESSORIES SHALL INCLUDE THE FOLLOWING

A. Solid brass service valves.

B. Bi-flow liquid line filter drier.

C. Outdoor unit coil guard (louvered unit casing).

2.5 WARRANTY

A. Provide unit with minimum 5-year compressor warranty.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate indoor and outdoor unit where shown on drawings.

B. Install indoor fan-coil unit on neoprene or fiberglass pad vibration isolators and attach to system duct with flexible connectors.

C. Locate outdoor unit so as to provide recommended airflow, service and maintenance clearance and mount on a 4 inch high (4 inch above grade) concrete pad.

END OF SECTION 238143

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Secondary power wiring and distribution system.

B. Lightning protection system.

C. Fire alarm and smoke detection system.

D. Lighting control equipment.

E. Electrical control systems and interlock wiring.

1.2 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. Telephone system equipment.

1.3 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.

1.4 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-101 - Life Safety Code. 2021 Edition.

4. NFPA-780 - Lightning Protection Code. 2020 Edition.

C. Applicable Codes:

1. ANSI-A17.1: Elevators, Dumbwaiters, Escalators and moving walks.

2. Florida Building Code 2023 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.

1.5 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 260573 – Power System Analysis for additional requirements.

1.6 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. Fire alarms and smoke detection systems, including point-to-point wiring diagrams, matrix, riser, and battery calculations.

2. Lightning protection system.

3. Dimensional layout of all electrical rooms, drawn to scale, with equipment location shown therein. Clearances to be in accordance with NEC and local codes.

4. 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.

1.7 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.

1.8 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.

1.9 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

2.1 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 2200 Low-Voltage Transformers

f. 26 2416 Panelboards

g. 26 2726 Wiring Devices

h. 26 2816 Enclosed Switches and Circuit Breakers

i. 26 2913 Enclosed Controllers

j. 26 4313 Transient Voltage Surge Suppression

k. 26 5100 Interior Lighting

l. 26 5600 Exterior Lighting

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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.

3.5 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. 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 260526 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.

C. 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. Transformers.

3. Fire alarm and smoke detection system.

4. Electric motors for all equipment.

5. Electric safety devices.

3.6 INSPECTION FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.7 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.

3.8 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.

3.9 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 260500

SECTION 260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES 600 VOLT AND BELOW

PART 1 - GENERAL

1.1 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

2.1 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° C for conductors running through continuous rows of fixtures.

PART 3 - EXECUTION

3.1 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 except conductors from isolation transformers.

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 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The entire system of raceways and equipment to be grounded and bounded in accordance with Article No. 250 of latest edition of National Electrical Code and any local regulation or governmental governing authority.

PART 2 - PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

A. Main service 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. 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.

E. Bonding for other systems such as lightning protection, communications, cable TV, water piping, etc. where required by N.E.C. or other codes shall be bonded per Article 250 of N.E.C.

2.2 GROUND CLAMPS

A. O-Z Gedney, Steel City, or approved substitute.

PART 3 - EXECUTION

3.1 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 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.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 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

2.1 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

3.1 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.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND CONDUIT SYSTEMS

PART 1 - GENERAL

1.1 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.

1.2 SUBMITTALS

A. Submittal for products furnished under this section is not required.

PART 2 - PRODUCTS

2.1 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. Outlets and junction boxes shall be Steel City or approved substitute.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. Permanent barriers shall be furnished in multi-gang boxes if the voltage between adjacent wiring devices exceeds 300 volts.

N. 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.

O. 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.

P. Pull and junction boxes shall be by Hoffman or approved substitute.

Q. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, screw covers, etc.

R. 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.

S. 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.

T. 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.

2.2 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.

2.3 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.

2.4 RIGID GALVANIZED STEEL (RGS)

A. Conduit Use:

1. Exterior exposed primary service conduit.

2. Interior and exterior exposed secondary service conduit.

2.5 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.

2.6 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

3.1 INSTALLATION

A. Minimum size of conduits shall be 1/2 inch (16 mm) for controls circuiting and 3/4 inch 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. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

G. Complete conduit systems before pulling conductors.

H. 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.

I. Where conduits of different levels must cross, the minimum separations shall be maintained, and they shall cross at right angles.

J. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300-19.

K. Provide nylon pull cord in all empty conduits. Steel wire not acceptable as pull wire.

L. 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.

M. Conduits which enter crawl space, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects, or rodents to these spaces from street mains.

N. Conduit not serving elevator equipment shall not be permitted to pass through elevator shafts or elevator equipment rooms.

O. 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.

P. 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.

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. Where conduits running overhead pass through building expansion joints they shall be connected by flexible metal conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3 inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

T. 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.

U. 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.

V. Standard HCA color coding:

1. Yellow: Life Safety Branch

2. Red: Fire Alarm System

W. If the above conflicts with existing color code, use existing.

X. No conduit shall be installed in elevated slabs.

3.2 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.

3.3 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.

3.4 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 260533

SECTION 260573 - POWER SYSTEM ANALYSIS

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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. Automatic transfer switch.

c. Engine generator.

d. Switchboards.

e. Distribution panelboards.

f. Branch circuit panelboards.

g. 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. Low voltage equipment circuit breaker trip device characteristics.

   b. Low voltage equipment fuse characteristics.

   c. Cable damage point characteristics.

   d. Pertinent transformer characteristics including:
      1) Transformer full load current
      2) Transformer magnetizing inrush.
      3) ANSI transformer withstand parameters.
      4) Significant symmetrical fault current

   e. Pertinent motor characteristics.

   f. 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.

   g. System shall fully coordinate at 0.1 seconds and higher per NFPA 70 and NFPA 99.

   h. 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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

3.1 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.

3.2 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.

3.3 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 260573

SECTION 261219 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 - GENERAL

1.1 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 Florida Power and Light.

PART 2 - PRODUCTS

2.1 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. Secondary conduits, wire, excavation, and backfill to be provided by Division 26 as shown on drawings from transformer to main distribution point.

H. Division 26 to provide secondary lugs on transformer and shall coordinate with power company as to proper drilling and lugs required.

I. 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

3.1 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 261219

SECTION 262200 - LOW VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Section 260500.

B. Provide dry type transformers as specified herein, and as shown on the contract drawings.

PART 2 PRODUCTS

2.1 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

2.2 EQUIPMENT REQUIREMENTS

A. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. Transformers shall have a terminal bar for all grounding and bonding conductors secured to the inside of the enclosure per NEC 450.10.

K. Transformers shall meet the requirements of the most current version of federal law 10 CFR Part 431.

PART 3 EXECUTION

3.1 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 262200

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 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

2.1 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Provide panelboards by Square D or Cutler-Hammer, 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

3.1 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 Phenolic 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 Phenolic 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. Yellow: Life Safety Branch

I. Surge protection shall be provided for all life safety branch panels per Section 264313 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 264313 of these specifications.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide switches, receptacles, device plates, and other wiring devices as indicated on drawings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include Leviton, Acuity Controls or approved equal.

2.2 SWITCHES

A. 20-Amp, 120/277 VAC:

1. Single pole: Leviton No. 1221-2W (normal branch).
2. Single pole: Leviton No. 1221-2R (emergency branch).
3. Three-way: Leviton No. 1223-2W (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.

2.3 RECEPTACLES

A. 20-Amp, 125-VAC, NEMA 5-20R:

1. Duplex type, hospital grade: 8300-W (white) for normal power devices and 8300-R (red) for emergency devices.
2. Ground fault circuit interrupter, 20-amp hospital grade: Leviton No. GFNT2-HGW (white)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-SGW (white) for normal power and 8300-SGR (red) for emergency power devices.
5. Duplex type, weather resistant, GFI: Leviton No. WT899-HGW (white) 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.

2.4 DEVICE PLATES

A. Provide Leviton Series 80 nylon plates, red for emergency circuits and white for normal circuits, or approved substitute. Provide cast alloy or stamped metal plates on all exposed switches and receptacles.

PART 3 - EXECUTION

3.1 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 260533. 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 260533, 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.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 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

2.1 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. All switches shall be capable of interrupting locked rotor current of motor which it serves.

E. Enclosures to be NEMA-1 for interior use and NEMA-3R for exterior use unless noted otherwise.

F. Provide dual-element Bussman type FRN (250 volt) or type FRS (600 volt) fuses for any fusible safety switch serving a motor circuit.

G. For non-motor loads, provide dual element Bussman type LPN (250 volt) or type LPS (600 volt).

PART 3 - EXECUTION

3.1 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 Phenolic nameplates.

D. All safety switches and enclosed circuit breakers shall be capable of being locked in the open position.

END OF SECTION 262816

SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 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 shown 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.

PART 2 - PRODUCTS

2.1 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 electrical drawings for 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.

PART 3 - EXECUTION

3.1 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 260500.

END OF SECTION 262913

SECTION 263213 - ENGINE GENERATORS

PART 1 - GENERAL

1.1 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.

1.2 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

2.1 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. Steve Turner, Jr.
   Caterpillar
   510 Lake Crook Rd.
   Deerfield, IL 60015
   HEALTHTRUST@CAT.com
   (309) 494-5105
   HPG Contract No. 46261

2. Chris Banet
Cummins Crosspoint, LLC
Power Generation Sales - Nashville Area
706 Spence Ln, Nashville, TN 37217
(615) 478-2057
email: HCA@Cummins.com
HPG Contract No. 6344

3. Mike Evans
Generac
Energy Systems Southeast LLC.
1117 Willowood Road
Knoxville, TN 37922
HCA@essellc.com
(865) 806-9435
HPG Contract No. 3489

4. Keith Kraemer
Kohler
1515 JP Hennessy Dr.
LaVergne, TN 37086
email: HCASALES@NixonPower.com
(615) 664-1487
HPG Contract No. 66551

2.2 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.

2.3 COOLING

A. Engine shall be cooled by plant mounted radiator with engine driven fan, jacket water pump, and fan guard.

B. 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.

C. 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.

2.4 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. All devices requiring a.c. service (day tank pump, battery charger, water jacket heater, battery heaters, etc.) shall be connected to an a.c. service panel installed inside the enclosure. This panel shall be mounted in an accessible location and equipped with a main breaker and branch breakers as required.

D. A.C. wiring inside enclosure shall be neatly routed and enclosed in same type conduit used in building.

E. 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.

F. When a sub-base fuel tank is being utilized, provide service platform as required to allow for maintenance of the generator.

2.5 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.

2.6 SUBBASE FUEL TANK:

A. Provide a subbase fuel tank and associated fuel line connections sized to run for 24 hours.

B. Tank shall be UL listed 142 primary steel tank and shall have UL listed overfill containment system integral with the tank system. Overfill containment reservoir shall have a normally closed UL listed drain port into the primary tank. Minimum overfill storage shall be 7 US gallons.

2.7 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.

2.8 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.

2.9 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

3.1 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 263213

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide automatic transfer switch(es) as shown on the drawings.

1.2 RELATED SECTIONS

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide automatic transfer switch as manufactured by ASCO, Cummins or Zenith.

2.2 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.

N. Provide all wiring and raceways as required for elevator pre-signal and controls as required by elevator manufacturer.

PART 3 - EXECUTION

3.1 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 263600

SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 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.

1.2 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

2.1 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. 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

3.1 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.

END OF SECTION 264113

SECTION 264313 - (TVSS) TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 - GENERAL

1.1 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 individual circuit surge protection devices, as required by the Florida Building Code, for all circuits exiting or entering the building structure.

1.2 RELATED WORK

A. Section 262416 - Panelboards.

B. Section 260526 – Grounding and Bounding for Electrical Systems.

C. Section 264113 – Lightning Protection for Structures

1.3 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.

1.4 SUBMITTALS

A. Submit product data and shop drawings as required by Section 260500.

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

2.1 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.

2.2 WARRANTY

A. SPD devices shall be warranted for a minimum of 10 years.

2.3 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

3.1 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. The SPD shall not include multiple replacement modules.

D. 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.

E. 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.

F. 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 264313

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 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.

1.2 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

2.1 ACCEPTABLE MANUFACTURERS

A. Lighting fixtures shall be by Acuity, per HCA's purchasing agreement.

1. Contact:
Sam LaFalce
Acuity Brands
Sam.LaFalce@AcuityBrands.com
859-227-9534

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

2.2 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.

PART 3 - EXECUTION

3.1 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. Surface or recessed fixtures in or on plastered or drywall ceilings shall be supported in accordance with seismic fixture mounting details and shall not depend on ceilings for support.

M. Support fixtures in seismic zones per detail on drawings.

N. 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 265100

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide labor, materials, equipment and services necessary for installation of all exterior lighting fixtures, lamps, poles, pole bases etc. for:

1. Area lighting.
2. Decorative lighting.
3. Flood lighting.
4. Parking lot and access roads.
5. Exterior signage.
6. 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.

1.2 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

2.1 ACCEPTABLE MANUFACTURERS

A. Lighting fixtures shall be by Acuity, per HCA's purchasing agreement.

1. Contact:
   Sam LaFalce
   Acuity Brands
   Sam.LaFalce@AcutiyBrands.com
   859-227-9534

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.

2.2 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, square, designed for wind load in the area of installation.

PART 3 - EXECUTION

3.1 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 265600

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide 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.

1.2 SYSTEM DESCRIPTION

A. Each Telecommunications Room (TR) in a building shall have a Telecommunications Grounding Busbar (TGB) properly connected per ANSI/TIA/EIA-607.

B. Relevant bonding and grounding infrastructure acronyms.

1. EK (Equipment Bonding Conductor): An insulated copper conductor that bonds metallic items and equipment to the TMGB and TGB.

2. IC (Interconnecting Bonding Conductor) (referred to in TIA/EIA-607 as the Bonding Conductor for Telecommunications): The copper conductor that bonds the TMGB to the service equipment (power) ground.

3. TBB (Telecommunications Bonding Backbone): An insulated copper conductor extending from the TMGB to each TGB.

4. TGB (Telecommunications Grounding Busbar): A copper ground reference busbar, typically installed in telecommunication rooms (TR) that is bonded to the TMGB by the TBB. The TGB references metallic entities in the TR space to ground.

5. TMGB (Telecommunications Main Grounding Busbar): A copper ground reference busbar, typically installed in the entrance facility or entrance room that is bonded to the service equipment (power) ground by the IC.

1.3 SUBMITTALS

A. Submit product data for the following:

1. TGB busbar.

2. TMGB busbar

3. Equipment rack busbars.

4. Two-hole and one-hole (with backstop) lugs.

5. No. 3/0 AWG and No. 6 AWG conductors.

6. Grounding Pig-tails or leads

B. Submit details of grounding elements for equipment rack applications.

1.4 QUALITY ASSURANCE

A. Comply with section 271500.

B. All work will conform to Article 250-Grounding and Article 800-Communications of the National Electrical Code (NEC) for grounding, bonding, and protecting electrical and communications circuits.

C. Materials and work specified herein shall comply with the applicable requirements of ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

D. Materials and work specified herein shall comply with the applicable requirements of IEEE-426.

E. If there is a conflict between the grounding standards, follow IEEE-426 as the primary standard.

F. Delivery, Storage, and Handling

G. Comply with section 271500.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All material must be UL listed.

B. A single manufacturer will be used for all grounding material.

2.2 MATERIALS AND FABRICATION

A. Telecommunication Main Grounding Busbar (TMGB) shall be 1/4" x 4" x 20" insulated copper ground bar in size.

B. Telecommunication Grounding Busbar (TGB) shall be 1/4” x 4” x 10” insulated copper ground bar in size.

C. Equipment Rack Busbars shall be 1/4” x 1” x 19” rack ground bar in size.

D. Bonding Conductors

1. All bonding conductors shall be insulated copper. The exception is the use of flat, braided, aluminum ground straps utilized for bonding sections of aluminum cable trays.

2. Unless otherwise specified, size the conductors as required by NEC.

3. Unless otherwise specified, the IC (Interconnecting Bonding Conductor) (referred to in TIA/EIA-607 at the Bonding Conductor for Telecommunications) shall be insulated, copper, No. 3/0 AWG.

4. Unless otherwise specified, the TBB (Telecommunications Bonding Backbone) shall be green-colored (or identified as a grounding wire every 10 feet) insulated, copper, No. 3/0 AWG.

5. Unless otherwise specified, the EK (Equipment Bonding Conductor) shall be green-colored insulated, copper, No. 6 AWG.

E. Bonding conductor terminations acceptable materials

1. Two-hole compression lugs: (Used on conductors at the TMGB or TGB) Color coded to appropriate cable, high conductivity wrought copper, electro tin plated, or approved equal.

2. One-hole compression lugs: (Used on conductors at the hardware/equipment) Color coded to appropriate cable, high conductivity wrought copper, electro tin plated, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with section 271500.

3.2 INSTALLATION

A. Provide all local bonding as specified on the drawings and in the specifications.

B. Bonding conductors shall be continuous and routed in as direct a route as possible to the point of termination.

C. All insulated ground bars must be isolated from the structural support by a 2-inch minimum separation, using manufacturer's recommended insulating stand-offs and hardware.

D. Clean ground bars prior to terminating conductors.

E. Label all telecommunications bonding conductors as close as possible to their termination point.

F. Confirm that the electrical contractor bonded the TMGB to the service equipment (power) ground, typically located in the electrical entrance facility, utilizing the most direct route possible to minimize conductor length.

G. Bond the following when present.

1. Metallic equipment racks.

2. Cable shields.

3. All metal raceways and cable trays.

H. Adjustments: Comply with section 271500.

END OF SECTION - 270526

SECTION 270528 - FIRESTOPPING FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Firestopping of Through Penetrations in Fire Rated Assemblies.

B. Smoke Seals.

C. Construction enclosing compartmentalized areas.

1.2 RELATED SECTIONS

A. Division 26 – Section 260533 –Raceways and Conduit Systems.

B. Division 27 – Section 271500 – Structured Voice and Data Cabling Infrastructure.

1.3 REFERENCES

A. ASTM E 84, “Surface Burning Characteristics of Building Materials”.

B. ASTM E 119, “Fire Tests of Building Construction and Materials”.

C. ASTM E 814, “Fire Tests of Through Penetration Firestops”.

D. ANSI/UL263, “Fire Tests of Building Construction and Materials”.

E. ANSI/UL723, “Surface Burning Characteristics of Building Materials”.

F. ANSI/UL1479, “Fire Tests of Through Penetration Firestops”.

G. Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

H. National Fire Protection Association (NFPA) – NFPA 101: Life Safety Code.

I. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code.

1.4 PERFORMANCE REQUIREMENTS

A. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

B. Where non- mechanical products are utilized, provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

C. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

D. Openings for cable trays shall be sealed using re-enterable firestopping pillows.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards and listing numbers of systems in which each product is to be used.

C. Shop Drawings: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

D. Certificates: Product certificates signed by firestop system manufacturer certifying material compliance with applicable code and specified performance characteristics.

E. Installation Instructions: Submit manufacturer's printed installation instructions.

1.6 QUALITY ASSURANCE

A. Products/Systems: Provide firestopping systems that comply with the following requirements:

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.

2. Firestopping products bear the classification marking of qualified testing and inspection agency.

B. Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Manufacturer's original, unopened, undamaged containers, identification labels intact identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instruction for multicomponent products.

2. Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.8 PROJECT CONDITIONS

A. Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

C. Maintain minimum temperature before, during, and for a minimum 3 days after installation of materials.

D. Do not use materials that contain flammable solvents.

E. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

F. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

G. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. HILTI USA Inc., 5400 S. 122nd East Ave. Tulsa, OK 74146. Phone (866) 445-8827, Fax (800) 879-7000, Website: www.us.hilti.com.

2. Specified Technologies Inc., 200 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: specseal@stifirestop.com, Website: www.stifirestop.com.

B. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.2 MATERIALS

A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Re-penetrable, round cable management devices containing a smoke seal fabric membrane for use with cable bundles penetrating gypsum or masonry walls, the following products are acceptable: Hilti Speed Sleeve (CP 653) or STI EZ-Path for use with cable penetrations allowing 0% to 100% fill.

C. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL) or STI Firestop Pillows (SSB14, SSB24, SSB26, SSB36).

2. Hilti Firestop Board (CP 675T) or STI Composite Board (CS3636, CS3641, CS2852).

D. For blank openings made in fire-rated wall or floor assemblies, where future penetration of cables is expected, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL) or STI Firestop Pillows (SSB14, SSB24, SSB26, SSB36).

2. Hilti Speed Sleeve (CP 653) or STI EZ-Path (EZDP144RS2).

E. Intumescent sealants or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant or STI LCI Intumescent Sealant.

2. Hilti CP 606 Flexible Firestop Sealant or STI SIL Silicone Sealant.

3. Hilti CP 601s Elastomeric Firestop Sealant or STI ES Elastomeric Sealant.

F. Non curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti CP 618 Firestop Putty Stick or STI SSP Intumescent Putty.

2. Hilti CFS-PL Firestop Plug or STI Intumescent Firestop Plug (FP).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer's installation instructions and technical information.

B. Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to protect adjacent surfaces.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install through-penetration firestop systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of firestopping products.

3.3 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage qualified independent inspection agency to inspect through-penetration firestop systems.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair firestopping products so they comply with requirements.

3.4 ADJUSTING AND CLEANING

A. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

END OF SECTION 270528

SECTION 271500 - STRUCTURED VOICE AND DATA CABLING INFRASTRUCTURE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Equipment, materials, labor, and services to provide telephone and data distribution system including, but not limited to:

1. Cable raceway, boxes, and cable tray.
2. Telephone and data cabling terminations.
3. Optical fiber and terminations.
4. Telecommunications outlets.
5. Terminal blocks/cross-connect systems.
6. Equipment racks and cabinets.
7. System testing and administration.
8. Documentation and submissions.

B. Supply and install a complete Belden Structured Cable System for this construction project at HCA Florida West Hospital, consisting of the following components:

1. Belden Structured Cabling System Components:
   a. Plenum rated 8 micron singlemode fiber optic backbone cable.
   b. D-Riser multi-pair voice distribution backbone cable.
   c. CMR rated horizontal Unshielded Twisted Pair (UTP) Category 6 cable for voice and data applications.
   d. Fiber and Copper termination hardware.
   e. Modular Category 6 patch panels.
   f. Category 6 connectors, jacks and faceplates.
   g. Equipment racks, cable tray, ladderrack and wire supports.
2. Pre-qualified bidders for this system are listed in Paragraph 1.10.F.
3. Questions with regard to this section shall be directed to IT&S Manager of I.C. Thomasson. Refer to Paragraph 1.8.B.2 for contact information.

C. Work not included:

1. The following work will be done by others:
2. Offsite services.
3. Providing data concentrators, hubs, servers, computers, and other active devices.
4. Telephone switch (PBX) and handsets.
5. Painting will be done by the General Contractor.

D. The contractor is required to utilize the pricing sheets at the end of this specification identified as “Attachment A”.

1.2 RELATED WORK

A. Low Voltage Rough-In: Section 273700.

B. Closed Circuit TV (CCTV) 28 2300

1.3 REFERENCES

A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA70 (National Electrical Code®), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:

1. ANSI/NECA/BICSI568 - Standard for Installing Commercial Building Telecommunications Cabling.

2. ANSI/TIA/EIA Standards:

a. ANSI/TIA/EIA 568B.1 Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.

b. ANSI/TIA/EIA 568B.2 Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components.

c. ANSI/TIA/EIA 568C.3 Optical Fiber Cabling Components Standard.

d. ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces.

e. ANSI/TIA/EIA 606A The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

f. ANSI/TIA/EIA 607A Commercial Building Grounding and Bonding Requirements for Telecommunications.

B. Install cabling in accordance with the most recent edition of BICSI® publications:

1. BICSI Telecommunications Distribution Methods Manual.

2. BICSI Cabling Installation Manual.

3. BICSI LAN Design Manual

C. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the owner's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

1.4 PERMITS, FEES, AND CERTIFICATES OF APPROVAL

A. The General Contractor will make application and pay for building permit.

B. As prerequisite to final acceptance, supply to the owner certificates of inspection from an inspection agency acceptable to the owner and approved by local municipality and utility company serving the project.

1.5 SYSTEM DESCRIPTION

A. A telecommunications cabling system generally consists of one telecommunications outlet in each workstation, wall telephones in common and mechanical areas, Intermediate Distribution Frames (IDF) located on each floor, and the Main Distribution Frame (MDF). Rate demarcation point (RDP) is located in the MDF.

B. All Data cables will consist of Category 6 cable terminated with a RJ45 jack and terminate the cables on rack mounted modular patch panels located in the appropriate IDF. (T568B)

C. Vertical/horizontal copper backbone cabling consists of multiple pair unshielded twisted-pair installed from the main cross-connect (MC) located in the MDF to the horizontal cross-connect (HC) located in each IDF. This copper backbone will serve as the telephone riser backbone.

D. Vertical/horizontal backbone cabling consists of 48 strands of 8 micron single mode optical fiber cable installed from the MC to the HC and will serve as the data communications fiber backbone.

1.6 BID REQUIREMENTS

A. Certificate of insurance. Contractor cannot begin installation of the system or be paid for any material or labor until this document is provided to the General Contractor.

1.7 PRE-CONSTRUCTION SUBMITTALS

A. The following submittals must be provided thirty (30) days prior to start of construction.

1. Manufacturer product data sheets for each material and equipment specified. Mark each sheet to clearly identify the specific products ad component parts, and data applicable to installation.

2. Assurance/Quality Control Submittals:

a. Proposed test forms for fiber riser, copper riser and horizontal UTP cable.

b. List of test equipment to be used for copper and fiber testing, (i.e., Fluke, PentaScanner, etc.)

c. List of all tests to be performed as part of the certification process.

d. Documentation of manufacturer's current qualification of contractor as an approved Belden Certified System Vendor (CSV) of the IBDN Plus System, IBDN 1200 System, IBDN System 2400, IBDN System 4800LX and IBDN Optical Fiber System.

e. Provide references of a minimum of three completed Belden installations.

f. Provide number of Belden certified installers. Owner may request a list by name and proof of training.

g. Installation work shall not begin prior to approval of all pre-construction submittals required in this section.

1.8 CONSTRUCTION SUBMITTALS

A. Submit a Microsoft Project timeline to include, but not limited to, the following milestones:

1. Material order date.

2. Material receipt date.

3. Project start date (by phase, if required.)

a. Rough-in (backbone cabling, horizontal cabling, all associated hardware).

b. Terminations.

c. Testing.

B. Weekly status report, to be submitted each Friday, of work progress until project is complete. Status reports should be submitted as follows:

1. General Contractor, Representative

2. Michael Henry I.C. Thomasson Associates, Inc. 2950 Kraft Drive, Nashville, TN 37204 mhenry@icthomasson.com.

C. Invoices should be submitted to, and as directed by, the general contractor.

D. As built drawings showing horizontal outlet and backbone cable labeling. Outlets should be numbered with a scheme that is consistent with the numbering scheme currently in use at the hospital (if renovation or addition project). This numbering scheme must be approved by the HDIS. These drawings must be provided to the PBX equipment vendor for set installation and station cross connections. The general contractor shall meet with the equipment vendor to establish an equipment installation schedule.

1.9 FINAL SUBMITTALS

A. The following submittals must be submitted and approved prior to final billing and payment. They should be submitted within thirty days of completion of the project.

1. Certification of level of performance as evidenced by comprehensive test results for UTP horizontal cabling, copper voice backbone cabling and single-mode fiber optic cabling as specified in this document. Electronic test results should be submitted to the HDIS at HCA Florida West Hospital.

2. Record drawings with as-built information and finalized versions of the shop drawings. Numbered outlets in each room shall be shown on these drawings using a numbering scheme consistent with the current numbering scheme in use at the hospital. This numbering scheme shall be approved by the HDIS. These submittals shall be on the base plan as provided by the Architect or Owner. These submittals shall be four copies in reproducible print form and one in electronic format (AutoCAD or DXF file.) One copy of these drawings shall be provided to the PBX vendor, as required in Paragraph 1.5.D, and the remaining copies submitted to the HDIS.

3. Manufacturer's system certification supporting the product warranty. It is the contractor's responsibility to arrange a job inspection by a Belden representative who is authorized to approve the cabling system 25-year warranty. Contractor shall contact Mr. Alan Halloy at (770) 542-8811, HCA's Belden Representative, to schedule a site visit.

1.10 VENDOR QUALIFICATIONS

A. Vendor shall be Belden certified as a Certified System Vendor (CSV.)

B. Manufacturer must provide a 25-year system warranty for cable system installed.

C. No sub-contractors are permitted unless specified in this document.

D. The contractor will be responsible for any damage caused, either to the physical structure or communications cables or systems. Any damage will be repaired as a part of the basic service to be provided under this specification, at no additional cost to the owner.

E. Since much of the work to be performed under this specification will be in the existing hospital, the contractor shall be familiar with construction standards for performing work under these conditions. The contractor shall adhere to the owners Infection Control Risk Assessment procedures.

F. Following are pre-qualified bidders for this project and are encouraged to make a site visit, if applicable, before submitting bids:

1. D & L Cabling
   81 Springdale Rd.
   Lake Worth, FL 33467
   561-642-5277
   Chad Brunson
   chad@dl-cabling.com

2. Ion Electric LLC
   2001 N. Andrews Ave.
   Pompano Beach, FL 33069
   586-405-5871
   Jim Beaudet
   jbeaudet@ionelectricLLC.com
3. GERELCOM
   560 NW Enterprise
   Port Saint Lucie, FL 34986
   772-340-5998
   Bryan Lanham
   blanham@gerelco.com
4. BLUEWAVE COMMUNICATIONS
   10330 USA Today Way,
   Miramar FL 33025
   305-710-1591
   Tim Orr
   torr@bluewavemiami.com
5. JADE COMMUNICATIONS
   6610 E. Rogers Circle
   Boca Raton FL 33487
   (561) 239-8206
   Serge LeBlanc
   sergel@jade-com.com

1.11 QUALITY ASSURANCE

A. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size. Installers must be certified and approved by the manufacturer with a minimum of three years' experience installing that manufacturer.

B. Upon request by the engineer/designer, furnish a list of references with specific information regarding type of project and involvement in providing of equipment and systems.

C. Equipment and materials of the type for which there are independent standard testing requirements, listings, and labels, shall be listed and labeled by the independent testing laboratory.

D. Where equipment and materials have industry certification, labels, or standards (i.e., NEMA National Electrical Manufacturers Association), this equipment shall be labeled as certified or complying with standards.

E. Material and equipment shall be new, and conform to grade, quality, and standards specified. Equipment and materials of the same type shall be a product of the same manufacturer throughout.

F. Subcontractors shall assume all rights and obligations toward the contractor that the contractor assumes toward the owner and engineer/designer.

1.12 WARRANTY

A. The installed system shall be a certified Belden System the Contractor to, unconditionally guarantee in writing the materials, equipment, and workmanship for a period of not less than twenty five (25) years from date of acceptance by the owner. The owner shall deem acceptance as beneficial use.

B. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve you of these obligations.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling, and misalignment. Coordinate with the owner for secure storage of equipment and materials. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.

1.14 SEQUENCE AND SCHEDULING

A. Submit schedule for installation of equipment and cabling. Indicate delivery, installation, and testing for conformance to specific job completion dates. As a minimum, dates are to be provided for bid award, installation start date, completion of station cabling, completion of riser cabling, completion of testing and labeling, cut-over, completion of the final punch list and owner acceptance.

PART 2 - PRODUCTS

2.1 MATERIAL PRICING

A. HCA has developed a strategic relationship with Accu-Tech Corporation for project material pricing. Accu-Tech is the owner of a single source pricing advantage for all HCA Hospital projects. HPG Contract # 6715. Contractors are encouraged to contact Tim Flannagan with Accu-Tech Corporation at (615) 585-3972 or tim.flannagan@accu-tech.com for pricing.

2.2 MANUFACTURERS

A. Acceptable Manufacturer: Belden

B. Where no manufacturer is specified, provide products of manufacturers in compliance with requirements.

2.3 FABRICATION

A. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of equipment and its installation.

2.4 SUITABILITY

A. Provide products that are suitable for intended use, including, but not limited to environmental, regulatory, and electrical. All cabling, copper riser, and fiber shall be provided with suitable insulation for installing in an air plenum.

2.5 DATA STATION CABLE (Copper)

A. Solid copper, 24 AWG, 100 OHM balanced twisted-pair (UTP) Category 6 cables with four individually twisted-pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA568B.2 up to 250 MHz. Cable shall be black in color. Belden Part Number 2412010U1000.

1. *Note: Listed Type CMR, CMP, MPR and/or MPP (as required in the NEC 2002).

2.6 UNDERGROUND TELECOMMUNICATIONS CABLE

A. Optical Fiber: Single-mode 8.7 µm to 10 µm diameter, armored, gel-filled optical fiber, 48 strands, which meet or exceed the mechanical and transmission performance specifications listed in ANSI/TIA/EIA568B.3 and ANSI/TIA/EIA 758 A. Belden Part Number FDSD048F9.

B. Multi Pair Copper: 100 pair, 24 AWG, solid conductor cable which meet or exceed ANSI/ICEA S-84-608-2002: RUS 7 CFR (PE-39) standards. Superior/Essex Part Number 04-104-21 or equivalent.

2.7 VOICE/DATA – WORK AREA OUTLETS

A. Single-gang mounting plate with four (4) openings Belden Part Number AX102249 containing the following devices:

1. Voice Outlet 8pin modular, Category 6, unkeyed, white, pinned to T568 B standards. Belden Part Number RV6MJKUEW-S1.

2. Data Outlet 8pin modular, Category 6, unkeyed, black, pinned to T568 B standards. Belden Part Number RV6MJKUBK-S1.

B. Surface Mount Outlet: Almond Belden Part Number A0645272.

2.8 DATA ONLY WORK AREA OUTLET

A. Single-gang faceplate with 8-pin modular, Category 6, unkeyed, black data jack, pinned to T568 B configuration. Belden Part Number RV6MJKUBK-S1.

2.9 TERMINATION BLOCKS

A. Distribution Cable: Riser cable shall be terminated on 19 inch rack mountable 48 port patch panels with rear insulation displacement (IBC) meeting Category 6 performance standards and pinned to T568B standards. Belden Part Number RV6PPF2U48BK. Terminate one pair of the riser cable per port and spare back the violet sate of each 25 pair bundle.

2.10 PATCH PANELS

A. 19 in. rack mountable, 24:48port 8pin modular to insulation displacement connector (IDC) meeting Category 6 performance standards, and pinned to T568 B standards. Belden Part Number RV6PPF1U24BK (24 Port) RV6PPF2U48BK (48 Port)

2.11 RACK MOUNTED OPTICAL FIBER TERMINATION PANEL

A. Interconnect Units for IDF locations shall be Belden 1U FiberExpress Rack Mount Patch Panel, Part Number AX105563, equipped with double density, six (6) LC compatible optical fiber adapter strips, Part Number FFSU12LD. Interconnect Units for the MDF location shall be Belden 4U FiberExpress Rack Mount Patch Panel, Part Number AX100116, equipped with double density, twelve (12) LC compatible optical fiber adapter strips, Part Number AX101743.

2.12 OPTICAL FIBER CONNECTORS

A. Field Terminated Pigtails or Fusion LC connectors, which meet or exceed the performance specifications in ANSI/TIA/EIA568B.3. Belden Part Number FTSLC900PR12 or FTSLC900FS01.

2.13 LADDER RACK

A. B-Line Cable Runway, Part Number SB-17-18-TG and SB-17-24-TG, with the associated mounting hardware, shall be installed in the communications rooms as shown on the room layout drawings. All cable runways shall be securely fastened above the freestanding racks.

2.14 CABLE SUPPORTS

A. Cable support devices used above ceilings throughout main corridors shall be provided by a J-Hook Tree. Installation shall include all associated hardware for mounting in conjunction with Snake Tray provide one (1) 2” J-Hook every 4 feet. Refer to detail on sheet T301. Main corridor pathways are shown on the T-series drawings. Cable support devices above the drop ceiling off of the main corridors and in the communication rooms shall be provided by the cabling contractor.

2.15 PATCH CABLES

A. Patch cables are NOT required for this project.

2.16 WIRE MANAGEMENT

A. Vertical wire management shall be Part Number BHVHH06 between racks and Part Number BHVHH03 on the racks. Horizontal management shall be Part Number BHH192U

2.17 LISTED BUILDING ENTRANCE PROTECTORS

A. Building entrance terminal utilizing a two (2) foot fuse link between the outside cable plant splice and the protector module with IDC type input and output terminals, 100pair capacity and female mounting base, equipped with 230 volt solid state protector modules. Provide sufficient protector modules to completely populate all building entrance terminals.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION SITE SURVEY

A. Prior to start of systems installation, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial scheduled completions of the equipment room and telecommunications closets.

B. Examine areas and conditions under which the system is to be installed. Do not proceed with the work until satisfactory conditions have been achieved.

3.2 HANDLING AND PROTECTION OF EQUIPMENT AND MATERIALS

A. Be responsible for safekeeping of your own and your subcontractors' property, such as equipment and materials, on the job site. The owner assumes no responsibility for protection of above named property against fire, theft, and environmental conditions.

3.3 PROTECTION OF OWNER'S FACILITIES

A. Effectively protect the owner's facilities, equipment, and materials from dust, dirt, and damage during construction.

B. Remove protection at completion of the work.

3.4 INSTALLATION

A. Receive, check, unload, handle, store, and adequately protect equipment and materials to be installed as part of the contract. Store in areas as directed by the owner's representative. Include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting

wiring of system components, equipment alignment and adjustment, and other related work whether or not expressly defined herein.

B. Install materials and equipment in accordance with applicable standards, codes, requirements, and recommendations of national, state, and local authorities having jurisdiction, and National Electrical Code® (NEC) and with manufacturer's printed instructions.

C. Adhere to manufacturer's published specifications for pulling tension, minimum bend radii, and sidewall pressure when installing cables.

1. Where manufacturer does not provide bending radii information, minimum-bending radius shall be 15 times cable diameter. Arrange and mount equipment and materials in a manner acceptable to the engineer and the owner.

D. Penetrations through floor and fire-rated walls shall utilize intermediate metallic conduit (IMC) or galvanized rigid conduit (GRC) sleeves and shall be firestopped after installation and testing, utilizing a firestopping assembly approved for that application.

E. Install station cabling to the nearest Intermediate Distribution Frame (IDF), unless otherwise noted.

F. Installation shall conform to the following basic guidelines:

1. Use of approved wire, cable, and wiring devices.

2. Neat and uncluttered wire termination.

G. Attach cables to permanent structure with suitable attachments at intervals of 48 to 60 inches. Support cables installed above removable ceilings.

H. Install adequate support structures for 10 foot of service slack at each IDF.

1. Support riser cables every three (3) floors and at top of run with cable grips. Limit number of four-pair data riser cables per grip to fifty (50).

I. Install cables in one continuous piece. Splices shall not be allowed except as indicated on the drawings or noted below:

J. Provide over-voltage protection on both ends of cabling exposed to lightning or accidental contact with power conductors.

K. Notify the owner/engineer immediately of any horizontal cable run exceeding TIA/EIA specifications.

L. System inspection shall be provided through pre-construction, in-progress and final inspections by Owner/Engineer. The Owner/Engineer or the Contractor may, at his/her discretion, perform tests in addition to those specified in this document if there is any reason to question the condition of the material as furnished or installed.

3.5 GROUNDING

A. Grounding shall conform to ANSI/TIA/EIA 607(A) Commercial Building Grounding and Bonding Requirements for Telecommunications, National Electrical Code®, ANSI/NECA/BICSI568 and manufacturer's grounding requirements as minimum.

B. Bond and ground equipment racks, housings, messenger cables, and raceways.

C. Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 AWG green insulated copper grounding conductor.

3.6 LABELING

A. Labeling shall conform to ANSI/TIA/EIA606(A) standards. In addition, provide the following:

1. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.

2. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:

a. Inside receptacle box at the work area.

b. Behind the communication closet patch panel or punch block.

3. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.

4. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA606(A) standard color codes for termination blocks.

5. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.

6. Label cables, outlets, patch panels, and punch blocks with room number in which outlet is located, followed by a single letter suffix to indicate particular outlet within room, i.e., S2107A, S2107B. Indicate riser cables by an R then pair or cable number. Contractor is to submit labeling scheme for approval.

7. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner four (4) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion.

8. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner in electronic media form (compact disk) and utilizing AutoCAD software that is acceptable to the owner. The CD shall be delivered to the owner within six (6) weeks of acceptance of project by owner.

3.7 TESTING

A. Testing shall conform to ANSI/TIA/EIA568B.1 standard. Testing shall be accomplished using level IIe or higher field testers.

B. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct grounded and reversed pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.

1. Perform testing of copper cables with tester meeting ANSI/TIA/EIA568B.1 requirements.

2. If horizontal cable contains bad conductors or shield, remove and replace cable.

C. Initially test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA52614A: OFSTP14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant and ANSI/TIA/EIA5267 Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant. Measured results shall be plus/minus 1 dB of submitted loss budget calculations. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.

1. Cables shall be tested at 850 and 1300 nm for multimode optical fiber cables. Cables shall be tested at 1310 and 1550 nm for singlemode optical fibers.

2. Testing procedures shall utilize the one jumper reference.

3. Bi-directional testing of optical fibers is required.

D. Perform optical time domain reflectometer (OTDR) testing on each fiber optic conductor. Measured results shall be plus/minus 1 dB of submitted loss budget calculations.

1. Submit printout for each cable tested.

2. Submit compact disk with test results and program to view results.

E. Where any portion of system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner.

3.8 FIELD QUALITY CONTROL

A. Employ job superintendent or project manager during the course of the installation to provide coordination of work of this specification and of other trades, and provide technical information when requested by other trades. This person shall maintain current RCDD® (Registered Communications Distribution Designer) registration and shall be responsible for quality control during installation, equipment setup, and testing.

B. All installation personnel shall meet manufacturer's training and education requirements for implementation of extended warranty program.

3.9 REMOVAL OF UNUSED VOICE AND DATA HORIZONTAL CABLE

A. The cabling contractor shall remove an unused voice and data cable located in the construction area. The contractor shall work with the HDIS to identify unused cable. No cable is to be removed unless approved by the HDIS.

END OF SECTION 271500

ATTACHMENT A
STRUCTURED CABLING BID SUMMARY

Vendor _____
Contact _____
Telephone _____ Fax # _____ Email _____
Cabling System Proposed _____

HORIZONTAL CABLING			
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
Cable – CAT 6 PVC			
RJ-45 CAT 6 Jack – Black			
RJ-45 CAT 6 Jack – White			
RJ-45 CAT 6A Jack - Yellow			
Surface Mount Outlet – AO645272			
Face Plate – White – AX101784			
Stainless Wall Plate– AX104126			
Patch Panels – CAT 6 48 port			
Patch Panels – CAT 6 24 port			
Patch Panels – CAT 6A 48 port			
Patch Panels – CAT 6A 24 port			
Voice Block Wire Management AX100706			
Equipment Rack – 84” – BHRR194			
4 – Post Equipment Rack – XDR-8419-31228			
Horizontal Wire Management – BHH192U			
Vertical Wire Management 3” – BHVHH03			
Vertical Wire Management 6” – BHVHH06			
Cable Runway (Ladder Rack) 18”			
Misc Materials			
HILTI 2” Speed Sleeve 236323			
HILTI 4” Speed Sleeve 236324			
EZ PATH #EZD22			
EZ PATH #EZDP33FWS			
EZ PATH #EZDP433GK			
J-HOOK – 2”			
Material Total			$
Labor Total			$
Tax			$
HORIZONTAL CABLE TOTAL			$

STRUCTURED CABLING BID SUMMARY			
COPPER BACKBONE CABLE	TOTAL PROJECT		
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
100 Pair D-Riser Cable			
Patch Panels – CAT 6 48 port			
Minor materials			
Material Total			$
Labor Total			$
Tax			
COPPER BACKBONE CABLE TOTAL			$

OPTICAL FIBER BACKBONE	TOTAL PROJECT		
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
48 Strand 8/125 Fiber Cable			
Inter Connect Unit - 1U			
Adapter Strip			
Inter Connect Unit - 4U			
Connector Module			
Optical Fiber LC Connector			
Minor materials			
Material Total			$
Labor Total			$
Tax			
OPTICAL FIBER BACKBONE TOTAL			$
TOTAL CABLE SYSTEM PRICE			

Horizontal Cabling			$
Copper Backbone Cable			$
Optical Fiber Backbone			$
TOTAL			$

CLOSED CIRCUIT TV (CCTV)	SECTION 282300		
COMPONENT	QUANTITY	UNIT PRICE	TOTAL PRICE
Cable – Cat 6 PVC/Plenum Black			
Minor materials			
Material Total			$
Labor Total			$
Tax			
CLOSED CIRCUIT TV (CCTV) TOTAL			$

DIVISION 27 & 28 BID SUMMARY	SECTION NUMBER	SECTION TOTALS
STRUCTURED CABLING	27 1500	$
COPPER RISER CABLE	27 1500	$
OPTICAL FIBER BACKBONE	27 1500	$
CLOSED CIRCUIT TV (CCTV)	28 2300	$
DIVISION TOTAL		$

UNIT PRICES		
COMPONENT	ON SITE DURING CONSTRUCTION	RETURN TRIP REQUIRED AFTER CONSTRUCTION
Wall Telephone Outlet	$	$
One Jack Outlet	$	$
Two Jack Outlet	$	$
Three Jack Outlet	$	$
Four Jack Outlet	$	$
HOURLY LABOR RATES		
COMPONENT	ON SITE DURING CONSTRUCTION	RETURN TRIP REQUIRED AFTER CONSTRUCTION
Regular Time/HR	$	$
Overtime/HR	$	$
Holiday Time/HR	$	$

SECTION 273700 - LOW VOLTAGE ROUGH-IN SPECIFICATIONS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Division 26 or 27.

B. All conduit rough-in and outlet boxes for all low voltage systems/communications shall be provided and installed by Electrical Contractor.

C. All device locations will be as shown on communications systems drawings. Refer to system details for height requirements.

1.2 RELATED WORK

A. Raceways and Conduit Systems: Section 260533.

B. Hangers and Supports for Electrical Systems: Section 260529.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. All low voltage conduits shall be 1” EMT stubbed to nearest accessible ceiling unless otherwise noted in these specifications or drawings. Conduit shall be terminated with nylon bushing.

B. Contractor to provide standard outlet boxes to conform to "OUTLET BOX" section of these specifications and sized as shown on drawings.

C. The Electrical Contractor is responsible for all hangers, straps, and support structure necessary to properly hang/support conduit.

D. 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.

E. For “HCA Vision” Television locations, the Electrical Contractor shall provide a special recessed backbox that will house power, data, and coax. Hubbell Part Number NSAV124M. Contractor shall provide an outlet box and stub up for each knockout. Refer to Telecommunications Drawings for “HCA Vision” Television locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The General contractor will schedule the installation of the conduit systems.

B. The Electrical Contractor will receive, store and protect all rough-in equipment.

C. The Electrical Contractor shall use building lines or 90° angles when installing conduit.

D. The Electrical Contractor shall work with others trades to coordinate location and installation of bracing for TV brackets.

E. For structured voice and data cabling infrastructure, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, terminations and miscellaneous hardware required for a complete system is to be provided and installed.

F. For television cable system, background music/paging system, intercom system and nurse call/code blue system, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, and miscellaneous hardware required for a complete system is to be provided and installed by the respective Owner/Vendor.

G. Where open cable is run above dropped ceilings and penetrates a smoke or fire rated wall, this contractor shall furnish and install a minimum 1" (unless otherwise noted) empty sleeve, 5' long, extending at least 2' on both sides of the partitions with bushings on both ends. In areas in which penetrations larger than 1" are required, the communications contactor shall install Hilti Speed Sleeve product.

H. All cable concealed in walls or inaccessible (drywall) ceilings shall be installed in conduit.

END OF SECTION 273700

SECTION 281300 ACCESS CONTROL

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 are collectively applicable to this Section.

1.2 INTRODUCTION

A. The Contractor shall provide, install, and program a functionally complete integrated access control, and electronic locking as described in the following specifications. As directed by Owner, the system may be configured as a standalone system or may be configured as part of an Enterprise access control system either new or existing, utilizing interface units, and access control panels, and connected via WAN/ LAN to the hosting facility access control system/ access control software.

1.3 SUMMARY

A. Section Includes:

1. Connection to door access control locking devices Specified in Door Hardware section 087100, including electric locksets, electric strikes, magnetic locks, electrified exit devices, door position switches, request to exit buttons, motion sensors, key switches, push buttons, automatic operators, and wall mounted card readers.

2. Access Control panels and controllers connected to high-speed electronic-data transmission network as necessary to connect access controlled doors to parent facility if existing Access Control System via LAN/ WAN. If no parent system exists, provide one of the access control systems as described in Section 2.4.

3. Access Credentials will be Schlage aptiQ furnished by the owner.

4. Power Supplies, battery backup, Cabling, panel interface/ reader modules, or other peripherals required for an operationally complete system.

1.4 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 an 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 087100: 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 087100.

1.5 DEFINITIONS

A. CCTV: Closed-circuit television.

B. CPU: Central processing unit.

C. Credential: Data assigned to an entity and used to identify that entity.

D. dpi: Dots per inch. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

E. GFI: Ground fault interrupter.

F. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

G. I/O: Input/Output.

H. LAN: Local area network.

I. Location: A Location on the network having a PC-to-controller communications link, with additional controllers at the Location connected to the PC-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

J. NAS: Network-Attached Storage- File-level computer data storage connected to a computer network.

K. PC: Personal computer. Applies to the central station, workstations, and file servers.

L. PIM- Panel Interface Module- A receiver module for wireless card reader systems that translates wireless data to Wiegand or other protocol for use by access control system.

M. PCI Bus: Peripheral Component Interconnect. A peripheral bus providing a high-speed data path between the CPU and the peripheral devices such as a monitor, disk drive, or network.

N. PDF: Portable Document Format. The file format used by the Acrobat document-exchange- system software from Adobe.

O. RAS: Remote access services.

P. RF: Radio frequency.

Q. ROM: Read-only memory. ROM data are maintained through losses of power.

R. SAN: Storage Area Network- dedicated network that provides access to Block Level data storage.

S. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

T. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

U. UPS: Uninterruptible power supply.

V. USB: Universal serial bus.

W. WAN: Wide area network.

X. WAV: The digital audio format used in Microsoft Windows.

Y. WMP: Windows media player.

Z. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

AA. Windows: Operating system by Microsoft Corporation.

BB. Workstation: A PC with software that is configured for specific, limited security-system functions.

CC. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Common Requirements for Shop Drawings: Where this Section and other Sections of this Division require Shop Drawings to be submitted, meet the requirements defined in Division 01 Section "Submittal Procedures". In addition to the requirements of Division 01 comply with the following:

1. Prepare Shop Drawings using computerized drafting software compatible with AutoDesk's AutoCAD® and or Revit

2. Submit hardcopy of Shop Drawings in the quantity as required under Division 01 Section "Submittal Procedures". Hardcopies of Shop Drawings shall have each sheet clearly labeled with a unique sheet identification number.

3. In addition to hardcopies required by Division 01, submit one copy of Shop Drawings in electronic format on CD or DVD. Files contained on disc shall be named to correspond with the sheet names contained in the hardcopy set. Files on disc shall be include both AutoCAD® compatible source files and files printed to Portable Document Format (.pdf).

4. Shop Drawings shall be of appropriate scale but shall not be smaller than a scale of 1/4- inch equals one foot.

5. Diagrams for cable management system.

6. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.

7. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

a. Access Panel Communications wiring.

b. Wiring at Access Controlled Doors to devices.

c. Wiring & connections to integrated systems.

d. Network connections.

8. Cable Administration Drawings: As specified in "Identification" Article.

9. Battery and charger calculations for power supplies, central station, workstations, and controllers.

1.7 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals.

B. Manufacturer provided software.

C. Database copy containing all setup parameters.

1.9 QUALITY ASSURANCE

A. Common Requirements for Material Quality: Materials, equipment and devices shall be new and of the quality specified, and shall be free from defects at the time of installation. Materials, equipment and devices damaged in shipment or otherwise damaged or found defective prior to acceptance by the Owner shall be replaced with new materials, equipment or devices identical with those damaged, unless approved otherwise by the Owner in writing.

B. Common Requirements for Code Compliance: In case where differences occur between building codes, state laws, local ordinances, industry standards, 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.

C. Common Requirements for Compliance with AHJ Instructions: In cases where the Authority Having Jurisdiction requires deviations from the requirements of the Contract Documents, perform the following:

1. Promptly notify the Architect in writing of any such difference.

2. Obtain approval from Architect before proceeding with the Work.

D. 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 this project.

2. Cable installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International.

E. 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.

F. Comply with NFPA 70, "National Electrical Code."

G. Comply with NFPA 101 “Life Safety Code”

H. Comply with TIA-569-B “Commercial Building Standard for Telecommunications Pathways and Spaces”.

1.10 COORDINATION

A. In describing various materials, equipment and devices, in general each item may be described singularly, even though there may be a multiplicity of identical items. Also, where the description is general in nature, the exact sizes, duties, space arrangements, and other requirements must be obtained by reference to other portions of Contract Documents.

B. Space allocations for materials, equipment and devices have been made on the basis of present and known future requirements and the dimensions of items of equipment or devices of a particular manufacturer. Verify that all materials, equipment and devices proposed for use on this Project are within the constraints of the allocated space.

C. Coordinate arrangement, mounting, and support of electronic safety and security equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.

4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

D. Coordinate with Division 08/ Door & Frame provider for correct door preparation and hardware integration.

E. Coordinate with Electrical Contractor for provision of any power, back boxes, conduit stub ups, and other items normally provided by Division 26, Electrical, as required for system.

F. Coordinate with network/ IT provider for LAN/ WAN connections, IP addressing scheme, and other network related items as necessary for system communications.

G. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

H. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

I. Coordinate sleeve selection and application with selection and application of fire-stopping specified in Division 07 Section "Penetration Fire-stopping".

1.11 DELIVERY, STORAGE, AND HANDLING

A. Central Station, Workstations, and Controllers:

1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F (10 and 30 deg C), and not more than 80 percent relative humidity, noncondensing.

2. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.

3. Mark packing list with the same designations assigned to materials and equipment for recording in the system labeling schedules that are generated by software specified in "Cable and Asset Management Software" Article.

4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. Comply with provisions of Division 01 Section “Product Substitution Procedures”.

1. If item of equipment or device offered as Substitution differs in dimension or configuration from that indicated in the Contract Documents, provide, as part of the substitution submittal, a drawing that shows that the equipment or devices proposed for Substitution can be installed in the space available without interfering with other trades or with access requirements for operations and maintenance in the completed project. Drawings shall be of appropriate scale but shall not be smaller than a scale of 1/4-inch equals one foot.

2. Where substitute equipment or devices requires different arrangement or connections from that indicated in the Contract Documents, install the equipment or devices to operate properly and in accordance with the requirements of the Contract Documents. Make incidental changes necessary in piping, ductwork or wiring which results from the inclusion of the substitute equipment or device without any additional cost to the Owner. Pay all additional costs incurred by other trades in connection with changes required by the inclusion of the substituted equipment or device in the Work.

2.2 SYSTEM CHARACTERISTICS

A. The ACS shall consist of integrated hardware and software modules for the following:

1. Access Control

2. Alarm Monitoring.

3. Duress (panic) buttons.

4. Event logging and viewing.

2.3 DEVICES AND QUANTITIES

A. Some devices required for a complete operational Access Control System may, or may not be, listed below. Access Control Devices may be provided by another division (ie. Locking Devices and Card Readers Schlage MT-15 or MTK-15 provided by Division 08 7100). Verification of products and quantities provided by Division 28 shall be the responsibility of the Contractor prior to bid submittals and/ or system installation.

2.4 INTEGRATION TO OWNER SUPPLIED EQUIPMENT

A. Infant Protection System: The ACS shall interface with the Infant Protection System (IPS).

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. 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.

2.5 ACCESS CONTROL PANELS(SYSTEM SOFTWARE)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lenel

2. NO SUBSTITUTIONS: Unless matching existing software – Verify with architect prior to bidding..

B. Description: Access Control System shall match local/ parent facilities (if available), and have the capability of LAN/WAN connectivity to the existing system. Access Control Panels shall be sized appropriately for the installation.

C. ELEVATOR CONTROL

1. For elevator cabs having card readers, presentation of a valid credential shall be required to call restricted floors. These card readers shall be HID multiclass card readers with integrated PIN pads, so that doctors may navigate floors without their badges in an emergency.

2. For elevator lobbies having card readers, presentation of a valid credential shall be required to call the elevators. These card readers shall be HID multiclass card readers with integrated PIN pads, so that doctors may navigate floors without their badges in an emergency.

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.

2.6 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.

2.7 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. 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.

3. 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. The contractor shall provide 500 proximity access cards. Cards shall be of the type already in use by the facility. Verify the type and quantity with the Owner prior to construction via the submittal process.

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.

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. PANIC BUTTONS (WIRELESS)

1. Manufacturer: Centurion

2. Base System: Centurion Part # E1000

3. Wireless Sensor Receiver Module: Centurion Part # E3002

4. Radio Integration Module and Kit: Centurion Part # E3003

5. Panic Buttons: Centurion Part # E4005

6. Signal Booster: Centurion Part # E4015

7. Contractor shall reach out to Response Technologies. Contact: Erin Delfendahl edelfendahl@response-technologies.com . Contractor to communicate this is for an HCA project so to receive HPG pricing.

F. Video Intercom System

1. Manufacturer: Aiphone

   a. Desk Station: JP-4HD
   b. Wall Station: JP-DV
   c. Wall Station: JP-DVF

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

1. Record setup data for control station and workstations.

2. For each Location, record setup of controller features and access requirements.

3. Propose start and stop times for time zones and holidays, and match up access levels for doors.

4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.

5. Assign action message names and compose messages.

6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.

7. Develop user-defined fields.

8. Develop screen layout formats.

9. Complete system diagnostics and operation verification.

10. Prepare a specific plan for system testing, startup, and demonstration.

11. Develop acceptance test concept and, on approval, develop specifics of the test.

12. Develop cable and asset-management system details; input data from construction documents. Include system schematics and Visio Technical Drawings in electronic format.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

E. Install LAN cables using techniques, practices, and methods that are consistent with Category 5E rating of components and fiber-optic rating of components, and that ensure Category 6 and fiber-optic performance of completed and linked signal paths, end to end.

F. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

G. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.4 CABLE APPLICATION

A. Comply with TIA 569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. (15 m).

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. (1220 m).

E. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 ft. (8 m).

3.5 GROUNDING

A. Comply with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.

2. Bus: Mount on wall of main equipment room with standoff insulators.

3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.6 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 260553 "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 designations for facility's 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 particular device as shown.

2. Each wire connected to building-mounted devices 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.

3.7 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.8 FIELD QUALITY CONTROL

A. Perform Tests and Inspections:

1. Manufacturer's Field Service engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

2. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568-C.1.

3. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.

4. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

B. Devices and circuits will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

END OF SECTION 281300

SECTION 282300 - CLOSED CIRCUIT TV (CCTV)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes providing or installing, as indicated, the following items as part of the CCTV Systems.

1. CCTV system cable.

2. Refer to T2 series drawings for device locations.

B. Products not supplied under this Section: The CCTV System will be selected and provided by the Owner.

C. Related Sections:

1. Division 26

2. Sections 271500

1.2 SUBMITTALS

A. Submittals shall be as specified in Division 27 1500.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The CCTV System vendor, under contract with the Owner, will furnish system equipment, power unit cabinets, for a completed installation.

2.2 MATERIALS

A. Provide system cabling for devices as shown on T2 series drawings.

1. Data Cable shall be black CAT 6, Belden Part Number 2412010A1000/2413010A1000.

2. Data jack shall be black CAT 6. Belden Part Number RY6MJKUBK-S1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All system cable to be installed as shown on T2 series drawings for cable/device locations.

B. The CCTV System is to be provided, installed and checked by the Owner's selected vendor.

C. Owner's selected vendor will connect all equipment and leave the systems in a satisfactory operating condition.

END OF SECTION 282300

SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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

2.1 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.

2.2 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.

2.3 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.

2.4 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 be double 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.

2.5 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.

2.6 ALARM NOTIFICATION APPLIANCES

A. Provide 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.

2.7 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.

PART 3 - EXECUTION

3.1 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. Identify system components, wiring, cabling and terminals.

G. Install ground wire from FACU to main service ground.

H. Installation shall meet pathway survivability requirements of NFPA 72

3.2 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.

3.3 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.

3.4 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 283100

SECTION 312310 - EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section includes the excavation, backfilling and compacting required for the structures shown in the Contract Drawings.

B. Section includes vibratory densification of existing soils.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

1.3 REFERENCES

A. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.

B. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

D. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

E. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 DEFINITIONS

A. Granular sub-base: Granular fill directly beneath slabs-on-grade.

B. Granular Backfill: Fill immediately behind foundation elements or retaining walls.

C. Structural fill: Fill under the structure other than the granular sub-base.

1.5 SUBMITTALS

A. Upon request, submit soil test reports performed by the Structural Testing/Inspection Agency.

1.6 QUALITY ASSURANCE

A. Structural Testing/Inspection Agency shall perform the following quality related items:

1. Verify structural fill complies with specifications.

2. Determine particle size, liquid limit, plastic limit, plasticity index and maximum density of each type of soil.

3. Observe proofrolling.

4. Perform a sufficient number of field density tests to verify compaction of structural fill. As a minimum, perform one test per lift for every 2500 square feet of fill placed.

5. Verify foundation bearing capacity.

6. Verify quantities of material removed and quantities of material placed where Unit Prices are involved.

1.7 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.

1.8 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 therefrom 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.

1.9 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.

1.10 NOTICE

A. Notify the Architect/Structural Engineer 48 hours prior to the beginning of any excavation work.

PART 2 - PRODUCTS

2.1 GRANULAR SUB-BASE

A. Granular sub-base shall be 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.

2.2 GRANULAR BACKFILL

A. Backfill shall meet the requirements of the granular sub-base.

2.3 STRUCTURAL FILL

A. Structural fill shall meet the requirements of backfill specified above.

B. Structural fill shall be free of organics, debris and deleterious materials.

PART 3 - EXECUTION

3.1 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.

3.2 EXCAVATION

A. Excavation shall be considered unclassified.

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.

3.3 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.

3.4 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 8-inch thick loose layers.

C. Compact structural fill to 95 percent of the maximum dry density as measured by Modified Proctor, ASTM D1557. The water content during fill compaction should be kept within +3/-3 percent of the optimum moisture content.

3.5 PLACEMENT OF GRANULAR SUB-BASE

A. Do not place granular sub-base on subgrade that contains frost, mud or is frozen.

B. Compact granular sub-base to 95 percent of the maximum dry density as measured by Standard Proctor, ASTM D698. The water content during subbase compaction should be kept within +3/-3 percent of the optimum moisture content.

3.6 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 Standard Proctor, ASTM D698. The water content during backfill compaction should be kept within +3/-3 percent of the optimum moisture content.

3.7 CLEAN UP

A. Remove excess excavated materials from job site and upon completion leave site in clean condition.

END OF SECTION 312310

SECTION 313116 - TERMITE CONTROL

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:

1. Soil treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.
2. Section 076200 "Sheet Metal Flashing and Trim" for custom-fabricated, metal termite shields.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
2. Include the EPA-Registered Label for termiticide products.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of termite control product.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

1.7 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.8 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation, Pest Control Solutions.
b. Bayer Environmental Science.
c. Ensystex.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than three years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
3. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of termite-control-treatment Installer. Include quarterly maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.

END OF SECTION 313116

SECTION 316613 - AGGREGATE PIER FOUNDATION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work shall consist of designing, furnishing, installing, monitoring, and testing of Aggregate Pier foundations to the lines and grades shown on the drawings and as specified herein. The aggregate piers shall be constructed by either a down-hole vibrator or a down-hole tamper to create a columnar type configuration and shall be used to produce an intermediate foundation system for support of foundation loads.

B. It shall be the aggregate pier contractor's responsibility to determine and implement the systems and criteria to ensure that the specified performance is achieved.

1.2 RELATED SECTIONS

A. Section 013324 - Structural Submittals.

B. Section 014524 - Structural Testing/Inspection Agency Services.

C. Section 312310 - Excavating, Backfilling, and Compacting for Structures.

1.3 REFERENCES

A. ASTM C33 - Standard Specification for Concrete Aggregates.

B. ASTM D448 - Classification for Sizes of Aggregate for Road and Bridge Construction.

C. ASTM D1143 - Standard Test Methods for Deep Foundations Under Static Axial Compressive Load.

1.4 SUBMITTALS

A. The contractor shall submit the qualifications of the Aggregate Pier Installer (API) and the Aggregate Pier Designer (APD) in accordance with Section 1.6. Include a list of at least five (5) previously completed projects of similar scope and purpose. The list shall include a description of the project, relative size, and contact information.

B. The API shall submit detailed design calculations and construction drawings prepared by the APD. All plans shall be signed and sealed by a Professional Engineer in the State in which the project is constructed. The construction drawings shall indicate the spacing, location, and depth of the aggregate piers to achieve the performance criteria indicated on the drawings.

C. The APD shall submit documentation of Errors and Omissions design insurance for the work. The insurance policy shall provide a minimum coverage of $3 Million per occurrence with no limitation of liability.

D. The API shall submit a Quality Assurance Plan to the Architect/Structural Engineer prior to the installation of the Aggregate Pier System.

E. The API shall submit the Modulus test detail and setup to confirm that the installation procedure produces the pier modulus used in the design.

F. The API shall furnish a complete and accurate record of Aggregate Pier installation to the General Contractor. The record shall indicate the pier location, length, volume of aggregate used or number of lifts, densification forces during installation, and final elevations or depths of the base and top of piers. The

record shall also indicate the type and size of the installation equipment used, and the type of aggregate used.

G. Upon completion of the work, the API shall submit a warranty document good for a minimum of one year after the date of substantial completion of the building.

1.5 SITE AND SUBSURFACE CONDITIONS

A. The API and APD shall examine the areas and conditions under which aggregate piers are to be installed and notify the Architect/Structural Engineer in writing of any conditions detrimental to the proper and timely completion of the work.

B. A Geotechnical Report, including test boring records, has been prepared for this project. The Geotechnical Report is available for review. Failure to study and properly evaluate this data shall not constitute grounds for a claim for additional compensation.

C. The API and APD shall assume full responsibility for interpretation of soil boring and test pit data and for the conclusions drawn from the inspection of the site.

D. The API and APD shall become familiar with geological information in the area of the project and with the possibility of encountering difficult subsurface conditions.

1.6 QUALIFICATIONS

A. The API shall have a minimum of 5 years of experience with the installation of Aggregate Pier systems and shall have completed at least 50 projects. The full time, on-site, job supervisor for the API shall have a minimum of 5 years of experience in the construction of stone columns, which shall be documented in a resume submitted to the Architect and Structural Engineer

B. The APD shall have a minimum of 5 years of experience with the design of Aggregate Pier systems and shall have completed at least 50 projects.

1.7 QUALITY ASSURANCE

A. The API shall provide full-time Quality Control monitoring of Aggregate Pier construction activities. The API shall immediately report any unusual conditions encountered during installation to the APD, the General Contractor, the Structural Testing/Inspection Agency, and the Architect/Structural Engineer.

B. The API shall perform Aggregate Pier Modulus Test(s) and Uplift Test(s) (if applicable) to verify or modify Aggregate Pier designs. Bottom Stabilization Testing (BSTs) or Crowd Stabilization Testing (CSTs) shall be performed by the Control Technician during the installation of the modulus test pier. Additional testing, as required by the APD, shall be performed on selected production Aggregate Piers to compare results with the modulus test pier.

C. The Structural Testing/Inspection Agency shall perform the following:

1. Monitor the modulus test pier installation and testing. The API shall provide and install all dial indicators and other measuring devices.

2. Monitor the installation of Aggregate Pier elements to verify that the production installation practices are similar to those used during the installation of the modulus test elements.

3. Report any discrepancies to the API and General Contractor immediately. Notify the Architect/Structural Engineer if discrepancies are not rectified in a timely manner.

4. Observe the excavation, compaction and placement of the foundations. Dynamic Cone Penetration testing may be performed to evaluate the footing bottom condition as determined by the Structural Testing/Inspection Agency.

5. Submit a written inspection report as described in Section 3.5 D.3.

PART 2 - PRODUCTS

2.1 AGGREGATE PIER SYSTEM

A. The design of the Aggregate Pier system shall be based on the service load bearing pressure and the allowable total and differential settlement criteria of all footings indicated on the drawings for support by the Aggregate Pier system. The Aggregate Pier system shall be designed in accordance with generally accepted engineering practice and the methods described in these Specifications. The design life of the structure shall be 100 years.

B. The Aggregate Pier elements shall be designed using a Aggregate Pier stiffness modulus to be verified by the results of the modulus test.

2.2 BACKFILL MATERIALS

A. Aggregate for piers shall consist of hard, angular to sub-angular durable rock fragments, with the majority of particles in the range of 1/8 inch to 1-1/2 inches such as No. 57 and No. 67 stone in accordance with ASTM C33 or D448, or shall be other graded aggregate selected by the installer and successfully used in the modulus test.

2.3 EQUIPMENT

A. The Aggregate Pier Installer (API) shall furnish all equipment and accessories required for performance of the work in accordance with the requirements of the design, including appropriate energy input.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

A. An Aggregate Pier preconstruction meeting is to be convened by the General Contractor to ensure that all parties understand the project requirements and the role of each party.

3.2 AGGREGATE PIER CONSTRUCTION

A. Aggregate piers shall be constructed plumb and not more than 6 inches out of place at the top as shown on the Stone Column Layout Plan. Aggregate Pier Installer (API) shall make such modifications in the equipment, operations, or personnel as required, to assure that the aggregate piers are constructed within the specified accuracy.

B. Aggregate piers shall be installed by methods suitable to the soil conditions and types at the project site.

1. Augered Aggregate Piers shall be predrilled to the design depth with an auger diameter equal to the finished pier diameter and cased to the full depth if soil conditions will not allow the hole to remain open during the pier construction.

    a. Aggregate shall be added in lifts as determined by the Aggregate Pier designer (APD) with a maximum of 12-inches
    b. Each lift of aggregate shall be tamped or vibrated with the required energy and or penetration as required by the design to produce the required modulus.

c. The aggregate shall be removed and replaced with fresh aggregate if cave-ins occur during the aggregate placement such that the volume of caved-in soil is greater than 10 percent of the aggregate being compacted.

2. Displacement Aggregate Piers shall be constructed by advancing a hollow-shaft mandrel with a static weight that can produce a centrifugal force. The hollow-shaft mandrel, filled with aggregate, is incrementally raised, permitting the aggregate to be released into the cavity, and then lowered by vertically advancing and/or ramming to densify the aggregate and force it laterally into the adjacent soil. The cycle of raising and lowering the mandrel is repeated to the top of pier elevation. The cycle distance shall be determined by the Aggregate Pier Designer.

C. Obstructions:

1. Obstructions encountered during excavation or drilling that will prevent installation of the aggregate piers to design depth, or cause the aggregate pier to stray from its specified location during installation shall be removed or the pier shall be relocated or abandoned. To the extent the obstructions are shown in the geotechnical report, removal of obstructions shall be performed at no additional cost to the owner.

2. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, utility lines, etc., that prevent installing the aggregate piers to the required depth, or cause the aggregate pier to drift from the required locations. Dense natural rock or weathered rock shall not be deemed an obstruction, and piers may be terminated short of design lengths on such materials. The Aggregate Pier Designer shall be notified within 24 hours to verify that the short piers are acceptable.

3.3 TOLERANCE

A. The as-built center of each pier shall be within 6 inches horizontally of the locations indicated on the APD plans. Each pier shall extend to an elevation of at least 6 inches (±2 inches) above the bottom of footing. Piers installed outside of the above tolerances and deemed not acceptable shall be reinstalled at no additional cost to the Owner.

3.4 REJECTION

A. Aggregate Pier elements installed beyond the allowable tolerances shall be abandoned and replaced with new piers, unless the APD approves the condition or provides other remedial measures. Unless the rejection is caused by obstruction, refusal in rock, or errors in the project drawings, the cost of all labor and material required for the replacement shall not be completed at no additional cost to the Owner.

3.5 GENERAL CONTRACTOR RESPONSIBILITIES

A. Site Preparation and Protection

1. The General Contractor shall locate and protect underground and above ground utilities and other structures from damage during installation of the Aggregate Pier elements.

2. Site grades for Aggregate Pier installation shall be within 1 foot of the top of footing elevation or finished grade elevation to minimize Aggregate Pier installation depths. Ground elevations and bottom of footing elevations shall be provided to the Aggregate Pier Installer in sufficient detail to estimate installation depth elevations to within 3 inches.

3. Prior to, during, and following Aggregate Pier installation, the General Contractor shall provide positive drainage to protect the site from wet weather and surface ponding of water.

B. Aggregate Pier Layout

1. The location of foundations requiring Aggregate Pier supported shall be marked in the field using survey stakes or similar means. The Aggregate Pier Installer shall verify the accuracy of the survey prior to installation of the Aggregate Pier system.

C. Utility Excavation

1. The General Contractor shall coordinate all excavations made subsequent to Aggregate Pier installations so that excavations do not encroach on the piers as shown in the Aggregate Pier construction drawings. Protection of completed Aggregate Pier elements is the responsibility of the General Contractor. In the event that utility excavations are required in close proximity to the installed Aggregate Pier elements, the General Contractor shall contact the APD immediately to develop construction solutions to minimize impacts on the installed Aggregate Pier elements.

D. Footing Bottoms

1. Excavation and surface compaction of all footings shall be the responsibility of the General Contractor. Foundation excavations to expose the tops of Aggregate Pier elements shall be made in a workman like manner, and shall be protected until concrete placement, with procedures and equipment best suited to (1) avoid exposure to water, (2) prevent softening of the matrix soil between and around the Aggregate Pier elements before pouring structural concrete, and (3) achieve direct and firm contact between the dense, undisturbed Aggregate Pier elements and the concrete footing.

2. All excavations for footing bottoms supported by Aggregate Pier foundations shall be prepared in the following manner by the General Contractor. Recommended procedures for achieving these goals are to:

   a. Limit over-excavation below the bottom of the footing to 3 inches (including disturbance from the teeth of the excavation equipment). Fill over-excavation with additional cover concrete on the bottom of the footing.
   b. Compaction of surface soil and top of Aggregate Pier elements shall be prepared using a motorized impact compactor (“Wacker Packer,” “Jumping Jack,” or similar). Sled type tamping devices shall only be used in granular soils and when approved by the APD. Loose or soft surficial soil over the entire footing bottom shall be recompacted or removed, respectively. The surface of the aggregate pier shall be recompacted prior to completing footing bottom preparation.
   c. Place footing concrete immediately after footing excavation is made and approved, preferably the same day as the excavation. Footing concrete must be placed on the same day if the footing is bearing on moisture sensitive soils. If same day placement of footing concrete is not possible, open excavations shall be protected from surface water accumulation. A lean concrete mud-mat may be used to accomplish this. Other methods must be pre-approved by the APD.

3. The following criteria shall apply, and a written inspection report sealed by the project Structural Testing/Inspection Agency shall be furnished to the API to confirm:

   a. That water (which may soften the unconfined matrix soil between and around the Aggregate Pier elements and may have detrimental effects on the supporting capability of the Aggregate Pier reinforced subgrade) has not been allowed to pond in the footing excavation at any time.
   b. That all Aggregate Pier elements designed for each footing have been exposed in the footing excavation.
   c. That immediately before footing construction, the tops of Aggregate Pier elements exposed in each footing excavation have been inspected and recompacted as necessary with mechanical compaction equipment.
   d. That no excavations or drilled shafts (elevator, etc.) have been made after installation of Aggregate Pier elements within the excavation limits described in the Aggregate Pier construction drawings, without the written approval of the API or APD.

3.6 TESTING

A. Testing to determine specification compliance will be provided by the Aggregate Pier Installer, and will consist of at least one Modulus Test of an aggregate pier. The results of the Modulus Test shall meet the following criteria to pass:

1. Modulus test(s) shall be performed on a non-production Aggregate Pier. The Aggregate Pier Designer and the Architect/Structural Engineer shall approve the location of the Modulus Test.

2. Deflections of the top of the test pier shall be measured by a suitable method.

3. Deflections at the bottom of the test pier shall be measured by means of a telltale installed at the bottom of the test aggregate pier. Performance will be deemed acceptable when, at the specified design stress, deflection at the bottom of the pier does not exceed 20% of the deflection at the top of the pier.

4. Load increments, decrements, and duration, shall be determined using ASTM D1143 as general guidelines.

5. Surficial disturbance shall be compensated for by applying a seating load equal to 5% of the total load to the loaded steel plate before applying load increments.

6. The modulus testing shall be performed as described in the Design Submittal.

B. Modulus test report shall be prepared under direction of a Registered Professional Engineer in the project state and shall include:

1. A description of the installation equipment.

2. Installation records.

3. Complete test data.

4. Analysis of the test data.

5. Verification of the design parameter values based on the modulus test results.

END OF SECTION 316613

SECTION 323913 – MANUFACTURED METAL BOLLARDS

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:

1. Manufactured metal bollards.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete"
2. Section 055000 "Metal Fabrications"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of finish specified.

C. Shop Drawings: Indicate types, sizes, finishes, and anchorage details showing relationship with adjacent construction.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Source Limitations: Provide each type of product from a single source.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Protect stored materials from damage due to weather, excessive temperature, and construction operations.

C. Handle materials in accordance with manufacturer’s recommendations.

1.6 WARRANTY

A. Material Warranty: Provide manufacturer’s standard material warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products manufactured by the following:

1. BollardsUSA.com, a division of J.R. Hoe, 101 Ironwood Road, Middlesboro, KY 40965. www.jrhoe.com.

2. Shaw Stainless LLC, 3275 Florence Road, Powder Springs, GA 30127. https://stainlessandalloy.com

3. CMPI Custom Mfg. & Polishing, Inc., 2958 E. Division St., Springfield, MO 65803. www.cmpionline.com

B. Substitution Limitations: Comply with provisions of Division 01 Section for "SUBSTITUTION PROCEDURES."

2.2 MANUFACTURED METAL BOLLARD

A. Basis of Design – Derby Series Bollard as manufactured by Bollards USA, a division of J.R. Hoe:

1. Material: Stainless Steel
2. Top: Dome.
3. Neck Diameter: 6 inches.
4. Height: 36 inches.
5. Finish: No. 4 satin finish
6. Installation Method: Fixed.

2.3 MATERIALS

A. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: Type 304.
2. Pipe: Schedule 40 steel pipe, Type 304.
3. Tubing: Type 304.

2.4 ACCESSORIES

A. Fasteners: Manufacturer’s recommended noncorrosive fasteners.

B. Hardware for Fixed Mount Bollards: Stainless steel threaded rods, nuts, and washers.

2.5 FINISHES

A. Powder-Coat Finish: Manufacturer's standard polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

1. Salt Spray Resistance: 5,000 hours when tested per ASTM B117.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install according to manufacturer's written instructions and details.

B. Install bollards plumb and securely anchored at locations indicated on Drawings.

3.3 CLEANING AND PROTECTION

A. Clean bollards as recommended by manufacturer.

B. Touch-up, repair, or replace damaged bollards before Substantial Completion.

END OF SECTION 323913