

PROJECT MANUAL
INCLUDING CONSTRUCTION SPECIFICATIONS

for

**V-S034, TERMINAL C LST LEVEL 1
DUMPSTER PAD ENCLOSURE (D/B)**

ORLANDO INTERNATIONAL AIRPORT

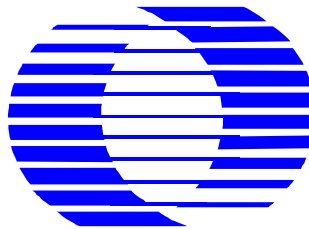
Orlando, Florida 32827

CONTRACT DOCUMENTS

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VOLUME 4 OF 6



GREATER ORLANDO AVIATION AUTHORITY

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SECTION 10 14 00 – WAYFINDING SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Special Conditions, apply to this Section.

1.2 SUMMARY OF WORK INCLUDED

- A. CONTRACTOR shall be responsible for securing all sign permits, including payment of fees, required by the County for the installation of all exterior and interior signage for the Project.
- B. Sign Fabrication: Types of signs, messages, and graphics are indicated on the Drawings and herein, and require various materials, finishes, illumination and fabrication and installation techniques.
- C. Shop drawings, layouts, samples, and mock-ups for GOAA approval.
- D. Structural design and calculations for all ceiling suspended signage to confirm structural integrity of the designed support connection. All structural connections will require certification by an Engineer licensed in the State of Florida.
- E. Installation of all fabricated signs, including all fasteners and fastenings and related electrical and data connections.
- F. Coordination with all trades of this Contract required for the fabrication and installation of the signage, including the approvals by the GOAA required in this Section. Fabrication and installation of the Work in accordance with National Electrical Code (NEC); latest edition, Underwriters Laboratory UL; latest edition, National Fire Protection Agency (NFPA); latest edition and National Electrical Manufacturers Association Standards,
- G. Coordination and verification of all messages with GOAA. GOAA to provide complete set of sign location plans with sample numbering system and electronic message schedule template for fabricator to complete sign message schedule for submission and approval by the GOAA.
- H. Verification of all conditions and sign dimensions in the field. Sign Fabricator to coordinate all signage requirements with the architectural, structural, lighting, electrical, and telecommunications drawings to ensure that all proposed signs can be installed, with power and required data connections and structurally supported. Verification of conditions and sign dimensions to be completed prior to sign fabrication and approval of all required submittals.
- I. Related Sections include the following:
 - 1. Division 26 Sections for electrical service and connections for illuminated signs.

1.3 QUALITY ASSURANCE

A. DESIGN CRITERIA

- 1. Structural design: Details on Drawings indicate a design approach for sign fabrication but do not necessarily include all fabricating details required for the

complete structural integrity of the signs, including consideration for static, dynamic, and erection loads during handling, erecting, and service at the installed locations, nor do they necessarily consider the preferred shop practices of the individual Sign Fabricators. Therefore, it shall be the responsibility of the Fabricator to perform the complete structural design of the signs and to incorporate all the reasonable safety factors necessary to protect the GOAA and their representatives, against public liability. Designs that survive rational engineering analysis will be acceptable, provided that shop drawings; including structural design, are approved by the GOAA. Signs must meet all applicable local, state, and national codes, as well as testing laboratory listings where required. It is the responsibility of the Sign Fabricator to provide engineering calculations by the Florida State certified engineer for connection details and sign structural calculations to GOAA for review / approval prior to any fabrication. Fabricator will coordinate with General Contractor on all footings, structural attachments, and penetrations of slabs.

B. SHOP DRAWINGS

1. The Drawings presented for pricing are not fabrication drawings. The Signage Contractor is expected to provide all details necessary to effectively explain and specify the fabrication process and the expected performance of the installed product. The Signage Contractor must demonstrate through details and specifications their complete understanding of the desired final product and the method/process by which they are producing said product. The Signage Contractor is responsible to field measure prior to submitting Shop Drawings. Repackaging the supplied Drawings with new title blocks and delivering them as submittals will not be accepted. Although art may be supplied electronically, Signage Contractors must be prepared to create all graphic content from scratch – per instance as requested - to demonstrate and verify the quality and accuracy of the delivered product.
2. Provide shop drawings for all items including, but not limited to the following:
3. Complete fabrication and installation drawings for each sign type. Indicate dimensions, materials, finishes, fastening, anchorage, joining, sealing, backing, utility requirements, rough-in, and adjacent related site conditions.
4. Each sign type with all graphic elements.
5. Evacuation Map final graphics. The Environmental Graphics documentation will provide a template to be used for developing specific area plans and routes as coordinated with the DFS representative and Emergency Egress plans.
6. All letter styles shall be accurately reproduced.
7. Connections and routing for all power and data cabling.

1.4 SUBMITTALS

- A.** Procedure: Prepare submittals in accordance with the requirements of the Special Conditions, and to include the following:
1. Notes on Drawings shall clearly define any actions requiring review by the GOAA.
 2. First article of production-run items, both large and small, will be reviewed by the GOAA before production run is commenced.

3. It shall be the responsibility of the Contractor to schedule all review meetings with the GOAA.
 - B. Submit physical samples of sufficient size and quantity to illustrate materials, finishes, equipment or workmanship, and to establish standards by which completed work will be judged. Samples must represent the functional characteristics of the product or material, with integrally related parts and attachment devices, colors, and finishes.
 - C. All samples to have a place for stamp approval.
 - D. Required samples for review:
 1. Full 6" x 6" set of all specified paint colors and finishes.
 2. Complete, full-size message in each typeface to demonstrate proper spacing (black text on white background: outline not accepted).
 3. Sample of each type of fastener to be used.
 4. Each type of exposed metal used for major elements of work with respective finish.
 5. Each type of adhesive vinyl film, including computer-cut designs, shown full-size on each of the specified ground colors.
 6. Each type of neon.
 7. Mock-ups as scheduled in this section. Mock-ups shall become the property of GOAA and are not to be part of the completed work.
 8. Unless otherwise noted, one full size, complete, item must be prepared and installed by the fabricator as "first article" for each sign type. Upon inspection and approval by the GOAA, the fabrication of subsequent articles may continue.
 9. Other items as may be required by GOAA, or as noted on the Drawings or herein.
 - E. Extra Materials / Spares: Deliver to the appropriate GOAA's Representative contact person, in manufacturer's original packaging and store at the Project where directed.
 1. Furnish (1) gallon of each finish paint color for touch-up purposes.
 2. Furnish (6) lamps of each type and size used in the signage (as applicable).
 3. Furnish spare keys to master keyed locks on directory or Kiosk signage
 - F. Supplementary Product Literature: Submit for information. Furnish within seven (7) days of request, manufacturer's literature describing the general properties of each product to be used in the Work
- 1.5 Permits by Signage Contractor
- A. Signage Contractor shall make all submittals for each permit via the GOAA's Representative. Signage Contractor shall be responsible for paying all fees, making adjustments as required, or any task necessary for obtaining local building and installation Sign permits for the proper execution of the Work.
- 1.6 QUALITY ASSURANCE
- A. Mock-ups and Prototypes:
 1. Provide a mock-up (partial for large Signs; complete for smaller Signs) of each sign type at the fabrication facility or on-site for review.

2. Utilize the same materials and installation methods in the mock-up as intended for the final Work. Schedule the installation so that the mock-up may be examined, and any necessary adjustments made, prior to commencing fabrication of the final Work. Replace unsatisfactory items as directed.
 3. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance for the Work throughout the project.
- B. Work-In-Progress Approvals:
1. Provide work-in-progress sign elements reviews. Scheduled or unscheduled viewings at the Fabrication Facility may be initiated by the GOAA's Representative as necessary to ensure continued quality control and make any adjustments required during fabrication. Unsatisfactory items are to be corrected by the Signage Contractor as directed by the GOAA.
- C. Regulatory Requirements:
1. Comply with applicable requirements of the Applicable Laws and Authorities. Obtain necessary approvals and permits from all such Authorities as required.
- D. Markings and Labels:
1. Locate markings, labels, manufacturer names and other identifications so as to be concealed from public view and as acceptable by the GOAA's Representative.
 2. No trade name or other identification shall appear on any item where the public will see it, except as specifically approved by the GOAA's Representative in advance.
- E. Final Location of Signs:
1. The location of signs as shown on the Location Plans is for general reference only and in some cases is not representative of the exact final location. Final locations of Signs shall be field located in coordination with the GOAA's Representative.
 2. Signage Contractor shall arrange for meetings at the Project to accommodate direction of final locations according to Project Construction Schedule.
- F. Lettering:
1. The Signage Contractor shall be responsible for the quality control of all lettering. All letterforms shall be crisp, sharp, free of nicks, ragged edges and discontinuous curves. All lettering shall conform to approved typeface, weight and letter spacing. No substitutions of typeface foundry, brand or version or implementation technique will be accepted without prior approval.
 2. Vinyl Die Cut Graphics: All camera-ready artwork shall be anagraph scanned for cutting on a Gerber Sign Maker II or approved equal.
 3. All cutting and routing shall be executed in such a manner that all edges and corners of finished letterforms are true and clean. Letterforms with rounded positive or negative corners, nicked, cut, or ragged edges, etc., will not be accepted. All letterforms shall be so aligned as to maintain a baseline parallel to the sign format. Margins must be maintained as specified in drawings.
 4. All Work under the Agreement shall be performed by skilled craftsmen under supervision of trained foremen, experienced in the trade of craft required to accomplish the Work and produce a product of high quality.

G. Tactile Sign Messages

1. All tactile sign messages must comply with ADAAG 2006; Sections 703.2-703.4
2. Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch (1.6 mm) minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch (9.5 mm) minimum.
3. Braille shall be contracted Braille (Grade 2), domed and maintain a minimum 3/8 inch clear-space from other tactile elements.
4. Proof-reading of Braille messages is to be performed by the sign fabricator prior to fabrication.

H. High Quality of Workmanship:

1. The Signage Contractor shall be responsible for the high quality of all materials and workmanship required for the execution of the Agreement including materials and workmanship of any firm or individual who act as Signage Contractor's Sub-Contractor.
2. Signage Contractor shall be responsible for providing up-to-date drawings, specifications, graphic schedule, etc., to all sub-contractors.

I. Dimensions

1. Written dimensions on drawings shall have precedence over scaled dimensions.
2. Signage Contractor shall verify and be responsible for all dimensions and conditions shown by these drawings. Shop details must be approved by the GOAA's Representative prior to fabrication.

J. Discrepancies

1. Signage Contractor shall notify the GOAA's Representative of any discrepancies in the Drawings, Sign Location Plan or Sign Message Schedule, in field dimensions or conditions and/or changes required in construction details.

K. Regulatory Requirements:

1. Comply with applicable portions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
2. References

L. The City of Orlando Code of Ordinances - Chapter 64 - SIGNS of Ordinance No. 2016-47

M. U.S. Department of Homeland Security - Seal and Signature Usage Guidelines

- N. National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual."
- O. American Welding Society (AWS) – AWS D1.1 "Structural Welding Code, Steel," and AWS D1.2 "Structural Welding Code, Aluminum."
- P. Underwriters Laboratories Inc. (UL) – Standards for Safety, UL Publication 48 "Electric Signs."

1.7 GRAPHICS/ARTWORK

- A. Designer to provide artwork on: Via electronic file transfer as Acrobat PDF for graphic layouts included in the Drawings.

1.8 WARRANTY

- A. Signage Warranty
 - 1. Submit to the GOAA's Representative a 5-year written warranty (effective the date of final acceptance) covering all Signs, notarized by the Signage Contractor and Installer (if Sub-Contractor is used), agreeing to repair or replace the Defective Signs. Upon notification of such Defective Signs within the warranty period, make necessary repairs or replacement at the convenience of the GOAA's Representative.
- B. Linear Polyurethane Paint Factory Finish Warranty
 - 1. Submit to the GOAA's Representative a 5 year written warranty, warranting that the factory-applied linear polyurethane finishes will not develop excessive fading or excessive non uniformity of color or shade, and will not crack, peel, pit, corrode or otherwise fail as a result of Defects in materials or workmanship within the following defined limits. Upon notification of such Defects within the Warranty Period, make necessary repairs or replacement at the convenience of the GOAA's Representative.
- C. "Excessive Fading"
 - 1. A change in appearance that is perceptible and objectionable as determined when visually compared with the original color range standards.
- D. "Excessive Non-Uniformity"
 - 1. Non-uniform fading to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
- E. "Will Not Pit or Otherwise Corrode"
 - 1. No pitting or other type of corrosion, discernible from a distance of 10' (3 m), resulting from the natural elements in the atmosphere at the project site.

1.9 MAINTENANCE

- A. Maintenance and Operating Manuals
 - 1. Furnish complete manuals describing the materials, devices and procedures to be followed in operating, cleaning and maintaining the Work. Include manufacturers' brochures and parts lists describing the actual materials used in the Work, including metal alloys, finishes, electrical components and other major components.

2. Assemble manuals for component parts into single binders identified for each system.
- B. Instruction
1. Prior to acceptance, establish with GOAA's Representative an instruction and training program for GOAA's Representative's personnel.
 2. Notify the GOAA's Representative in writing at least 7 days prior to commencement of the program providing an outline of topics indexed to the Maintenance and Operating Manual.
 3. Provide a trained instructor. Provide three (3) consecutive 4-hour periods of training scheduled during the normal 8-hour working day. Instruction and training shall include, but shall not be limited to, procedures to be followed in the normal day-to-day maintenance and operation of the Work.

PART 2 - PRODUCTS

2.1 FABRICATION

- A. Signage shall be complete for proper installation as described in the Drawings.
- B. Finish work shall be firm, well anchored, in true alignment, properly squared, with smooth clean uniform appearance, without holes, cracks, discoloration, distortion, stains, or marks.
- C. Construct all work to eliminate burrs, dents, cutting edges, and sharp corners.
- D. Finish welds on exposed surfaces to be imperceptible in the finished work.
- E. Except as indicated or directed otherwise, finish all surfaces smooth.
- F. Surfaces, which are intended to be flat, shall be without dents, bulges, oil canning, gaps, or other physical deformities.
- G. Surfaces, which are intended to be curved, shall be smoothly free-flowing to required shapes.
- H. Except where approved otherwise by GOAA, conceal all fasteners.
- I. Make access panels tight-fitting, light proof, and flush with adjacent surfaces.
- J. Conceal all identification labels and Underwriters Limited labels to conform to Underwriters Limited Codes.
- K. Carefully follow manufacturer's recommended fabricating procedures regarding expansion or contraction, fastening, and restraining of acrylic plastic.
- L. Exercise care to ensure that painted, polished, and plated surfaces are unblemished in the finished work.
- M. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals.
- N. All illumination shall be even and without hot spots.
- O. Ease all exposed metal edges.
- P. Provide miscellaneous metal items required for completion of the work even though not shown or specified.

- Q. Refer to Drawings for sign color specifications.
- R. Paint finishes shall be Matthews Acrylic Polyurethane with Matthews Primers and Metal Pre-Treatments or GOAA approved equal.
- S. Shop painting to be uniform on and around all sign elements to ensure sign elements will withstand all weather conditions.
- T. Mounting: Mounting plates shall be in conformance with manufacturer's written recommendations.

2.2 MATERIALS

- A. All Specified Metals
 - 1. Aluminum
- B. Aluminum shall be suitable for ornamental, architectural work. Surface finish shall be smooth, free of extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of the specific application.
 - 1. Stainless Steel
- C. Stainless steel shall be suitable for ornamental and architectural work. Surface finish shall be smooth, free of all extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of specific application. Structural metal for concealed framing shall be of galvanized rolled steel or equal as required to satisfy structural requirements.
- D. Aluminum exterior cabinets, spacers, backplates and frames shall be constructed from 0.25 inch aluminum, #4 horizontal brushed and clear anodized finish, unless otherwise specified on Drawings.
- E. Aluminum interior plaques shall be constructed from 0.125 inch aluminum, #4 horizontal brushed finish with semi-gloss linear polyurethane clear coat, unless otherwise specified on Drawings.
- F. Aluminum interior fabricated components shall be constructed from 0.125 inch thickness aluminum sheet.
- G. Adhesive used for installing Signs shall be manufactured by Dow Corning or equal. "VHB" tape such as Polyfoam or "Isotac" contact adhesive tape manufactured by 3M shall be used in conjunction with silicone adhesives for installation of wall signs, in minimum thicknesses available.
- H. Extruded aluminum shapes utilizing 6063-T6 aluminum alloys, unless otherwise specified on Drawings.
- I. Concrete Installation of anchoring devices into concrete slab shall be adjusted to avoid penetrating existing reinforcing conduit, etc. contained in the concrete slab. Coordinate with the Architect and Structural Engineer.
- J. Stainless steel exterior cabinets, spacers, backplates and frames shall be constructed from 0.125 inch stainless steel, #4 horizontal brushed and clear anodized finish, unless otherwise specified on Drawings.

- K. Stainless steel interior plaques shall be constructed from 0.125 inch thickness stainless steel sheet, #4 horizontal brushed finish with semi-gloss linear polyurethane clear coat, unless otherwise specified on Drawings.
- L. Stainless steel interior fabricated components shall be constructed from 0.0625 inch stainless steel, unless otherwise specified on Drawings.
- M. Stainless steel shall be suitable for ornamental and architectural work. Surface finish shall be smooth, free of all extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of specific application. Structural metal for concealed framing shall be of galvanized rolled steel or equal as required to satisfy structural requirements.
- N. Acrylic intended for non-illuminated use shall be 0.25 inch cast acrylic sheet with non-glare finish, unless otherwise specified on Drawings. Acrylic intended for edge-illuminated use shall be 10mm extruded acrylic sheet with embedded diffuser particles designed specifically for edge-lighting, unless otherwise specified on Drawings.
- O. Use Plexiglas II as manufactured by Rohm and Haas Co., or equal quality. Thickness shall be as indicated on Drawings or not less than 1/8" thick. Signage Contractor shall provide color and finish samples of all plastics for approval before fabrication; no substitution in color, thickness, or finish of plastics will be accepted without written approval from the GOAA's Representative. All plastics shall be of uniform color, translucence and illumination, as supplied by manufacturer. Any exposed edges of acrylic shall be finished so as no saw marks are visible.
- P. Decal or Transfer: Provide special printed paper or vinyl suitable for reproducing the design onto material indicated, as required. Submit sample to the GOAA's Representative for approval.
- Q. Aluminum posts shall be constructed from 2-inch square T52 tubes, 0.1875 wall thickness and #4 brushed and clear anodized finish with capped ends, unless otherwise specified on Drawings.
- R. Hardware / Hinges: Provide and install all incidental hardware necessary for the proper functioning of the Signs, including, but not restricted to, materials and products covered in this section. Provide stainless steel hinges for all hinged access panels. Provide pin tumbler locks for all access panels requiring locks. Provide stainless steel fasteners for assembling ferrous and non-ferrous metals.
- S. Bolts, nuts, screws, washers, anchors and other devices required to complete the Work. Signage Contractor shall use the same basic metal or alloy as the metal fastened, and finish to match in color and texture. Use stainless steel 300 series alloy where used to join dissimilar materials.
- T. All exposed fasteners to be 0.125 inch flathead stainless steel screws painted to match adjoining surfaces unless otherwise specified on drawings.
- U. Pin-mount supports shall be 3/16" to 1" diameter painted threaded rods as appropriate.
- V. Insulation /Material Isolation: Separate all ferrous and non-ferrous metals with non-conductive gaskets to prevent electrolysis. In addition to gaskets, provide stainless steel fasteners for some cases as required.

W. Welding Electrodes and Filler Metal

PART 3 - Provide the alloy and type of welding electrodes and filler metal required for strength, workability, compatibility and color match after grinding smooth and finishing the fabricated product.

- A. Applied interior vinyl graphics to be High Performance Cast Vinyl Sheeting, unless otherwise specified on Drawings. Applied exterior vinyl graphics to be High Performance Reflective Vinyl Sheeting, unless otherwise specified on Drawings.
- B. Additional Material/Processes: For materials or processes described in the preceding list, the material and/or process as detailed in the design documents shall be used as the meet or exceed equivalent.

3.2 ELECTRICAL COMPONENTS

- A. Electrical components must conform to applicable electrical codes and the following:
 - 1. All materials must be approved and listed by Underwriters Laboratories, Inc.
 - 2. Light Emitting Diode (LED) general lighting requirements:
- B. Provide sufficient LED wattage, quantities and spacing to ensure continuous, maximum illumination.
- C. Provide LED lighting prototypes to verify brightness and uniformity of lighting with designer.
 - 1. LED lighting component, color and power requirements:
- D. Edge lighting – fabricated linear white LED's 24 VAC
- E. Back lighting – fabricated matrix white LED's 24 VAC
 - 1. Heavy duty, non-keyed, flush mounted, fused or un-fused disconnects. Provide NEMA 1 for dry locations and proper enclosure for others.
- F. Electrical Wiring and Equipment: Provide and install electrical materials such as ballasts, transformers, lamps, sockets, neon units, connectors, and all other equipment which shall be new and shall be approved by Underwriters Laboratories, Inc. The assembly of all components within the illuminated signs shall conform to all standards of Underwriters Laboratories, Inc. as published in the latest edition of "Standards for Sign Safety" and all illuminated signs shall bear the U.L. label. All wiring and equipment shall be concealed within the Sign structure.
- G. Conduit and Devices: Provide rigid steel conduit, junction boxes and associated devices in accordance with applicable codes as required.
- H. LED power supplies shall be used as required for internally illuminated cabinet signs, in quantity and arrangement as recommended by ballast manufacturer and accessible for maintenance and shown on Shop Drawings.
- I. Disconnect Switch: All Signs or Sign components with electrical service shall be equipped with an approved external disconnect switch, flush mounted on the cabinet / Sign, with circuits and capacity to control all primary wiring within the Sign. Location of switch must be shown on Shop Drawings and is subject to approval.
- J. Illumination: All Signs with LED light sources shall be built to perform as required by the Design Consultant's documentation. Signage Contractor shall provide any

specification information required to verify performance. All lamps and transformers shall be provided by the Signage Contractor. Signage Contractor shall provide waterproof flush access panel(s), which shall be concealed wherever possible. Conduit wiring and electrical equipment from the field electrical connection to any part of the sign and within the sign shall be provided by the Signage Contractor.

- K. Ventilation: While maintaining a proper weather seal, Signage Contractor shall provide for sufficient ventilation of Sign components to prevent overheating or warping; allowing for color of sign, mounting surface, climate conditions, etc. In providing for ventilation, Signage Contractor shall protect sign from elements (rain, wind, debris, etc.) that might cause operational or cleaning problems. Signs / cabinets with light leaks will not be accepted. Signage Contractor shall utilize stainless steel bug mesh screen for integration with weep holes or vent / louvers on the Signs to prevent insect migration into illuminated Signs.
- L. Dynamic Signage: All dynamic screens, related equipment (i.e. media player), and compatible mounting systems to be supplied by Owner. Drawings show suggested design intent based on most current information provided by Burns (Technology) Sign Contractor to provide sign structural support, internal-illumination per Lighting Drawing, and any required custom fabrication based on final electronics Specifications. See Specifications, Dimensions, and Drawings provided by Burns (Technology) for all dynamic components that are part of wayfinding signage, including LCD screens, LED screens, OLED screens, and media players. Sign fabricator to manufacture sign cabinets that are accessible for maintenance and for future change out of the screens, possibly with slightly different dimensions. All electrical components shall be compatible with the latest UL and NECA standards. After installation, fabricator to verify that all components work seamlessly, per manufacturer's specifications.
- M. Dynamic Signage Equipment: All dynamic screen components, media players, and associated electrical components, will be provided by Owner. Fabricator to include mounting brackets, structure, and cabinets as specified in the Drawings.

3.3 FINISHING MATERIALS

- A. Linear Polyurethane Coatings: Provide the following, or other products as acceptable.
 - 1. Acrylic Linear Polyurethane enamel: Two components, acrylic aliphatic isocyanate / acrylic polyurethane having ultraviolet (UV) inhibitors and engineered for exterior application by Matthews Paint Company or approved equal.
 - 2. Primer for Aluminum: Two part component primer: One-coat Matthews 74-734 and 74-735 Metal Pretreat at .25 mils dry film thickness or one-coat Matthews 74-793 Spray Bond at .15 to .25 mils dry film thickness or Wyandotte / AKZO Grip-Guard Wash Primer (2Afy-31284) with Grip-Guard Wash Primer Hardener (10AFK-31285) combined and applied per manufacturer's specifications or approved equal (primer) for the application of the pre-approved and pre-formulated paint system.
 - 3. Primer for Steel: Two part component primer: One-coat Matthews 74-734 and 74-735 Metal Pretreat at .25 mils dry film thickness or Wyandotte / AKZO

Grip-Guard Wash Primer (2Afy-31284) with Grip-Guard Wash Primer Hardener (10AFK-31285) combined and applied per manufacturer's specifications or approved equal (primer) for the application of the pre-approved and pre-formulated paint system.

4. Clear Sealers: Crystal clear matte polyurethane sealers By Matthews Paint Co. or approved equal. Sealers are to resist rust and corrosion associated with exposure to salt air. As required and of highest quality available, applied per manufacturer's specifications.
- B. Anodized Aluminum Components / Panels: If required, Signage Contractor shall provide anodized (application of aluminum oxide film coating in clear or colored dye finish) aluminum panels or parts to match Executive Architect's color, grain, finish and specifications.
- C. Silk Screening Materials: Provide photo processed screening, arranged to furnish sharp and solid images without edge build up or bleeding of the coating. Pattern-cut screens may be used for non-repeat copy, provided that final image copy is equal to photoscreen quality. Provide only weather-resistant coating materials, compatible with the intended substrates. All silk-screened graphics are to be done with the finest screen size feasible for sharp, even reproduction.
- D. Vinyl Die-Cut and Pattern Cut-out Graphics: Use Scotchcal Opaque and Translucent film and Scotchcal Diamond Grade VIP Reflective film manufactured by 3M where specified or equivalent. Use pressure-sensitive, non-yellowing, non-peeling and weather resistant vinyl as specified. Use approved fonts and equipment as specified.

3.4 FABRICATION OF SIGNS AND SUPPORTS

- A. General: Provide custom manufactured Sign assemblies, components completely fabricated and finished at factory before delivery to Project. Construct to accurate detail and dimensions as shown and as review on approved Shop Drawings. Fit and assemble the Work at the shop and mark the components as required to facilitate assembly during installation. Exposed fasteners on finished faces will not be allowed, unless specifically indicated. Waviness and oil canning of surfaces is not acceptable. Minimum material thickness is to be 0.090 inches. Conceal wiring, conduct and other electrical items within sign enclosures.
- B. Lettering: Cut and rout in a manner to produce true and clean edges and corners of finished letterforms. Letterforms having rounded positive or negative corners, nicked, cut, or ragged edges are not acceptable. Align letter forms to maintain a baseline parallel to the sign format. Maintain margins as indicated on the Drawings.
- C. Seams and Joints: The Signage Contractor shall cut walls and floors carefully and neatly repair them in an acceptable manner. Signage Contractor shall consult the Architect of Record in cases where cutting into a structural portion of the building is required so that satisfactory reinforcement may be provided. Added joints shall be ground filled and finished flush and smooth with adjacent work. Such seams shall be invisible after final finish has been applied. Spot welded joints shall not be visible on exterior of signs after final finish has been applied. No gaps, light leaks, waves, or oil canning will be permitted in Work. If any of these are evident, the Signage Contractor will be required to correct its Work or construct a new Sign at its own expense.

- D. Metal Signs and Supports: Fabricate exposed surfaces uniformly flat and smooth, without distortion, pitting, or other blemishes. Form exposed metal edges to a smooth radius. Permanently bond the laminated metal components and honeycomb core with adhesive or sealant in accordance with product manufacturer's recommendations. Grind exposed welds and rough areas to make flush with adjacent smooth surfaces.
- E. Welding: Make welds continuous. Comply with American Welding Society, Aluminum Association, and Copper Development Association standards for the type of metal used.
- F. Fasteners: Use exposed fasteners only if shown on the Construction Documents. Perform drilling and tapping at shop.
- G. Dissimilar Materials: Where metal surfaces will be in contact with dissimilar materials, coat the surfaces with epoxy paint or plate with zinc chromate, or provide other means of dielectric separation as recommended by manufacturer to prevent galvanic corrosion (i.e. Neoprene gasket as an isolation membrane)
- H. Castings: Exposed surfaces shall be uniformly free from porosity and roughness. Edges shall be filled and ground smooth. Faces shall be chemically etched and mechanically polished for specified finish.
- I. Galvanizing: Provide for steel components in exterior construction, and where noted in Drawings shall be galvanized. Complete the shop fabrication prior to application of the zinc coating. Remove mill scale and rust, clean and pickle the units as required for proper pretreatment of the surfaces.
- J. Hardware: Provide all incidental hardware necessary for the proper functioning of signs. External hardware shall conform to the external appearance of the Sign.
- K. Supports and Backing in Walls: Signage Contractor shall provide engineered Sign supports anchored to building structure where required and to meet requirements of applicable building codes. Support or backing requiring installation within the building wall construction shall be immediately relayed to the Architect of Record and GOAA's Representative for field coordination. Signage Contractor shall meet with the Contractor to review all requirements.
- L. Access Doors and Frames: Access doors and frames shall be flush with the material in which they occur, unless otherwise specified. Access doors and frames shall be provided upon prior written approval of the Architect. Each trade providing access doors and frames shall verify the need for fire rated doors on the Construction Drawings. Access doors in walls, partitions or ceilings shall bear UL fire rated labels of same fire rating. If access doors and frames are required to be exposed to view, they shall be chrome, brass, stainless steel, or other finish to match other finishes in the spaces in which they are to be installed, unless otherwise specified. Obtain GOAA's Representative's approval for location of each access door prior to placement.
- M. Acoustical Requirements: Certain partition, floor and ceiling assemblies are required to have sound absorption and sound transmission loss characteristics as required in the Specification sections or as indicated on the Construction Drawings. The Signage Contractor shall coordinate his work in constructing these assemblies and that of other contractors whose work adjoins, connects to, or penetrates these

assemblies to assure that such work does not reduce acoustical characteristics of the assemblies.

3.5 SHOP APPLICATION OF SIGN FINISHES

- A. Sign Graphics: Provide the letters, numerals, symbols, and other graphics markings, using the finish materials shown. Apply the graphics neatly, uniformly proportioned and spaced, and accurate within the dimensions indicated. Prepare the substrate surfaces and apply finish materials in accordance with manufacturers' instructions.
- B. Metal Finishes: Remove scratches, abrasions, dents and other blemishes before applying finish. Apply the following to the fabricated Work, with texture and reflectivity as required to match the Architect's sample.
- C. Linear Polyurethane Finishes: Clean the surfaces as required for proper adhesion of coatings. Use 3M Co. "Scotch Brite" pads or equivalent with cleanser and water, and/or chemically treat as recommended by paint manufacturer to remove deleterious film or residue.
- D. Linear Polyurethane Paint: Provide pretreatment and primer in accordance with manufacturer's recommendation. Add ultra violet inhibitors to paint subject to sunlight exposure.
- E. Clear Linear Polyurethane Finish: Provide pretreatment, primer, and matte or semi-gloss finish coatings in accordance with manufacturer's recommendations. Apply 1.5 to 2.0 mils (0.0375 to 0.050 mm) dry film thickness.

3.6 GRAPHIC APPLICATION

- A. Preparation: Surfaces to receive the graphic markings shall be clean, dry, and otherwise made ready for application of the materials. Accurately measure and lay out the required marking configurations as indicated on drawings.
- B. Vinyl Die-cut and Pattern-cut Graphics: Use pressure sensitive, non-yellowing, non-peeling and weather resistant vinyl adhesive letters or images, custom flood coated as required, die cut from ScotchCal or ScotchLite as manufactured by 3M Company or equivalent. Apply in strict accordance with manufacturer's instructions. Make uniformly smooth and free from bubbles, wrinkles, stretching and blemishes.
- C. Painted or Silk-screened Graphics: All graphics shall be applied using photo processed screens from camera ready art, arranged to furnish sharp and solid images without build-up or bleeding of the coating. Comply with coating manufacturer's application instructions. Provide proper type of primer to suit each substrate and obtain a permanent bond. Verify compatibility of each substrate with the coatings to be used in the Work. Apply the markings with neat edges, minimum 3 mils (0.075 mm) dry film thickness and as required to obtain solid markings without voids.
- D. Acid-Etched Graphics and Typography: Acid-etched typography and graphic imagery must be an average of 1/16" deep, with clean, crisp, sharp edges; ragged or soft (polished out) edges will be rejected. Acid baths used for etching should be fresh and used in an environment and temperature that will provide the highest quality etched images. Color fill as indicated by the S/P color and finish schedule, keeping inks and fills true to the edges of letterforms / graphics.

PART 4 - EXECUTION

4.1 VERIFICATION OF CONDITIONS

- A. Inspect all surfaces to receive signage and report all defects that would interfere with signage installation.
- B. Starting Work implies acceptance of surfaces as satisfactory
- C. Verify all conditions and sign dimensions in field. Contractor to review and study architectural, landscape, lighting, electrical and related plans to insure that all proposed signs can be installed and supported. Verification of conditions and sign dimensions to be completed prior to sign fabrication and reviewed with the architect.

4.2 DEMOLITION

- A. Existing signage to be removed and responsibly discarded.
- B. Installation of new signage to be installed immediately after any demolition.
- C. Temporary signage, if necessary, is to conform with GOAA's Graphic Standards for Temporary Signage
- D. Unused data and/or electrical feeds to be coordinated with GOAA for proper terminations.
- E. Any surfaces damaged should be repaired and painted/patched to match adjacent surface.
- F. Concrete and floor surfaces to be repaired in coordination with the GOAA.

4.3 INSTALLATION

- A. Install signage upon acceptance by the GOAA of material and substantial completion of job site area to receive such materials.
- B. Special Precautions: Guard against damaging existing pavements and planting where signage is to be installed.
- C. Footings beneath topping surface shall be installed and located prior to top surface installation.
- D. Prior to installation, check all components, nuts, bolts, and other connections for proper alignment, fit and any damage. Replace damaged or defective components.
- E. Prior to installation, confirm all electrical locations and requirements with the GOAA.

4.4 CLEAN UP

- A. Keep areas of work clean, neat and orderly at all times. Clean surfaces, inside and out. Use approved cleaners if necessary to remove dirt.
- B. Protective coverings and strippable films shall be removed at a time that will afford the greatest protection of the furniture. Surfaces shall be cleaned to remove excess glazing and sealant compounds, dirt, and other substances.
- C. Upon completion of work and before final acceptance, remove tools, surplus materials, apparatus, and debris from the site. Leave the site in a neat, clean condition, acceptable to the Engineer. Wash, clean, and leave paved areas without stains.

4.5 FINAL INSPECTION AND ACCEPTANCE

- A. Upon completion of work, the GOAA will perform a final inspection for acceptance.
- B. All unused mock-ups and unused submittals shall be removed from site prior to final acceptance.
- C. Submit operation manuals, tools, and keys as specified in this Section.

END OF SECTION 10 14 00

SECTION 10 21 13 - SOLID SURFACE TOILET COMPARTMENTS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes vertical solid ~~surface-color~~ reinforced composite toilet partitions and associated trim.
- B. Related Sections include the following:
 - 1. Section 06 10 00 "Rough Carpentry" for Blocking.
 - 2. Section 10 28 00 "Toilet, Bath and Laundry Accessories."

1.3 DEFINITIONS

- A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

- A. A. Product data:
 - 1. For each type of product indicated.
- B. B. Shop drawings:
 - 1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
 - a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
 - b. Show locations and sizes of cutouts and holes for plumbing fixtures, soap holders and other items installed in solid surface.
- C. Samples:
 - 1. For each type of product indicated.
 - a. Submit minimum 6-inch by 6-inch sample in specified gloss.
 - b. Cut sample and seam together for representation of inconspicuous seam.
 - c. Indicate full range of color and pattern variation.
 - 2. Approved samples will be retained as a standard for work.
- D. Product data:
 - 1. Indicate product description, fabrication information and compliance with specified performance requirements.
- E. Sustainable Design Submittals:

1. Product Data: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for Leadership Extraction Practices for the following:
 - a. Extended Producer Responsibility
 - b. Recycled content
 2. Product Certificates: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's)
 - c. Health Product Declarations (HPD's)
 3. Adhesives and Sealants: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" subparagraph "Documentation on Low Emitting Materials" for Volatile Organic Chemical Emission requirements.
- F. Product certificates:
1. For each type of product, signed by product manufacturer.
- G. Fabricator/installer qualifications:
1. Provide copy of certification number.
- H. Manufacturer certificates:
1. Signed by manufacturers certifying that they comply with requirements.
- I. Maintenance data:
1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
 - a. Maintenance kit for finishes shall be submitted.
 2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

- A. Qualifications:
1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
- B. Fabricator/installer qualifications:
1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
- C. Applicable standards:
1. Standards of the following, as referenced herein:
 - a. American National Standards Institute (ANSI)
 - b. American Society for Testing and Materials (ASTM)
 - c. National Electrical Manufacturers Association (NEMA)
 2. Fire test response characteristics:
 - a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1) Flame Spread Index: 25 or less.

2) Smoke Developed Index: 450 or less.

- D. Pre-installation conference:
 - 1. Conduct conference at project site.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.
- B. Store components indoors prior to installation.
- C. Handle materials to prevent damage to finished surfaces.
 - 1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY

- A. Provide manufacturer's 10-year warranty against defects in materials.
 - 1. Warranty shall provide material and labor to repair or replace defective materials.
 - 2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

1.8 MAINTENANCE

- A. Provide maintenance requirements as specified by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Company, Corian Surfaces-Bobrick Washroom Equipment, Inc.; Sierra Series or comparable product by one of the following manufacturers meeting all requirements including sustainability requirements.
 - a. DuPont Company
 - a-b. Ampco Products, LLC
 - b-c. ASI Partitions Corp.

2.2 MATERIALS

- A. Solid color reinforced composite (SCRC) material for stiles, panels, doors, and screens with antigraffiti coating, thermoset and integrally fused into homogenous piece.
- A. ~~Solid polymer components~~
 - 1. ~~Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.~~

~~2. Superficial damage to a depth of 0.010 inch (0.25 mm) shall be repairable by sanding and/or polishing.~~

B. Toilet partitions:

1. Pilasters of 1-inch solid surface material:
 - a. Floor mounted.
2. All mounting hardware to be internally mounted in panels and pilasters and to be concealed after assembly of partitions.

C. Urinal screens:

1. Panels to be wall mounted.
2. All mounting hardware to be concealed after installation of panel.

D. Thickness: $\frac{3}{4}$ inch.

E. Performance Requirements:

1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
4. Smoke Developed Index (ASTM E 84): Less than 450.
5. Flame Spread Index (ASTM E 84): Less than 75.
6. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
7. Uniform Building Code: Class II.

~~E. Performance Characteristics~~

- ~~1. Tensile Strength (ASTM D 638): 6000 psi.~~
- ~~2. Flammability (ASTM E 84 / NFPA 255 / UL 723): Class 1 / Class A.~~
- ~~3. Flame Spread Index: <25.~~
- ~~4. Smoke Development Index: <25.~~

2.3 2.3 ACCESSORIES

A. Joint adhesive:

1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.

B. Sealant:

1. Manufacturer's standard mildew-resistant silicone sealant in colors matching components.

C. Adhesives and sealants shall comply with the requirements in section 01 81 13.14 "Sustainable Design Requirements – LEED v4 BD+C" subparagraph "Documentation on Low Emitting Materials" for Volatile Organic Chemical Emissions.

2.4 FACTORY FABRICATION

A. Shop assembly

1. Shop fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
 - a. Reinforce with strip of solid polymer material, 2" wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as required or as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
 - a. Rout cutouts, radii and contours to template.
 - b. Smooth edges.
 - c. Repair or reject defective and inaccurate work.

2.5 FINISH

- A. Refer to Section 09 00 01 "Finish Key" for product color and finish.

2.6 HARDWARE

A. Hinges:

1. Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.

B. Latch and keeper:

1. Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper.
 - a. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.

C. Coat hook:

1. Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.

D. Door bumper:

1. Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance screen doors.

E. Door pull:

1. Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction.
2. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

F. All hardware is supplied by fabricator and it's integrally mounted into the partitions at the time of manufacture.

G. Exposed hardware:

1. Stainless steel type 304.

- 2. Mild steel: Not allowed.
- H. Urinal screens:
 - 1. No visible mounting hardware is allowed.
 - 2. Concealed hardware:
 - a. Stainless steel type 304:
 - 1) This material to be used in all panel-to-wall connections.
 - b. Mild steel: Not allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
 - 1. Provide product in the largest pieces available.
 - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
 - a. Exposed joints/seams shall not be allowed.
 - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 - 4. Cut and finish component edges with clean, sharp returns.
 - 5. Rout radii and contours to template.
 - 6. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.3 3.3 REPAIR

- A. Repair or replace damaged work, which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.

END OF SECTION 10 21 13

SECTION 10 21 14 - DETENTION STAINLESS-STEEL MODESTY 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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes vertical detention stainless-steel modesty panels and associated trim.
- B. Related Sections include the following:
 - 1. Section 06 10 00 "Rough Carpentry" for Blocking.
 - 2. Section 10 28 00 "Toilet, Bath and Laundry Accessories."

1.3 SUBMITTALS

- A. A. Product data:
 - 1. For each type of product indicated.
- B. B. Shop drawings:
 - 1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
 - a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
- C. Samples:
 - 1. For each type of product indicated.
- D. Product data:
 - 1. Indicate product description, fabrication information and compliance with specified performance requirements.
- E. Sustainable Design Submittals:
 - 1. Product Data: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for Leadership Extraction Practices for the following:
 - a. Recycled content
- F. Maintenance data:
 - 1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
 - 2. Include in project closeout documents.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.

- B. Store components indoors prior to installation.
- C. Handle materials to prevent damage to finished surfaces.
 - 1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.5 WARRANTY

- A. Provide manufacturer's warranty against defects in materials.
 - 1. Warranty shall provide material and labor to repair or replace defective materials.
 - 2. Damage caused by physical or chemical abuse will not be warranted.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Modesty panel: 13-gauge stainless steel with a continuous 13-gauge stainless steel edge band.
- B. Mounting angles: 13-gauge stainless steel.
- C. Tube supports shall be made of 10-gauge stainless steel with slab bracket and ceiling bracket. (Shipped loose)
- D. Base plate: 5-inches x 6-inches x 1/4-inch stainless steel.
 - 1. Anchor base plate to floor and ceiling with 3/8"-16 x 1-inch break-off head security screws.

2.2 Mounting Angles

- A. Tube support mounting angles: 1-inch x 3/4-inch x 13 gauge stainless steel angles.
- B. Wall mounting angles: 1-1/2-inches x 1-1/2-inches x 3/16-inch stainless steel angle clips 5-inches long.

2.3 Finish

- A. All surfaces of the modesty panel, mounting angles, base plate and tube support shall be directional belt sanded (satin).

2.4 Fabrication

- A. Mounting angles shall be welded along panel and dressed smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances, and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

3.3 REPAIR

- A. Repair or replace damaged work, which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

- A. Keep components clean during installation.
- B. Remove adhesives, sealants and other stains.

END OF SECTION 10 21 14

SECTION 10 22 13 - WIRE MESH PARTITIONS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard-duty wire mesh partitions.
 - 2. Wire mesh ceilings.

1.3 DEFINITIONS

- A. Intermediate Crimp: Wires pass over one and under the next adjacent wire in both directions, with wires crimped before weaving and with extra crimps between the intersections.
- B. Lock Crimp: Deep crimps at points of the intersection that lock wires securely in place.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: For Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate clearances required for operation of doors.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wire mesh partition hardware to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Locks: Furnish 5 percent of quantity installed for each type indicated, but no fewer than two locks.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire mesh items to provide protection during transit and Project-site storage. Use vented plastic.
- B. Inventory wire mesh partition door hardware on receipt, and provide secure lockup for wire mesh partition door hardware delivered to Project site.
 - 1. Tag each item or package separately with identification, and include basic installation instructions with each item or package.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. Acorn Wire & Iron Works, LLC.
 - 2. American Woven Wire Corporation.
 - 3. Central Wire and Iron.
 - 4. King Wire Partitions, Inc.
 - 5. Miller Wire Works, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Wire mesh units shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
 - 1. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft. at any location on a panel.
 - 2. Total load of 200 lbf applied uniformly over each panel.

3. Concentrated load and total load need not be assumed to act concurrently.

2.3 MATERIALS

- A. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre consumer recycled content not less than 25 percent. Refer to Section 01 81 13.14 "SUSTAINABLE DESIGN REQUIREMENTS - LEED V4 BD+C" for recycled content requirements.
- B. Steel Wire: ASTM A 510.
- C. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.
- D. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- E. Steel Pipe: ASTM A 53/A 53M, Schedule 40, unless another weight is indicated or required by structural loads.
- F. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.
- G. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- H. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.
- I. Post-Installed Anchors: Capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components are zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- J. Power-Driven Fasteners: ICC-ES AC70.
- K. Galvanizing Repair Paint: High-zinc-dust-content paint for regalanizing welds in steel, complying with SSPC-Paint 20.

2.4 STANDARD-DUTY WIRE MESH PARTITIONS

- A. Mesh: 0.135-inch-diameter, intermediate-crimp steel wire woven into 2-inch square openings.
- B. Posts for 90-Degree Corners: 1-1/4-by-1-1/4-by-1/8-inch steel angles or square tubes with holes for 1/4-inch-diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.

- C. Posts for Other-Than-90-Degree Corners: Steel pipe or tubing with holes for 1/4-inch-diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
 - 1. Partitions up to 12 Feet High: 1-1/4-inch OD by 1/8 inch.
 - 2. Partitions up to 20 Feet High: 2-1/2-inch OD by 1/8 inch.
- D. Adjustable Corner Posts: Two 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels connected by steel hinges at 36 inches o.c., with holes for 1/4-inch-diameter bolts aligning with bolt holes in vertical framing.
- E. Line Posts: 3-inch-by-4.1-lb or 3-1/2-by-1-1/4-by-0.127-inch steel channels; with 1/4-inch steel base plates.
- F. Three-Way Intersection Posts: 1-1/4-by-1-1/4-by-1/8-inch steel tubes or channels, with holes for 1/4-inch-diameter bolts aligned for bolting to adjacent panels.
- G. Four-Way Intersection Posts: 1-1/4-by-1-1/4-by-1/8-inch steel tubes, with holes for 1/4-inch-diameter bolts aligned for bolting to adjacent panels.
- H. Floor Shoes: Metal, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.
- I. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/4-by-1/2-by-1/8-inch steel channels or 1-1/4-by-5/8-by-0.080-inch cold-rolled, C-shaped steel channels, banded with 1-1/4-by-1/8-inch flat steel bar cover plates on four sides, and with 1/8-inch-thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, 3-by-3-inch steel, three per door; bolted, riveted, or welded to door and jamb framing.
 - 2. Cylinder Lock: Unless noted otherwise, Mortise type with cylinder specified in Section 08 71 00 "Door Hardware"; operated by key outside and lever inside; mounted in lower section of door.
 - 3. Electrified Cylinder Lock: At locations indicated, Electrified mortise type with cylinder specified in Section 08 71 00 "Door Hardware" and security equipment specified in Section 28 13 00 "Physical Access Control System"; operated by key outside and lever inside; mounted in lower section of door.
 - a. Basis of Design Lockset: Corbin-Russwin ML20900 ECL Series.
 - b. Provide armored cabling for all exposed cable.
 - 4. Door Position Switches: at locations indicated, Sentrol 2707AD High Security Concealed Magnetic Contacts.
 - a. Provide surface mount switches on secure side of hatch.
 - 3-5. Inactive Leaf Hardware: Cane bolt at bottom and chain bolt at top.
- J. Sliding Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on four sides.
 - 1. Hardware: Two, four-wheel roller-bearing carriers, box track, and bottom guide channel for each door.
 - 2. Padlock Lug: Mortised into door framing and enclosed with steel cover.

- K. Accessories:
 - 1. Sheet Metal Base: 0.060-inch-thick steel sheet.
 - 2. Adjustable Filler Panels: 0.060-inch-thick steel sheet, capable of filling openings from 2 to 12 inches.
 - 3. Wall Clips: Manufacturer's standard, steel sheet; allowing up to 1 inch of adjustment.
- L. Finish: Hot-dip galvanized unless otherwise indicated.

2.5 WIRE MESH CEILINGS

- A. Mesh, Framing, and Stiffeners: Fabricated from same mesh and framing as wire mesh partition panels.
- B. Perimeter Partition Supports: 1-1/2-by-1-1/2-by-1/8-inch steel angle, with holes for 1/4-inch-diameter bolts aligned for bolting to top of wire mesh partitions and to sides of wire mesh ceiling panels.
- C. Wall Supports: 1-1/2-by-1-1/2-by-1/8-inch steel angle punched for attachment to wall and wire mesh ceiling panels.
- D. Intermediate Supports: Steel I-beams or rectangular tubes, as recommended by manufacturer.
- E. Intermediate Support Posts: 2-by-2-by-1/8-inch steel tubes.
- F. Finishes: Match adjacent wire mesh partitions.

2.6 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts, hardware, and accessories required for complete installation with manufacturer's standard finishes.
 - 1. Fabricate wire mesh items to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and remove spatter.
- B. Standard-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 - 1. Mesh: Securely clinch mesh to framing.
 - 2. Framing: Fabricate framing with mortise and tenon corner construction.
 - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
 - b. Fabricate three- and four-way intersections using manufacturer's standard connecting clips and fasteners.
 - c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.

3. Fabricate wire mesh partitions with 3 to 4 inches of clear space between finished floor and bottom horizontal framing.
 4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
 5. Doors: Align bottom of door with bottom of adjacent panels.
 - a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
 6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.
- C. Wire Mesh Ceilings: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
1. Mesh: Securely clinch mesh to framing.
 2. Framing: Fabricate framing with mortise and tenon corner construction.
 - a. Provide stiffeners as indicated or, if not indicated, as required by panel span and as recommended by wire mesh ceiling manufacturer. Weld stiffeners to framing.
- D. Wire Mesh Stairway Partitions: Provide door jamb framing on each side of doors. Attach tamper shields centered behind exit devices.

2.7 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

2.8 PRIVACY SLATS

- A. High Density Polyethylene (HDPE) extruded slats intended to fit between wire mesh picketts.
- B. Integral color with UV inhibitor.
1. Color as selected by Architect from Manufacturer's full line.
- C. Top or bottom locking mechanism to maintain consistent top edge height.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine floors for suitable conditions where wire mesh items will be installed.
- C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRE MESH PARTITIONS ERECTION

- A. Anchor wire mesh partitions to floor with 3/8-inch-diameter postinstalled expansion anchors at 12 inches o.c. through anchor clips located at each post and corner. Shim anchor clips as required to achieve level and plumb installation.
1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- B. Anchor wire mesh partitions to floor with 3/8-inch-diameter postinstalled expansion anchors at 12 inches o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.
- C. Anchor wire mesh partitions to walls at 12 inches o.c. through back corner panel framing and as follows:
1. For concrete and solid masonry anchorage, use expansion anchors.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 4. For steel-framed gypsum board assemblies, use lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
- D. Secure top capping bars to top framing channels with 1/4-inch-diameter "U" bolts spaced not more than 28 inches o.c.
- E. Provide line posts at locations indicated or, if not indicated, as follows:
1. On each side of sliding-door openings.
 2. For partitions that are 7 to 9 feet high, spaced at 15 to 20 feet o.c.
 3. For partitions that are 10 to 12 feet high, located between every other panel.
 4. For partitions that are more than 12 feet high, located between each panel.
- F. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- G. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- H. Install doors complete with door hardware.
- I. Install service windows complete with window hardware.
- J. Weld or bolt sheet metal bases to wire mesh partitions where indicated.

- K. Bolt accessories to wire mesh partition framing.

3.3 WIRE MESH CEILINGS ERECTION

- A. Anchor wall support angle to walls at 12 inches o.c. and as follows:
 - 1. For concrete and solid masonry anchorage, use expansion anchors.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed gypsum board assemblies, use lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.
- B. Attach wire mesh ceiling panels to wall support angles with bolts at 12 inches o.c.
- C. Attach wire mesh ceiling panels to wire mesh partitions with slotted angles bolted to sides of ceiling panels and to top of partitions at 12 inches o.c.
- D. Attach wire mesh ceiling panels to intermediate supports as recommended by manufacturer.
- E. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors and gates to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Remove and replace defective work, including doors and framing that are warped, bowed, or otherwise unacceptable.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.
- D. Refer to Section 01 74 23 "Final Cleaning" for additional requirements.

END OF SECTION 10 22 13

SECTION 10 22 26 - OPERABLE PARTITIONS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Manually operated, individual glass panel partitions.
- B. Related Sections include the following:
 - 1. Division 03 Sections for concrete tolerances required.
 - 2. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per glass operable partition supplier's template.
 - 3. Division 06 Sections for wood framing and supports and all blocking at head and jambs as required.
 - 4. Division 08 Sections for lock cylinders and keying requirements.
 - 5. Division 09 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the glass operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for Architectural Application and Installation of Operable Partitions."

1.4 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable glass panel partition, component, and accessory specified.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
- C. Shop Drawings: Show location and extent of operable glass panel partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings and at storage

areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

- D. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- E. Samples: Color samples demonstrating full range of finishes available for selection by architect. Verification samples will be available in same thickness and material indicated for the work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- B. Protect panel and glazing materials during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage to the glass and hardware.

1.6 WARRANTY

- A. Manufacturer's Special Project Warranty on Glass Panels: Provide written warranty signed by the manufacturer of glass operable partitions agreeing to replace those panels with manufacturing defects.
 - 1. Manufacturing defects are defined as any defect materially obstructing vision through the glass, and mechanical failure of hardware which prevents the proper operation of the panels after appropriate installation.
 - 2. Warranty period: Two (2) year from date of installation.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Modernfold, Inc., Glass Wall Model FSW-G and FSW-C with single point fixings or comparable approved product meeting all requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.

2.2 OPERATION

- A. Manually operated and top-supported series of individual glass panels. Panels use two-piece, clamp-on top and bottom rail that fastens together from alternating sides.

2.3 CONSTRUCTION

- A. Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with concealed fasteners. Finished in-place partition shall be rigid, level, plumb,

aligned with uniform joints and appearance; free of bow, warp, twist, deformation, surface and finish irregularities.

- B. Dimensions: Fabricate operable glass panel partitions with manufacturer's standard panel sizes to form an assembled system of dimensions indicated on Drawings, and verified by field measurements.
 - 1. Maximum panel width: 39-inches
 - 2. Standard rail thickness: 1-7/8-inches
- C. Top and Bottom Rails: Continuous two-piece assemblies with removable end caps. Rails fasten together from alternate sides of partition allowing for field adjustment to job site conditions. Snap-on covers are furnished to facilitate installation.
- D. Bottom Rail Locking System: Floor bolts are used to stabilize panels from movement in all directions.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B221 (ASTM B221M) for extrusions; manufacturer's standard strengths and thicknesses for type of use.
- B. Glass: Compliant with safety standards specified in ANSI Z97.1 CPSC16, CFR1201, ASTM C1036 and ASTM C1048.
 - 1. Thickness: 1/2-inch or 3/8-inch; tempered.
 - 2. Color: Clear

2.5 PANEL FINISHES

- A. Provide top and bottom fittings with the following finish:
 - 1. Satin stainless steel clad

2.6 SUSPENSION SYSTEM

- A. Suspension Tracks: Extruded aluminum with a minimum wall thickness of 0.235 inches. Incorporate cast aluminum or mitered intersections, switches, and curves in stacking area. Provide alignment pins for track, intersections, switches and curves insuring both fit and roller surface integrity.
 - 1. Exposed track soffit: Factory-finished aluminum with white powder coat.
- B. Carriers: Two stainless steel trolleys with vinyl roller surfaces. Trolley design incorporates eight (8) wheels of varying dimensions. Automatic indexing of panels into stack area is provided by pre-programmed switches and trolleys without electrical, pneumatic, or mechanical activation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E557, operable glass partition manufacturer's written installation instructions, Drawings, and approved Shop Drawings.

- B. Install operable glass partitions and accessories after other finishing operations, including painting, have been completed.
- C. Match operable glass partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

- A. Clean metal and glass surfaces upon completing installation of operable glass partitions to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that insure operable glass partitions are without damage or deterioration at time of Substantial Completion.

3.3 3.3 ADJUSTING

- A. Adjust operable glass partition to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 3.4 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable glass partitions. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Insure finished floor under operable glass partition is level ± 0.13 -inch in ten (10) feet non-cumulative.

3.5 3.5 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representatives.

END OF SECTION 10 22 26

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections (including all sustainability requirements), apply to this Section.
- B. Section Includes:
 - 1. Wall guards.
 - 2. Impact-resistant handrails.
 - 3. Corner guards.
 - 4. Interior bollards.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
 - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Product Data: Documentation for Low Emitting Materials
 - a. Low Emitting Materials for Adhesives and Sealants
- C. Shop Drawings: For each type of wall and door protection showing locations and extent.
 - 1. Include plans, elevations, sections, and attachment details.
- D. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated, in each color and texture specified.
 - 1. Include Samples of accent strips and accessories to verify color selection.
- E. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
 - 1. Wall Guards: 12 inches long. Include examples of joinery, corners, end caps, and field splices.
 - 2. Corner and End-Wall Guards: 12 inches long. Include example top caps.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of handrail.

- B. Material Certificates: For each type of exposed plastic material.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- 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. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 96-inch-long units.
 - 2. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
 - 2. Keep plastic materials out of direct sunlight.
 - 3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store wall-guard covers in a horizontal position.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall-products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.

2.3 WALL GUARDS

- A. Bumper Rail: Standard-duty, PVC-free assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.
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. Babcock-Davis.
 - b. Construction Specialties, Inc.
 - c. Nystrom, Inc.
 - d. WallGuard.com.
 2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; as follows:
 - a. Profile: Flat profile, nominal 4 inches high by 1 inch deep.
 - b. Color and Texture: As selected by Architect from manufacturer's full range.
 3. Continuous Retainer: Minimum 0.080-inch-thick, one-piece, extruded aluminum.
 4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
 5. Bumper: Continuous, resilient bumper cushion(s).
 6. End Caps and Corners: Prefabricated, injection-molded plastic; matching color cover; field adjustable for close alignment with snap-on cover.
 7. Accessories: Concealed splices and mounting hardware.
 8. Mounting: Surface mounted directly to wall.
- B. Stainless Steel Wainscot:
1. Refer to Section 09 00 01 "Finish Key".
 - ~~1. Material: Stainless-steel sheet, Type 304.~~
 - ~~a. Thickness: Minimum 0.0781 inch.~~
 - ~~b. Finish: Directional satin, No. 4 Diamond Plate.~~
 2. Mounting: Adhesive:
 - a. Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 and South Coast Quality Management District (SCAQMD) rule 1168 2005 using the applicable exposure scenario.

- 1) Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional requirements.

2.4 CORNER GUARDS

- A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed metal with formed edges; with 90- or 135-degree turn to match wall condition.
 1. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0781 inch.
 - b. Finish: Directional satin, No. 4.
 2. Wing Size: As indicated.
 3. Corner Radius: 1/8 inch.
 4. Mounting: As indicated.
 - a. Adhesive:
 - 1) Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 and South Coast Quality Management District (SCAQMD) rule 1168 2005 using the applicable exposure scenario.
 - 2) Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional requirements.
 - b. Screws: Flat head, countersunk, stainless steel.
- B. Flush-Mount, Stainless Steel Corner Guards: Fabricated as one piece from formed metal; with 90-degree turn to match wall condition.
 1. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 16-gauge.
 - b. Finish: Directional satin, No. 4.
 2. Wing Size: As indicated.
 3. Corner Radius: 1/8 inch.
 4. Mounting: Screw to wall structure as indicated by manufacturer.

2.5 END-WALL GUARDS

- A. Surface-Mounted, Metal, End-Wall Guards: Fabricated from one-piece, formed or extruded metal that covers entire end of wall; with formed edges.
 1. Material: Stainless-steel sheet, Type 304.
 - a. Thickness: Minimum 0.0781 inch.
 - b. Finish: Directional satin, No. 4.
 2. Wing Size: Nominal 1-1/2 by 1-1/2 inches.
 3. Corner Radius: 1/8 inch.
 4. Mounting: Adhesive.
 - a. Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 and South Coast Quality Management District (SCAQMD) rule 1168 2005 using the applicable exposure scenario.

2.6 INTERIOR BOLLARDS

- A. Floor Anchored, fixed, heavy duty, stainless steel bollard.

- B. Basis-of-Design Product: Subject to compliance with requirements, provide Alvarado Mfg. Co., Inc.; The C-Post or comparable approved product meeting all requirements including sustainability requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.
- C. Post
 - 1. Material: 11-gauge rolled steel, chrome plated finish.
 - 2. Size: 3-inch diameter.
 - 3. Height: 36-inches.
 - 4. Base Cover: 5-1/2-inches diameter.
 - a. Material: match post.
- D. Floor Anchor: Manufacturer's standard expansion anchors, 4 anchors per bollard.

2-62.7 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- C. Adhesive: As recommended by protection product manufacturer.
 - 1. Provide products that do not contain excessive levels of VOC's in accordance with the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings or the South Coast Quality Management District(SCAQMD) Rule 1113 June 2011.

2-72.8 FABRICATION

- A. Fabricate wall protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2-82.9 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
- B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings. If not indicated on Drawings, install at heights indicated below:
 - 1. Bumper Rails: 36-inches above finished floor.
- C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
 - 3. Adjust end caps as required to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.
- C. Refer to Section 01 74 23 "Final Cleaning" for additional cleaning requirements.

END OF SECTION 10 26 00

SECTION 10 26 41 – BULLET RESISTANT 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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. This Section includes Fiberglass composite panels.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating installation with adjacent attachment to building structure.
- C. Samples: For each material.
- D. Product test reports.
- E. Research/evaluation reports.
- F. Maintenance data.

1.4 STANDARDS

- A. UNDERWRITERS LABORATORY UL 752 11th Edition dated Sept. 5, 2005 Standard for Bullet Resistant Equipment
- B. Submit for approval prior to fabrication catalog cuts, brochures, specifications, UL LISTING VERIFICATION, proof of possession of PRODUCT LIABILITY INSURANCE in an amount not less than five million U.S. dollars, and printed data in sufficient detail to indicate compliance with the contract documents and the manufacturer's instructions for the installation of Bullet Resistant Fiberglass. Furnish verification of compliance with ASTM E119-00e ONE HOUR FIRE RATING from a recognized testing laboratory.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver the materials to the project with the manufacturer's U. L. Labels intact and legible. Handle the material with care to prevent damage. Store the materials inside under cover, stack flat and off the floor.

1.6 WARRANTY

- A. All materials and workmanship shall be warranted against defects for a period of two (2) years from the date of receipt at the project site.

PART 2 - PRODUCTS

2.1 BULLET RESISTANT FIBERGLASS MATERIAL

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Safeguard security services, LTD Armortex; Armotex O.F. 300 fiberglass composite panels, Ballistic Level, UL-Level 3.
 - 1. Diebold, Inc.
 - 2. Ross Engineering
 - 3. Norshield Security Products
- B. U. L. Listed Level 3 bullet resistant fiberglass not manufactured with starch – oil ballistic grade cloth will be in excess of 1 3/8" in thickness and or exceed 15 lbs. per square foot and is not acceptable.

2.2 SECURITY LEVEL

- A. The Bullet Resistant Fiberglass Composite panel(s) must be U. L. LISTED, RATED FOR LEVEL 3.

PART 3 - EXECUTION

3.1 SUPPORTING MEMBERS

- A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and the architectural drawings.

3.2 JOINTS

- A. All joints shall be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer at joint shall be 4" (2" on each panel or a 2" minimum overlap).
- B. All internal 90 Degree corners provide lap for the entire depth of bullet resistive material.

3.3 APPLICATION

- A. Armor shall be installed in accordance with the manufacturer's printed recommendations. Armor panels shall be adhered using an industrial adhesive, mastic, screws or bolts. Method of application shall maintain the bullet resistive rating at junctures with the concrete floor slab, the concrete roof slab, the bullet resistive door frames, the bullet resistive window frames, and all required penetrations.

END OF SECTION 10 26 41

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Underlavatory guards.
 - 3. Custodial accessories.
- B. Related Requirements:
 - 1. Section 09 30 13 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

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.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Product Data: Documentation for Low Emitting Materials
 - a. Low Emitting Materials for Adhesives and Sealants
 - 3. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's)
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, visible silver spoilage defects.
 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WASHROOM AND SHOWER ROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Products: Subject to compliance with requirements, provide one of the following:

Key	Description	Manufacturer	Product No.
GB	Grab Bar – 42" 1-1/2" diameter stainless steel	Bradley Bobrick	812 B-6806
GB	Grab Bar – 36" 1-1/2" diameter stainless steel	Bradley Bobrick	812 B-6806
GBS	Security Grab Bar – 42" 1-1/2" diameter stainless steel	Bradley	SA70
	Mop/broom holder – 4 holders	Bradley	9954
SCD	Seat cover dispenser - recessed	Bradley Bobrick	584 B-301
MI	Tilted glass mirror with shelf - 18"x36"	Bradley Bobrick	7405 B-166
MI	Mirror – accessible	Bobrick	B-290
SD	Soap dispenser – recessed	Bobrick	B-306
SD	Soap dispenser – surface mounted	deb	CTF16LC
SD	Soap dispenser – surface (wall) mounted	OFCI	---
TPD	Toilet paper dispenser, surface mounted double 9" rolls	Bradley Bobrick	5425 B-2892
SND	Sanitary napkin disposal – surface mounted	Bradley Bobrick	4721/4722 - 15 B-254
SND	Sanitary napkin disposal – recessed	Bradley Bobrick	4732-1015 B-353
SND	Sanitary napkin disposal – partition mount-	Bradley	4721-15

	ed dual access	Bobrick	B-354
SNV	Sanitary napkin vendor – surface mounted	Bradley Bobrick	4A20 (FREE) B-2706 50
SNV	Sanitary napkin vendor – recessed	Bradley Bobrick	402 B-3706-50
PTD	Automated paper towel dispenser and waste receptacle– recessed, 12 gallon	Georgia Pacific, enMotion	59491 with 59466
PTD	Automated paper towel dispenser – recessed	Georgia Pacific	59466 59471
PTD	Paper towel dispenser – non-automatic, surface mounted	TBD	TBD
	Fold down utility shelf - surface mounted	Bradley Bobrick	790 B-287
	Circular waste chute - 6" diameter	Bradley Bobrick	P10 – 696 B-352
	Retractable stanchion – recessed, full opening or 10 ft	Visiontron	700
	Hooks and shelf - 6	Bradley Bobrick	9124 B-298 shelf B-985 hook strip
MIF	Mirror, custom – full size	Bradley Bobrick	705 series B-290 2472
	Folding child seat – surface mounted	Koala Brocar	KB102-00 103-BQS
WH	Robe hook - single	Bradley Bobrick	931 B-76717
WH	Robe hook - double	Bradley Bobrick	932 B-76727
	Garment rack/hooks – surface mounted with 3 hooks	Ex-Cell Kaiser	703 SA or 724 CHR
	Pull down step	Step & Wash	SNW-SS 975B
CS	Changing table, height adjustable - 440# capacity	Max-Ability	PRESSALIT CARE 2000
	Door stop	Bobrick	B-687
	Shower curtain rod	Bobrick	B-6047
	Shower curtain hooks	Bobrick	204-1
	Shower curtain – 10 mil thick minimum nylon, anti-static, anti-bacterial, flame-retardant, hemmed sides, reinforced top, corrosion-resistant grommets		White or light color
	Shower seat, folding	Bobrick	B-5181
CS	Changing table, child	Bradley Koala	9612 KB100-00 or KB-110-SSWM
	Soap dish, recessed	Bradley Bobrick	9352 and 9353 B-4390
	Towel bar, surface mounted	Bobrick	B-530-24

	Ionizer (1 per 8 sanitary fixtures)	Biozone	AC series
	Sharps Disposal – Recessed Unit	Bradley Bobrick	989 B-35016

2.2 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

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. Plumberex Specialty Products, Inc.
 - b. Truebro by IPS Corporation.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.3 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Mop and Broom Holder:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bradley Corporation; 9954.

2.4 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.
- D. Refer to Section 01 74 23 "Final Cleaning" for additional cleaning requirements.

END OF SECTION 10 28 00

SECTION 10 43 13 - DEFIBRILLATOR CABINETS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Defibrillator cabinets, accessories, and installation.
 - 2. Automated external defibrillators (AED's)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for AED cabinets.
 - 1. Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 2. Automated External Defibrillator
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
- C. Shop Drawings: For defibrillator cabinets. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each type of exposed finish required.
- E. Samples for Initial Selection: For each type of exposed finish required.
- F. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- G. Product Schedule: For defibrillator cabinets. Indicate whether recessed, semi recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For AED cabinets and AED's to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to AED cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.
- C. Qualifications:
 - 1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

1.6 DELIVERY, STORAGE & HANDLING

- A. Delivery:
 - 1. Deliver materials in manufacturer's original packaging with identification labels intact.
- B. Storage and Protection:
 - 1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.7 SEQUENCING

- A. Sequence With Other Work: Comply with defibrillator cabinet manufacturer's written recommendations for sequencing construction operations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Stainless-Steel Sheet: ASTM A 666, Type 304.
- C. Tempered Float Glass: ASTM C 1048, Kind KT, Condition A, Type I, Quality q3, 1/8 inch, Class I (clear).

2.2 AED CABINET

- A. Cabinet Type: Suitable for mounting AED with emergency telephone and alarm.
- B. Basis of Design manufacturer: Potter Roemer LLC; or a comparable product by one of the following:
 - 1. J. L. Industries, Inc., a division of Activar Construction Products Group;.
 - 2. Larsen's Manufacturing Company.

- C. Cabinet Interior Size: 14 inches wide by 14 inches high by 6-3/4 inches deep, as required to incorporate AED and specified features. All cabinet components and equipment shall be accessible, removable and replaceable with the cabinet door in a 90 degree position.
- D. Cabinet Material: Stainless-steel sheet.
- E. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim.
- F. Cabinet Trim Material: Stainless-steel sheet.
- G. Door Material: Stainless-steel sheet.
- H. Door Style: Provide limited visibility window.
- I. Door Glazing: Tempered float glass.
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide manufacturer's standard.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- K. Accessories:
 - 1. Identification: Manufacturer's standard.
- L. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for the interior of cabinet.
 - 2. Stainless Steel: No. 4.
- M. Cabinet Interior Features:
 - 1. Emergency Phone Box.
 - 2. Cable Access Box
 - 3. Raceway
- N. Alarm:
 - 1. Circuitry Board.
 - 2. Alarm Circuitry
 - 3. Alarm Key Switch and Key:
 - 4. Control for Visual Alarm, Audio Alarm and Relay Closures:
- O. Power Requirements for Alarm Board, Siren and LED:

2.3 AUTOMATED EXTERNAL DEFIBRILLATOR (AEDS)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Philips Heartstart OnSite Defibrillator or comparable approved product meeting all requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.

2.4 FABRICATION

- A. AED Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 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 finishes on exposed surfaces of AED cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish AED cabinets after assembly.
- D. 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.

2.6 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install AED cabinets in locations and at mounting heights, at heights acceptable to the Fire Department and according to the Florida Building Code – Accessibility, Fifth Edition.
- B. AED Cabinets: Fasten cabinets to structure, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust cabinet doors to operate easily without binding.
- C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by AED cabinet and mounting bracket manufacturers.
- E. Replace AED cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 43 13

SECTION 10 44 13 - FIRE PROTECTION CABINETS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - b. Fire hose valves.
- B. Related Requirements:
 - 1. Section 10 44 16 "Fire Extinguishers."
 - 2. Section 21 12 00 "Fire-Suppression Standpipes" for fire-hose connections.

1.3 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
 - 1. Show location of knockouts for hose valves.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
- C. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each type of exposed finish required.
- E. Samples for Initial Selection: For each type of exposed finish required.
- F. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.

- G. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers and hose valves indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.7 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. 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.

2.2 FIRE-PROTECTION CABINET FEC

- A. Cabinet Type: Suitable for fire extinguisher.
 - 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. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Larsens Manufacturing Company.
 - c. Potter Roemer LLC.
- B. Cabinet Construction: Nonrated and rated to match wall construction.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material (Public Areas): Stainless-steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.

- D. Cabinet Material (Non-Public and Exterior Areas): Aluminum.
 - 1. Shelf: Same metal and finish as cabinet.
- E. Recessed Cabinet (Public Areas):
 - 1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as drywall bead.
- F. Semirecessed Cabinet (Non-Public Areas): One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- G. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- H. Cabinet Trim Material: Same material and finish as door.
- I. Door Material (Public Areas): Stainless-steel sheet.
- J. Door Material (Non-Public Areas): Aluminum sheet.
- K. Door Style (Public Areas): Flush opaque panel, frameless, with no exposed hinges.
- L. Door Style (Non-Public Areas): Vertical duo panel with frame.
- M. Door Glazing: Tempered break glass.
- N. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide projecting door pull and friction latch.
 - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- O. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
 - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to solid opaque panel doors and on cabinet glazing at vertical duo doors.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

P. Materials:

1. Aluminum: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 for extruded shapes.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: Match Architect's sample.
2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.
3. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.3 FIRE-PROTECTION CABINET FVC

A. Cabinet Type: Suitable for fire-hose valve.

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. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Larsens Manufacturing Company.
 - c. Potter Roemer LLC.

B. Cabinet Construction: Nonrated and rated to match wall construction.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Stainless-steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet (Public Areas):

1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as drywall bead.

E. Semirecessed Cabinet (Non-Public Areas): One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

G. Cabinet Trim Material: Same material and finish as door.

H. Door Style: Fully glazed panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Accessories:

1. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to solid opaque panel doors and on cabinet glazing at vertical duo doors.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

L. Materials:

1. Aluminum: ASTM B 221, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 for extruded shapes.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: Match Architect's sample.
2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.
3. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
 2. Provide factory-drilled mounting holes.
 3. Prepare doors and frames to receive locks.
 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.

- D. 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 roughing-in for hose valves and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- F. Refer to Section 01 74 23 "Final Cleaning" for additional cleaning requirements.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.
- B. Related Requirements:
 - 1. Section 10 44 13 "Fire Protection Cabinets."

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and ~~UL~~labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ansul Incorporated; Tyco International.
 - b. Fire End & Croker Corporation.
 - c. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - d. Kidde Residential and Commercial Division.
 - e. Potter Roemer LLC.
 - f. Pyro-Chem; Tyco Fire Suppression & Building Products.
 - 2. Valves: Manufacturer's standard.
 - 3. Handles and Levers: Manufacturer's standard.
 - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container (Public Areas): UL-rated 4:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- C. Multipurpose Dry-Chemical Type in Aluminum Container (Non-Public Areas): UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher UON.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 10 51 13 - METAL LOCKERS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Welded corridor lockers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
- C. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- D. Samples: For each color specified, in manufacturer's standard size.
- E. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- F. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
 - a. Locks.
 - b. Identification plates.
 - c. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

- A. Coordinate sizes and locations of bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Verify available warranties and warranty periods for units and components.
 - 4. Warranty Period for Welded Metal Lockers: Lifetime from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the Florida Building Code Fifth Edition (2014) – Accessibility.

2.3 WELDED CORRIDOR LOCKERS

- 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. AJW Architectural Products.
 - 2. ASI Storage Solutions; ASI Group.
 - 3. DeBourgh Mfg. Co.
- B. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
 - 1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
 - 2. Door Style: Unperforated panel.
- C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 - 1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
 - 2. Backs: 0.048-inch nominal thickness.
 - 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
 - 1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 - 1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.

- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- G. Locks: Combination padlocks (provided by others).
- H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
- I. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- J. Coat Rods: Manufacturer's standard.
- K. Continuous Zee Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.
 - 1. Height: 4 inches.
- L. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
 - 1. Closures: Vertical-end type.
- M. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
- N. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- O. Boxed End Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- P. Materials:
 - 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- Q. Finish: Baked enamel or powder coat.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 LOCKS

- A. Combination Padlocks: Provided by Owner.

2.5 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- E. Accessible Lockers: Fabricate as follows:
 - 1. Locate bottom shelf no lower than 15 inches above the floor.
 - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
- G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
 - 1. Sloping-top corner fillers, mitered.
- H. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.
- I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
- J. Boxed End Panels: Fabricated with 1-inch-wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.

- K. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
 - 1. Provide one-piece panels for double-row (back-to-back) locker ends.
- L. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.6 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
 - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
 - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
 - 3. Anchor back-to-back metal lockers to floor.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
 - 1. Attach hooks with at least two fasteners.
 - 2. Attach door locks on doors using security-type fasteners.
 - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

- a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 1. Attach recess trim to recessed metal lockers with concealed clips.
 - 2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
 - 3. Attach sloping-top units to metal lockers, with closures at exposed ends.
 - 4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
 - 5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

SECTION 10 51 70 - WEAPON LOCKERS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall mounted handgun lockers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of handgun locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of handgun locker.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
- C. Samples: For each color specified, in manufacturer's standard size.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.
- E. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver handgun lockers until spaces to receive them are clean, dry, and ready for their installation.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of installation area by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that handgun lockers can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain handgun lockers and accessories from single source from single locker manufacturer.
 - 1. Obtain locks from single lock manufacturer.

2.2 HANDGUN LOCKERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Spacesaver Corporation, Wall Mounted Handgun Locker EDGH04 or comparable approved product by one of the following.
 - 1. Fasco Security Products
 - 2. Precision Locker Company.
 - 3. Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.
- B. Cabinet:
 - 1. Material: 16 gauge steel
 - 2. Door: 5-inch x 10-inch minimum opening
 - 3. Lock: individually keyed with master key.
 - a. Drill and pick resistant
 - 4. Compartment: 6-inch minimum depth, neoprene lined.
 - 5. Identification Plates: Manufacturer's standard, etched, embossed, or stamped plates.
 - 6. Finish: Powder Coat.
 - a. Color as selected by architect from manufacturer's full line.

2.3 FABRICATION

- A. Fabricate handgun lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true.
 - 1. Mount lockers to walls using pre-drilled mounting holes.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect handgun lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace handgun lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by manufacturer.

END OF SECTION 10 51 70

SECTION 10 71 13 - EXTERIOR SUN CONTROL DEVICES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes: Shop fabricated metal screen panels to mount on the exterior of the building.
- B. Related Requirements
 - 1. Section 05 21 00 "Structural Steel Framing" for structural attachment

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include, section properties, load and span tables, dimensions, and finishes.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
- C. Shop drawings shall be submitted showing panel placement, profiles, material thicknesses, finishes, layout, anchorage and openings as dimensioned on the Architectural drawings.
- D. Samples for Initial Selection
 - 1. Provide color samples for finish selection.
- E. Samples for Verification
 - 1. Provide a full width sample of each panel showing material and finish.

1.5 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. Refer to Section 01 43 39 "Visual Mock-up Requirements" for requirements.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. The panels shall be protected from damage during storage, and handling.
- B. Screen panels shall be elevated above the ground, sloped to provide drainage, and protected from the weather with a ventilated covering. Moisture must not be allowed to accumulate between or on panels; contractor shall monitor, protect, and handle accordingly. All banded bundles shall be broken open so that air can circulate between the metal surfaces.

PART 2 - PRODUCTS

2.1 SUNSCREEN PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide EPIC Metals Corporation, Type EST4 Panels or comparable approved product meeting all requirements including sustainability requirements.
 1. Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.
- B. Design Depth: 2-1/2"

2.2 MATERIAL

- A. The screen panels shall be cold-formed from steel coils conforming to ASTM A653, Grade 40, or equal, having a minimum yield strength of 40,000 psi.
- B. Before forming, the steel coils shall have received a hot-dip protective coating of zinc conforming to ASTM A924, Class G90, as defined in ASTM A653.

2.3 FABRICATION

- A. Screen panels shall be cold-formed by the continuous roll forming process in depth shown on drawings. Break-formed panels are not acceptable.
 1. The surfaces between the dovetail ribs shall be perforated.
 2. Finished Paint Option- Both surfaces of the screen panels shall be factory coated and oven cured. The finish shall be applied after perforating and forming are complete. The same color shall be used on both sides of panel. Painting prior to perforating is not acceptable. Air dry coatings are not acceptable.
 - a. Color: As selected by Architect from Manufacturer's full line.

2.4 ACCESSORIES

- A. Trim or accessories shall be provided as indicated on the Architectural design drawings.

PART 3 - EXECUTION

3.1 GENERAL

- A. The screen panels shall be installed in strict accordance with the manufacturer's instructions, approved erection drawings, and all applicable safety regulations.

3.2 BEFORE INSTALLATION

- A. The supporting frame and other work relating to the screen panels shall be examined to determine if this work has been properly aligned and completed.
- B. All components of the screen panels shall be protected from damage during storage and handling.

3.3 INSTALLATION

- A. Before being permanently fastened, screen panels shall be placed on the supporting frame and adjusted to final position with ends accurately aligned and adequately bearing on the supporting frame. Consistent coverage shall be maintained so that panels located in adjacent bays will be properly aligned.
- B. Cutting of screen panels to suit jobsite conditions shall be performed in a neat and professional manner, (no cutting torches). Only those openings indicated on the structural drawings shall be cut. Other openings shall be cut and reinforced by those requiring the openings as approved by the Structural Engineer. Exposed raw edges must be touched-up with coatings that have an equal endurance to that of the original coating.
- C. Panels shall be fastened to all supporting members with an approved fastener as specified manufacturer. Care must be taken to maintain the coverage prior to fastening the screen panels.
- D. Construction loads shall not be applied to screen panels until after the panels are permanently fastened to supporting members, and side laps are attached. The construction loads shall not exceed the capacity of the panels.
- E. Items such as signage, light fixtures, flashing, etc. shall not be attached to screen panels without specific approval of the Architect and Structural Engineer.
- F. Accessories and any supplied reinforcement for small openings shall be fastened as indicated on the manufacturer's erection drawings.

3.4 AFTER INSTALLATION

- A. Construction loads that could damage the screen panels such as heavy concentrated loads and impact loads shall be avoided. Protection or planking shall be used in all high traffic areas.
- B. Galvanizing and other coatings that are damaged must be field repaired using appropriate methods and shall be the responsibility of the contractor.
- C. Cleaning surfaces of the screen panels shall be the responsibility of the contractor.

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C PHASE 1 (WS110)

EXTERIOR SUN CONTROL DEVICES
Section 10 71 13

END OF SECTION 10 17 13

SECTION 10 73 16 - ALUMINUM CANOPIES

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 (including all sustainability requirements), apply to this Section.

1.2 SECTION INCLUDES

- A. Flat metal canopies.

1.3 RELATED SECTIONS

- A. Section 05 50 00 "Metal Fabrications".

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
- C. Shop Drawings: Submit complete shop drawings including all necessary plan dimensions, elevations and details. Contractor shall verify all dimensions and provide elevations at each column, finish floor, and related soffit before releasing to shop drawings for fabrication.
- D. Delegated-Design Submittal: Submit design calculations signed by a Registered Professional Engineer. Design calculations shall state that the system design complies with the wind requirements of ANSI/ASCE 7-88, the stability criteria of applicable building code, and other governing criteria.
 - 1. For system engineering of components and system engineering of attachment to structure to resist environmental loads.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Products shall be wholly produced by a recognized manufacturer with at least 10 years' experience in the design and fabrication of specified systems.
 - 1. Systems shall be mechanically fastened - welding is not acceptable.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Refer to Section 01 43 39 "Visual Mock-Up Requirements" for additional requirements.

1.6 PRE-INSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.10 WARRANTY

- A. Manufacturer shall warrant systems, including material and workmanship, from defects for a period of one year from substantial completion.
- B. Installer shall warrant entire scope of installation including: connections, flashing, sealing, and other items related to installation for a period of one year from substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following or comparable approved product meeting all requirements including sustainability requirements:
 - 1. Dittmer Architectural Aluminum.

2. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.

2.2 PERFORMANCE REQUIREMENTS:

- A. System Performance: Provide aluminum canopy system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Florida Building Code requirements for geographic area in which work is located.
- B. Sizes shown on drawings are to be considered minimum.
- C. Structure shall be capable of sustaining severe icing, hail, hurricane force winds and supporting a concentrated load such as being walked upon.
- D. Sustainability Requirements:
 1. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
 - a. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional information and requirements for recycled content.
 2. Environmental Product Disclosure: Provide an Environmental Product Declarations (EPD) that conforms with one of the following:
 - a. Product specific declarations in accordance with ISO 1404
 - b. Environmental Product Declarations conforming to ISO 14025, 14040, 14044 and EN 15804 or ISO 21930
 - c. Industry Wide Product Specific Type III EPD Third Party Certification

2.3 MATERIALS

- A. All aluminum extrusions shall be alloy 6063 heat treated to a T-6 temper.
- ~~B. Standard finish for all components shall be satin anodize meeting Aluminum Association Specification AA-M-10C-22A-21 minimum.~~
- B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Color and Gloss: Match Architect's sample.
- C. Fasteners:
 1. Deck Screws (rivets not permitted): Type 18-8 non-magnetic stainless steel sealed with a neoprene "O" ring beneath 5/8" outside dimension, conical washer.
 2. Fascia Rivets: Size 3/16" by 1/2" grip range aluminum rivets with aluminum mandrel.
 3. Bolts: All bolts, nuts and washers to be 18-8 non-magnetic stainless steel.
 4. Tek Screws: not permitted.

D. Acrylic Glazing:

1. Acrylic glazing and sidewall panels, where indicated, shall be acrylic panels equal to Rohm & Haas, "Plexiglas" Type G. Color to be selected by Architect. Panel thickness to be a minimum of 1/4".

2.4 FABRICATION

- A. Comply with indicated profiles, dimensional requirements and structural requirements.
- B. Use sections true to details with clean, straight sharply defined profiles and smooth surfaces of uniform color and texture, free from defects impairing strength and durability.
- C. All welding to be done by heli-arc process.
- D. Bents shall consist of shop welded one piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.
- E. Mechanical joints shall consist of stainless steel bolts with a minimum of two (2) bolts per fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2" thick by 1 1/2" aluminum bolt bars welded to structural members. All such mechanical joints must be detailed on shop drawings showing all locations.
- F. Roof Deck: Extruded aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panel widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'-0" to offset dead load deflections. Internal dams are to be used at non-draining ends of deck.
- G. Expansion joints, design structure for thermal expansion and contraction. Provide expansion joints as required.
- H. Exposed rivets used to fasten bottom of fascia to deck to have finish to match fascia.
- I. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect and Construction Manager of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 FIELD DIMENSIONS

- A. General contractor shall field confirm bent locations, dimensions and elevations shown on shop drawings prior to fabrication.

3.4 CANOPY INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install protective covers in positions indicated in plans and approved shop drawings.
- C. Protective cover shall be erected true to line, level, plumb, and leak free.
- D. Extreme care shall be taken to protect finish during handling and erection.

3.5 PROTECTION

- A. Products shall be cleaned promptly after completion of installation.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 73 16

SECTION 10 81 13 - BIRD CONTROL DEVICES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Labor, materials and supervision to install bird control netting to the building structure.
- B. Related Requirements:
 - 1. Division 23 Sections for mechanical equipment.
 - 2. Division 26 sections for light fixtures.

1.3 QUALITY ASSURANCE

- A. Obtain all technical information on products and installation from the manufacturer.
- B. Utilize manufacturer authorized Installers who are knowledgeable in installations.
- C. Installer shall visit the site to gather all information of existing site conditions.
- D. Single Source Responsibility: Netting and all parts / accessories of the bird netting shall be from one manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit all descriptive information from the manufacturer including catalogs, installation instructions and other descriptive material.
- B. Provide Warranty: Material and installation.
- C. Provide Samples: Each type of bird netting used, including proposed fastening methods and hardware.
- D. Provide certified installer statement.

1.5 PRODUCT HANDLING

- A. Protect products from damage before, during and after the installation.

1.6 PROJECT CONDITIONS

- A. Coordination: Furnish all anchor devices required to fasten system to and around existing building structure. Coordinate installation with existing conditions and within on-site tolerances.

- B. Visit site and field measure prior to fabrication and delivery of materials.

1.7 WARRANTY

- A. $\frac{3}{4}$ " bird netting shall carry a minimum 10-year guarantee against U.V. breakdown for black netting.
- B. Installation shall be guaranteed for 2 years.
- C. Installation shall be performed by a certified authorized installer.
 - 1. Proof of Certification required.

PART 2 - PRODUCTS

2.1 BIRD NETTING PRODUCT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Bird-B-Gone, Inc., Bird Net 2000 or comparable approved product meeting all requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.

2.2 BIRD NETTING SYSTEM

- A. Material: U.V. stabilized knotted polyethylene net.
 - 1. Flame resistant (270°F melting point), Rot-proof, non-conductive.
 - 2. Color: Black.
- B. Break Strength: ISO 1806 protocol mesh tested in excess of 40 lbs.
- C. Sizes: $\frac{3}{4}$ ".
- D. Hardware: All metal hardware or products shall be stainless steel.
- E. Maintenance Access: provide manufacturer's standard access system for lighting fixtures and other equipment.

2.3 MOUNTING SYSTEMS

- A. Solid Steel: For corner attachments use eye bolts with lock nuts and multipurpose cable brackets with powder actuated fire-in-pins for intermediate attachments.
- B. Steel I-Beams: For corner attachments, use eye bolts with lock nuts. For intermediate attachments, use appropriate size girder clips.
- C. Sheet Metal: Use multipurpose cable brackets with self-tapping screws for both corner and intermediate attachments.
- D. Brick, Concrete and Stone: For corner attachments, use expanding corner net bolts. For intermediate attachments, use one of the following attachments: open or closed net loop, net spike, split pin with anchor rivet or multipurpose cable bracket.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the installation area and note any detrimental or hazardous work conditions. Notify Architect and Construction Manager of unacceptable conditions.
- B. Do not proceed with installation until unacceptable conditions are corrected.

3.2 SURFACE PREPARATION

- A. Surfaces should be thoroughly cleaned and free of bird droppings, nesting materials, rust peeling paint or other debris.
- B. Remove or repair articles that may damage bird netting after installation, including overhanging foliage, brush and loose parts on the structure.

3.3 INSTALLATION

- A. Install bird net as recommended by the manufacturer. Bird net shall fit the area to be protected perfectly so pest birds cannot enter the protected area, and so the netting blends with the architecture.
- B. Provide access for light fixtures and other equipment requiring periodic maintenance,
- C. Bird net shall be installed tightly and securely to ensure a long-lasting installation that is visually hard to see.

3.4 INSPECTION

- A. Visually inspect bird net for any signs of poor installation, including loose screws, fasteners or un-removed debris.
- B. Immediately correct and repair deficient installation.

END OF SECTION 10 81 13

SECTION 11 13 16 - LOADING DOCK SEALS AND SHELTERS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Transparent strip door curtains

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.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and field connection.
- C. Samples: For each type of fabric indicated.

1.4 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of dock openings and contiguous construction by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 TRANSPARENT-STRIP DOOR CURTAINS

- A. General: Door curtains consisting of overlapping strips suspended from top of opening to form a sealed door curtain. Provide strips of length required to suit opening height and with sufficient unit number to close opening width with overlap indicated.
- B. Strip Material: Curved, clear, transparent, extruded PVC. Fabricate strips for manufacturer's standard method of attachment to overhead mounting system indicated.
 - 1. Strip Width and Thickness: 6 inches wide and 0.060 inch thick.
 - 2. Overlap: None.

- C. Header Mounting: Consisting of an angle bolted or welded to opening lintel; equip angle with permanently attached mounting pins and a steel-angle or -plate retaining strip attached to angle with wing nuts.
- D. Steel Finish: Hot-dip galvanize components to comply with the following:
 - 1. ASTM A 123/A 123M for iron and steel support mounting.
 - 2. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware and anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical systems for inflatable units to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Dock Seals: Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.

3.3 ADJUSTING

- A. After completing installation, inspect exposed factory finishes and repair damaged finishes.

END OF SECTION 11 13 16

SECTION 11 15 00 - SECURITY CONTROL EQUIPMENT

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. Exterior Kiosk
 - 2. Vehicle Inspection System
- B. Related Requirements:
 - 1. Division 26 Sections for connection of electrical equipment.

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 descriptions of individual components.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each component to include in operation and maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect components according to manufacturer's written instructions. Prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR KIOSK

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Exterior Kiosk Olea Kiosks, Inc.; Seattle Outdoor Ticketing Kiosk or comparable approved product meeting all requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.
- B. System Description
 - 1. 19-inch PCAP high-bright outdoor touchscreen
 - 2. Amplified stereo speakers
 - 3. Finish: powder coat
 - 4. Security: dual lock
 - 5. Bolt-down base
- C. Optional Components
 - 1. High-temperature resistant industrial PC
 - 2. Built-in WiFi Connectivity

2.2 VEHICLE INSPECTION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide TASC Management Corporation; Integrated Vehicle Inspection & Security System (IVISS) or comparable approved product meeting all requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.
- B. Components
 - 1. Base Unit
 - a. Fixed, above ground unit with 18-inch ramps
 - b. Unit description
 - 1) Four imaging modules
 - 2) Three LED light modules
 - 3) AirClean Module
 - 4) Scratch proof camera and light modules
 - c. Field replaceable system modules

2. Automated License Plate Recognition System
 - a. 1.3 MP ALPR camera description
 - 1) Resolution: 1280 by 960 pixels
 - 2) Sensor: Color, progressive scan CCD 1/3"
 - 3) Frame rate: 22.5 frames/second
 - 4) Filter: IR cut/all pass
 - 5) Video output: JPEG / MJPEG stream
 - 6) Exposure Control: Global Shutter, SW adjustable 1/25 – 1/40000s
 - 7) Communication Interface: 100 Mbit/second ethernet
 - 8) Communication protocol: TCP/IP, HTTP, FTP, NTP, ICMP, SMTP, DHCP, ARP
 - 9) JPEG Compression: Adjustable between 10-100%
 - 10) Light sensor: Configurable for switching between day and night mode
 - 11) Lens type: 6-36mm position sensitive motorized optics
 - 12) Iris, focus, zoom: automatic, motorized
 - 13) Range: 10-82 feet
 - 14) Power: 24-28 VAC, 20W
 - b. Vehicle Detection and Image Capture
 - 1) Trigger: Inductive loop
 - 2) Day and night image capture
 - c. License plate recognition
 - 1) Convert image to characters
 - 2) Output: ASCII or Unicode
 - d. Processing
 - 1) Interface with gate to open automatically
 - 2) Process and record data in database
3. Driver IP Camera
 - a. Image Device: 1/28" PS Exmor 2.38M CMOS
 - b. Total pixels: 1952 by 1236
 - c. Video Output: CVBS: 1.0 Vp-p / 75 ohms composite, 704 x 480(N), 704 x 576(P)
 - d. Focal Length: 3.8mm (Fixed)
 - e. Focus Control: manual
 - f. Minimum object distance: 1.64 feet
 - g. Operating environment: +14° - +131 ° F
4. Loop Detector

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install security control equipment according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to paved surfaces.

3.3 STARTUP SERVICE

- A. Engage a manufacturer-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 ADJUSTING

- A. Adjust hardware to function smoothly, and lubricate as recommended by manufacturer.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 11 15 00

SECTION 11 24 23 - WINDOW WASHING SYSTEM

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. This scope includes design and supply of a window washing system at locations indicated in the contract documents.
- B. Related Requirements:
 - 1. Section 05 12 00 "Steel Structural Framing" for connections to structural steel.

1.3 REFERENCES

- A. American Institute of Steel Construction (AISC).
 - 1. AISC S342L [1993], Load and Resistance Factor Design Specification for Structural Steel Buildings (including Supplement No.1).
- B. Aluminum Association (AA).
 - 1. AA DAF 45, Designation System for Aluminum Finishes.
 - 2. AA ADM-1 [2000], Aluminum Design Manual.
- C. American Society of Mechanical Engineers (AMSE).
 - 1. ASME A120.1 [2006], Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance.
- D. American Welding Society (AWS).
 - 1. AWS D1.2/D1.2M [2003], Structural Welding Code - Aluminum.
 - 2. AWS D1.1/D1.1M [2006], Structural Welding Code—Steel.
- E. ASTM International (ASTM).
 - 1. ASTM A123/A123M [2002], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A167 [1999 (2004)], Specification for Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet and Strip.
 - 3. ASTM A276 [2006], Standard Specification for Stainless Steel Bars and Shapes.
 - 4. ASTM A492 [1995 (2004)] Standard Specification for Stainless Steel Rope.
 - 5. ASTM B221 [2006], Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. Occupational Safety and Health Administration (OSHA).
 - 1. OSHA 1910, Subpart D, Walking and Work Surfaces.

- G. National Roofing Contractors Association (NRCA)
 - 1. The NRCA Roofing and Waterproofing Manual, Fifth Edition.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Indicate information on shop drawings as follows:
 - 1. Submit shop drawings showing complete layout and configuration of window cleaning system, including components and accessories.
 - 2. Indicate design and fabrication details, window "drops", hardware, and installation details.
 - 3. Include installation and rigging instructions and:
 - a. Required restrictive working usage and general safety notes.
 - b. Non-restrictive working usage and general safety notes.
 - 4. Ensure Shop Drawings are reviewed by Engineer licensed in State of Florida and submit calculations to Architect.
- B. Product data, including manufacturer's technical data sheet, for specified products.

1.5 INFORMATION SUBMITTALS

- A. Quality Assurance:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - 3. Manufacturer's installation instructions.
- B. Manufacturer's field reports specified.

1.6 CLOSEOUT SUBMITTALS

- A. Submit 1-year standard manufacturer warranty documents specified.
- B. Operation and Maintenance Data: Submit Operation and Maintenance data for installed products in accordance with Section 01 78 00 - Closeout Submittals.

1.7 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.
- B. Regulatory Requirements.
 - 1. Comply with Building Code for State of Florida.
 - 2. Comply with OSHA regulations as follows:
 - a. 1910, Subpart D, Walking and Working Surfaces.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery:
 - 1. Deliver materials in manufacturer's original packaging with identification labels intact and in sizes to suit project.
- C. Storage and Protection:
 - 1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.9 SEQUENCING

- A. Sequence with other Work and Comply with window washing equipment manufacturer's written recommendations for sequencing construction operations.

1.10 WARRANTY

- A. Project Warranty: Refer to Contract Conditions for additional project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.
- C. Warranty: Commencing on date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer with a minimum of 10 years' experience in manufacturing window washing and system components similar to or exceeding requirements of project.
- B. Manufacturer's Insurance: Ensure manufacturer carries liability insurance to protect against product and system failure in amount of ten million dollars US (\$10,000,000) minimum.

2.2 PRODUCTS AND SYSTEMS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products by Pro-Bel USA, Inc. or comparable approved manufacturer meeting all requirements including sustainability requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.

2.3 DESIGN PERFORMANCE REQUIREMENTS

- A. Design window cleaning system to suit project requirements to as indicated.

- B. Locate anchorages to suit suspension equipment specified.
- C. Design anchor components for cleaning equipment to:
 - 1. Ensure compatibility with industry standard equipment.
 - 2. Anchorage and anchor components: Designed by Engineer qualified in design of window cleaning and equipment and licensed in State of Florida.

2.4 MONORAILS

- A. Monorails and mounting: designed to carry minimum vertical service load of 1,000 lbs (4.5 kN); fabricated using aluminum extrusions to ASTM B221-2000 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes".
- B. Monorail finish: exterior finish to be mill finish.
- C. Capacity/Data plates: rail entry systems to be equipped with prominently displayed, non-corrosive plate clearly stating Maximum Service Capacity, Manufacturer's name, Serial No. and Manufacturing Date.
- D. Trolleys: equipped with heavy-duty rollers and 5/8" (16 mm) diameter U-bar safety anchors; exterior finish to be type 304 stainless steel. Design trolleys to run freely under load with minimum discontinuity at rail splices and provide end stops to ensure trolley cannot become detached from the rail. Stops to be removable for service.
- E. Safety U-bars: Type 304 stainless steel with yield strength of 35 Ksi (240 MPa). U-bar to be not less than 3/4" (19 mm) diameter material with 1-1/2" (38 mm) eye opening.
- F. Securement bolts: mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A123M-2002.
- G. Base plate and all other sections: galvanized mild steel as above with yield strength of 44 Ksi (300 MPa). Thickness and securement to suit application.

2.5 SOURCE QUALITY CONTROL

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
- B. Miscellaneous metal and steel fabrication companies not specifically engaged in the design, supply, and engineering of window washing systems are not eligible to bid this scope of work.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Provide experienced and qualified technicians to carry out erection, assembly and installation of window washing equipment system.

- B. Steel welding shall comply with AWS D1.2/D1.2M.
- C. Aluminum welding shall comply with AWS D1.1/D1.1M.

3.2 MANUFACTURERS INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, and technical data sheets.

3.3 PREPARATION

- A. Ensure structure or substrate is adequate to support complete window washing equipment system.

3.4 INSTALLATION

- A. Coordinate window washing equipment work with work of other trades, for proper time and sequence to avoid construction delays.
- B. Install window washing equipment plumb and level in accordance with manufacturer's written instructions.
- C. Accurately fit and align, securely fasten and install free from distortion or defects.
- D. Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal and vandalism.

3.5 FIELD QUALITY CONTROL

- A. When necessary have the manufacture assist in installation.
- B. Manufacturer to load test entire system.

3.6 ADJUSTMENT

- A. Lubricate moving parts to operate smoothly and fit accurately.
- B. Complete "Initial Inspection - Certification for Use" form included in Equipment Manual and Inspection Log Book provided by manufacturer.

3.7 PROTECTION

- A. Protect installed product from damage during construction.
- B. Repair damage to adjacent materials caused by window washing equipment installation.

END OF SECTION 11 24 23

SECTION 11 30 13 - RESIDENTIAL APPLIANCES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Refrigeration appliances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Product Schedule: For appliances.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For manufacturers' special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Refrigerator/Freezer, Sealed System: Full warranty, including parts and labor, for on-site service on the product.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 REFRIGERATOR/FREEZERS

- A. Refrigerator/Freezer - Full Size: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Whirlpool Corporation; WRS342FIA or comparable product by one of the following manufacturers meeting all requirements.
 - a. General Electric Company
 - b. Frigidaire
 - c. LG Electronics
 - d. Sub-Zero Inc.
 2. Type: Freestanding.
 3. Dimensions:
 - a. Width: 32-3/4 inches.
 - b. Depth: 32 -3/8 inches not including handle.
 - c. Height: 65-7/8 inches.
 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 14.5 cu. ft.
 - b. Freezer Volume: 6.75 cu. ft.
 5. General Features:
 - a. Dispenser in door for ice and cold water with dispenser lock.
 - b. Built-in water-filtration system.
 - c. Dual refrigeration systems.
 6. Refrigerator Features:
 - a. Interior light in refrigeration compartment.
 - b. Compartment Storage: vegetable crisper.
 - c. Door Storage: Modular compartments.
 7. Freezer Features: One freezer compartment with door.
 - a. Automatic defrost.
 - b. Interior light in freezer compartment.
 - c. Automatic icemaker and storage bin.
 8. Front Panel(s): Manufacturer's standard.
 9. Appliance Color/Finish: Stainless steel.
- B. Refrigerator/Freezer Compact: One-door refrigerator with freezer compartment inside and complying with AHAM HRF-1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Frigidaire; FFPE2411QB or comparable product by one of the following manufacturers meeting all requirements.
 - a. General Electric Company

- b. LG Electronics
 - c. Sub-Zero Inc.
 - d. Whirlpool Corporation
- 2. Type: Freestanding.
- 3. Dimensions:
 - a. Width: 18-5/8 inches.
 - b. Depth: 17-3/4 inches.
 - c. Height: 24-7/8 inches.
- 4. Storage Capacity:
 - a. Refrigeration Compartment Volume: 2.4 cu. ft.
 - b. Freezer Volume: 0.14 cu. ft..
- 5. Front Panel(s): Manufacturer's standard.
- 6. Appliance Color/Finish: Stainless steel.

2.3 ICEMAKERS

- A. Icemaker:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Scotsman; Prodigy Undercounter Cuber with Storage or comparable product by one of the following manufacturers meeting all requirements.
 - a. General Electric Company
 - b. LG Electronics
 - c. Sub-Zero Inc.
 - d. Whirlpool Corporation
 - 2. Type: Undercounter.
 - 3. Dimensions:
 - a. Width: 26 inches.
 - b. Depth: 27-3/8 inches.
 - c. Height: 33 inches.
 - 4. Front Panel: Manufacturer's standard.
 - a. Panel Color: Black.
 - 5. Appliance Color/Finish: Stainless steel.

2.4 WATER COOLER

- A. Point of use water cooler:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Blueline; Global Water G3 or comparable product by one of the following manufacturers meeting all requirements.
 - a. OASIS
 - b. Whirlpool Corporation
 - 2. Type: Freestanding

3. Dimensions:
 - a. Width: 13 inches
 - b. Depth: 15 inches
 - c. Height: 42 inches
4. Filtration: 3-stage

2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After installation, start units to confirm proper operation.

- 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
 - B. An appliance will be considered defective if it does not pass tests and inspections.
 - C. Prepare test and inspection reports.
- 3.4 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 11 30 13

SECTION 11 53 13 - LABORATORY FUME HOODS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Floor-mounted laboratory fume hoods.
 - 2. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.
 - 3. Work tops within fume hoods.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood blocking for anchoring fume hoods.
 - 2. Section 09 22 16 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
 - 3. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for field quality-control testing of fume hoods.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.
- B. Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For laboratory fume hoods.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
 - 3. Indicate locations and types of service fittings together with associated service supply connection required.

4. Indicate duct connections, electrical connections, and locations of access panels.
 5. Include roughing-in information for mechanical, plumbing, and electrical connections.
 6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from the above items.
 7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
 8. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples: For fume hood exterior finishes.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Showing compliance with specified performance requirements for as-manufactured containment and static pressure loss, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Constant Volume Fume Hoods with VAV Control and Steel Exterior:

11 53 13 - 2

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. Air Master Systems Corporation.
 - b. Bedcolab Ltd.
 - c. BMC Manufacturing.
 - d. Labconco Corporation.
 - e. Mott Manufacturing Ltd.
- B. Source Limitations: Obtain laboratory fume hoods from single manufacturer.
 1. Obtain laboratory fume hoods from same source as laboratory casework.
- C. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' fume hoods of similar sizes, types, and configurations, and complying with the Specifications, may be considered. See Section 01 60 00 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 as modified below:
 1. As-Manufactured (AM) Rating: AM 0.05 (0.05 ppm).
 2. As-Installed (AI) Rating: AI 0.05 (0.05 ppm).
 3. Average Face Velocity: 60 fpm plus or minus 10 percent with sashes fully open.
 4. Face-Velocity Variation: Not more than 10 percent of average face velocity across the face opening with sashes fully open.
 5. Sash Position: Fully open.
 6. Test Setup Modifications: Conduct tests with a minimum of three and a maximum of five people in the test room and with two 1-gal. round paint cans, one 12-by-12-by-12-inch cardboard box, and three 6-by-6-by-12-inch cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch blocks.
 7. Walk-by Test: At the conclusion of containment test, execute three rapid walk-bys at 30-second intervals, 12 inches behind the mannequin. Test-gas concentration during each walk-by shall not exceed 0.1 ppm and shall return to specified containment value within 15 seconds.
- B. Static-Pressure Loss: Not more than 1/2-inch wg at 100-fpm face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

2.3 FUME HOODS

- A. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices." Provide fume hoods UL listed and labeled for compliance with UL 1805.
- B. VAV Control: Equip fume hoods with an electronic control unit with a sensing device that monitors face velocity, and a motorized damper on the exhaust connection that maintains a constant face velocity by controlling air volume in response to control unit. Equip units with manual override switch that opens motorized damper to provide maximum exhaust capacity regardless of sash position.

2.4 MATERIALS

- A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.
 - 1. For perchloric acid fume hoods, use Type 316L instead of Type 304.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on exposed faces, and having a flame-spread index of 25 or less according to ASTM E 84.
- D. Glass: Clear, laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with two plies not less than 3.0 mm thick and with clear, polyvinyl butyral interlayer.
- 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. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.5 FABRICATION

- A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch door opening.
- B. Steel Exterior: Fabricate from steel sheet, 0.048 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
- C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls

at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

- D. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- E. Interior Lining: Provide the following unless otherwise indicated:
 - 1. Stainless steel, not less than 0.050 inch thick with epoxy coating.
- F. Stainless-Steel Lining Assembly: Welded unit consisting of end panels, back panel, top, and work top; reinforced to form a rigid assembly to which exterior is attached.
- G. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom. Secure baffle to cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle.
 - 1. Provide preset baffles.
 - 2. Provide epoxy-coated, stainless-steel screen at bottom baffle opening to prevent paper from being drawn into the exhaust plenum behind baffles.
- H. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection.
 - 1. Duct-Stub Material: stainless steel unless otherwise indicated.
- I. Bypass Grilles: Provide grilles at bypass openings of fume hoods.
- J. Sashes: Provide operable sashes of type indicated.
 - 1. Fabricate from 0.050-inch-thick stainless steel. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
 - 2. Glaze with laminated safety glass.
 - 3. Counterbalance vertical-sliding sash with sash weight and stainless-steel cable system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.
- K. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1-inch space between airfoil and work top. Sash closes on top of airfoil, leaving 1-inch opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.
- L. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with 1/4-inch-thick laminated glass or 3-mm-thick tempered glass,

sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.

1. Provide fluorescent tubes with color temperature of 3500 K and minimum color-rendering index of 85.
- M. Filler Strips: Provide as needed to close spaces between fume hoods and adjacent building construction. Fabricate from same material and with same finish as fume hoods.
- N. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling.
- O. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.
- P. Comply with requirements in other Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.6 CHEMICAL-RESISTANT FINISH

- A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.
- B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8M. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.
 2. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range.

2.7 ACCESSORIES

- A. Airflow Indicator and Alarm: Provide each fume hood with manufacturer's standard airflow indicator with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

- B. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.
 - 1. Provide with silence and test switches.
- C. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.
- D. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

2.8 SOURCE QUALITY CONTROL

- A. Demonstrate fume hood performance before shipment by testing fume hoods according to ASHRAE 110 as modified in "Performance Requirements" Article. Provide testing facility, instruments, equipment, and materials needed for tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

3.3 FIELD QUALITY CONTROL

- A. Field test installed fume hoods according to ASHRAE 110 as modified in "Performance Requirements" Article to verify compliance with performance requirements.
 - 1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
 - 2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

- A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.
- B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 11 53 13

SECTION 11 66 23 - GYMNASIUM EQUIPMENT

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Safety pads.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gymnasium equipment.
 - 1. Include plans, elevations, sections, and attachment details.
- C. Samples: For each exposed product and for each item and color specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Wall Matt System Manufacturer Qualifications
 - 1. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years.
- B. Wall Matt Contractor/Installer Qualifications
 - 1. Contractor shall be experienced in the field and approved by manufacturer.
 - 2. Contractor shall be factory-approved and have completed at least three projects of similar magnitude and complexity.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive Matts.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer..

- C. Install wall matts after other finishing operations, including painting, have been completed.
- D. Delivery of Materials
 - 1. Room temperature of at least 55 degrees Fahrenheit and moisture content of concrete slab of 3% or less.
 - 2. Area where materials are to be stored should be maintained at 55 degrees Fahrenheit and under 50% relative humidity by the General Contractor.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of safety pads that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 REMOVABLE SAFETY WALL PADS

- A. Source Limitations: Obtain from single source from single manufacturer.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, minimum 14-oz./sq. yd.; with surface-burning characteristics indicated.
- D. Wall Safety Pads: Padded wall panels designed to be attached in a continuous row; each panel section consisting of shock-absorbing polyethylene foam, with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles.
 - 1. Fill: Multiple-impact-resistant foam, minimum 2-inch-thick polyurethane, 3.5-lb/cu. ft. density.
 - 2. Size: Each panel section 48-inches by 96-inches.
 - 3. Number of Modular Panel Sections: As indicated on Drawings.
 - 4. Installation Method: Hook and loop fasteners on three sides for removal and replacement.
 - 5. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for one color.
- E. Cutout Trim: Manufacturer's standard flanged cutout trim kits for fitting pads around switches, receptacles, and other obstructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements of the Work.
 - 1. Verify critical dimensions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Install gymnasium equipment after other finishing operations, including painting, have been completed unless otherwise indicated.
- C. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relationship to adjacent construction; and aligned with court layout.

3.3 INSTALLATION OF SAFETY PADS

- A. Mount with bottom edge at dimension indicated on Drawings above finished floor.
- B. Cutout Trim: Limit cuts in face of padding so that cuts are securely and fully concealed behind trim-kit flange.

3.4 ADDITIONAL MATERIAL

- A. Provide additional safety pads for use as movable floor pads.
 - 1. Quantity: provide additional 10 pads.

END OF SECTION 11 66 23

SECTION 11 81 29 - HORIZONTAL FALL PROTECTION

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Rooftop horizontal cable fall protection system.
- B. Related Sections
 - 1. Section 03 30 00 "Cast-In-Place Concrete"
 - 2. Section 05 12 00 "Structural Steel Framing"
 - 3. Section 05 21 00 "Steel Joist Framing"
 - 4. Section 05 31 00 "Steel Decking"
 - 5. Section 07 52 00 "SBS Modified Bituminous Membrane Roofing"
 - 6. Section 07 62 00 "Sheet Metal Flashing and Trim"
 - 7. Section 07 92 00 "Joint Sealants"

1.3 REFERENCES

- A. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
- B. ASTM A123 / A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A747/A747M - Standard Specification for Steel Castings, Stainless, Precipitation Hardening.
- D. ASTM A36 - Standard Specification for Carbon Structural Steel.
- E. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- G. CSA Z259.16 - Design of Active Fall Protection Systems.
- H. OSHA 1926.502 - Fall Prevention Systems and Criteria and Practices.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's data and product information indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing in sufficient detail that the product complies with the contract requirements.
- B. Shop Drawings: For fabrication showing the complete fall protection system. Layout drawings of each system in relation to the supporting structure indicating the locations of properly labeled components.
- C. Installer's Certification: Furnish proof of installer's certification approval by manufacturer in the form of the installer's current certificate issued by the manufacture.
- D. Product Certificate: Containing the manufacturer's batch number on each individual component used in the systems.
- E. Qualifications Statement: For engineer performing delegated design.
- F. Systems Manual:
 - 1. Maintenance Procedures: Including parts list and maintenance requirements for all equipment.
 - 2. Operation Procedures: Indicating proper use of equipment for safe operation of the systems.
 - 3. Manufacturer's catalog data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing sufficient detail that the product complies with the contract requirements.
- G. Record Documents: Include a copy of Record Drawings in the systems manual.
- H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Delegated-Design Submittal: For fall protection system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2-year experience installing similar products, authorized, trained, and certified by manufacturer.
- C. Engineer for Delegated Design: Licensed in the jurisdiction and with a minimum of two years engineering fall protection systems.
- D. Coordination: Coordinate the installation of horizontal fall protection system with structural supports and finish materials.
- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Owner and Architect.
3. Remodel mock-up area as required to produce acceptable work.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened packaging. Store materials in original protective packaging. Prevent soiling, physical damage, or moisture.

1.8 PROJECT CONDITIONS

- A. Coordinate layout and installation of framing and reinforcements for fall protection system anchors.
 1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of horizontal fall protection system that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOFTOP HORIZONTAL CABLE FALL PROTECTION SYSTEM

- A. Provide rooftop horizontal cable fall protection system for rooftop maintenance including end anchors, intermediate cable supports, variable cable supports, traveler and corner cable supports as required.
 1. Maximum span of 39 feet (12 m) between anchors and provides continuous hands-free access for the user of the roof fall protection system.
 2. System shall not be used as a tieback anchor for facade maintenance.
- 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. Cable Safety – USA
 2. Hy-Safe Technology
 3. Latchways, Inc.

4. Pro-Bel Group
 5. XSPlatforms
- C. Performance Requirements:
1. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Control".
 2. Structural Performance: Fall protection systems shall withstand the effects of loads and stresses within limits and under conditions required by CSA Z259.16, ANSI A10.32, ANSI Z359.1, and OSHA 1926.502.
 - a. Allow for multiple users, based on required system calculations.
 - b. System designed for 2 simultaneous users maximum.
 - c. System capable of spanning 39 feet between intermediate supports.
 - ~~d. Maximum allowable force on anchors: 5000 lbs.~~
 - d. Anchors shall be designed to accommodate forces as defined by OSHA requirements.
- D. Materials:
1. Cable: 5/16" 316 Stainless Steel Rope.
 2. Base plates, anchors, Eye and Pin, and all other components: 316 stainless steel.
 3. Fasteners: Size as determined by design – 316 stainless steel.
- E. Fabrication:
1. Fabricate anchoring devices as recommended by the manufacturer to provide adequate support for intended use. Shop fabricate required anchorage posts using structural steel with material test certificates for full material traceability.
 2. Welding: AWS structural specification D1.1 by certified welders.
 3. Fabricate joints in a manner to discourage water accumulation.
 4. Swaging: Swage cable in-line with the anchor point.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fall protection equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate location of fall protection equipment indicated to be attached to structural substrate or surface of roofing system, and furnish anchoring devices with templates and diagrams.

3.3 INSTALLATION

- A. Install according to approved shop drawings and manufacturer's instructions. Coordinate with work of other trades.

- B. Install anchorage and fasteners in accordance with manufacturer's recommendations to obtain the allowable working loads published in the product literature and in accordance with this specification.
- C. Exposed work shall be true to line and level with accurate angles, surfaces and with straight square edges. Coordinate anchorage system with supporting structure.
- D. Do not load or stress system until materials and fasteners are properly installed and ready for service.

3.4 FIELD QUALITY CONTROL

- A. Provide manufacturer's certified installer to inspect installed fall protection system. Ensure that system components operate as specified.

3.5 ADJUSTING AND CLEANING

- A. Adjust fall protection components to function smoothly and safely.
- B. Clean components of any deleterious coatings or compounds. Remove loose materials, crating, and packing materials from site.

3.6 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1. Briefly describe function, operation, and maintenance of each component.
- B. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Provide training at the lifeline installation site.
 - 4. Training to take place at the completion of the installation.

END OF SECTION 11 81 29

SECTION 11 97 13 - DEAL DRAWERS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bullet-resistant Sliding Transaction drawer.

1.3 REFERENCES

- A. American Welding Society (AWS) D1.3/D1.3M - Structural Welding Code - Sheet Steel.
- B. ASTM International (ASTM) A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- C. Underwriters Laboratories (UL) 752 - Bullet Resisting Equipment.

1.4 SYSTEM DESCRIPTION

- A. Design Requirements: Provide drawer with "non-ricochet type" intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.

1.5 ACTION SUBMITTALS

- A. Shop Drawings: Include window profiles and sizes, type and spacing of frame anchors, reinforcement size and locations, details of joints and connections, and welding details.
- B. Product Data: Include product description for window assemblies including bullet-resistant ratings.
- C. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
- D. Samples: 2-inch x 2-inch coating samples showing available colors.

1.6 QUALITY ASSURANCE

- A. Transaction Window Assemblies: Ballistic Level 3 tested to UL 752.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Store drawers in protected, dry area, off ground or floor.
- B. Do not cover with non-vented coverings that create excessive humidity.
- C. Remove wet coverings immediately.

PART 2 - PRODUCTS

2.1 DEAL DRAWERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ARMORTEX Inc.; SS10DD or comparable product by one of the following:
 - 1. Creative Industries, Inc.
 - 2. C.R. Laurence Co., Inc.
 - 3. Diebold, Inc.
 - 4. Total Security Solutions

2.2 MATERIALS

- A. Steel Sheet:
 - 1. ASTM A1008/1008M, cold rolled, free from scale, pitting, coil breaks, and other surface defects.
 - 2. Recycled content: Minimum 25 percent.
- B. Bullet-Resistant Composite: UL Listed Bullet Resistant Composite of UL Ballistic Level equal to specified frame ballistic protection level.
- C. Ballistic Steel: Hi-Hard Ballistic Steel, of UL Ballistic Level equal to specified ballistic protection level.

2.3 FABRICATION

- A. Drawers
 - 1. Fabricate Case from 16 gage steel
 - 2. Face 16ga #3 Brushed Stainless Steel
 - 3. Stainless Steel mounting flange.
 - 4. Heavy duty drawer slides
- B. Welding: In accordance with AWS D1.3/D1.3M. Grind exposed welds flush and smooth.
- C. Finish work neat and free from defects.

2.4 FINISHES

- A. Stainless Steel: No. 3 brushed finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install drawer in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Set with flanges on top of counter
- C. Secure to adjacent construction using fastener type best suited to application.

3.2 ADJUSTING

- A. Touch up minor scratches and abrasions in finish coat to match factory finish.

END OF SECTION 11 97 13

SECTION 12 24 13 - ROLLER WINDOW SHADES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes
 - 1. Electrically operated sunscreen roller shades.
 - 2. Automatic window shade control system, including the following:
 - a. Energy control unit which automatically adjusts window shades based on solar and weather conditions.
- B. Related Sections:
 - 1. Section 06 10 00 "Rough Carpentry" for coordination with blocking.
 - 2. Section 09 22 16 "Non-Structural Metal Framing" for installation of shade pockets, closures and related accessories
 - 3. Section 09 29 00 "Gypsum Wall Board" installation of shade pockets, closures and related accessories
 - 4. Section 09 51 13 "Acoustical Panel Ceilings" installation of shade pockets, closures and related accessories
 - 5. Division 26 - Electrical: Electric service for EDU's, and EDU controls, internal communication, low voltage wiring and data transfer, and connection to the Internet and required.
- C. System Description
 - 1. Automated Shade Control System: Provide control system to control sunscreen roller shades in multiple buildings with an automated, computer-server based, solar tracking control system.
 - a. Include automated solar shade system to control shades by tracking the sun and the position of and intensity of the solar rays.
 - b. Include system programming for solar data for every window from sunrise to sunset, each day of the year, providing data for establishing the appropriate shade position on the window with aligned intermediate stop positions.
 - c. System shall be ready to accept a module for predictive Shadow program to keep shades up when in shadow throughout the day / year.
 - d. System shall be ready to accept a reactive Brightness module for excessive glare due to sky-brightness.
 - e. System shall be ready to accept a predictive Reflection module for first

- reflections off natural landscapes such as a body of water and nearby fixed structures vertically or horizontally.
- f. Including interface to provide capability of communication with the Building Management system (BMS) over RS 232 or BACNet over IP.
 - g. Include master centralized override capability form server.
 - h. Include calendar event scheduling form server.
2. The Limits of Work for the Roller Window Shade system is described generally as follows:
- a. Airside:
 - 1) All shades and control circuits located within the limits of work boundary designated as Airside Terminal;
 - 2) The Automated Window Shade Control System components needed to operate both Airside and Landside Terminal Shades including interface of Automated Window Shade Control System with Landside Roller Window Shade system
 - 3) The integration of the two building systems
 - b. Landside:
 - 1) All shades and control circuits within the limits of work boundary designated as the Landside Terminal

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 3. Storage and handling requirements and recommendations.
 - 4. Mounting details and installation methods.
 - 5. Typical wiring diagrams including integration of EDU controllers with automatic window shade control system.
 - 6. Manufacturer's description of the science and logic employed for all automated systems.
 - 7. Manufacturer's description of the integration of the solar control system and the human factors required to assure thermal and visual comfort in the environment for the occupants, in conjunction with daylighting as an energy conserving subsystem.
 - 8. Provide specific shade locations and control zones conforming to requirements of Design Intent.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Extended Producer Responsibility
 - b. Leadership Extraction Practices for Recycled Content

2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's)
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, power and control wiring diagrams, and relationship to adjacent work.
 1. Prepare control, wiring diagrams based on, switching and operational requirements.
 2. Include one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item.
- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- E. Solar and Sky Monitoring Systems: Functionality of the solar monitoring and sky monitoring systems. Provide non-proprietary detailed description of the science and logic employed in the automated solar tracking control system and a schedule of the solar data provided.
- F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth samples and aluminum finish sample as selected. Mark face of material to indicate interior faces.
- G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- H. Warranty: Provide manufacturer's warranty documents as specified in this Section.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years' experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section. This includes but is not limited to all required extrusions, accessories, controls and fabricated roller shades or else all stated and published warranties may be void.
- B. Installer Qualifications: Engage an installer, which shall assume responsibility for installation of all system components, with the following qualifications.
 1. Installer for roller shade system shall be trained and certified by the manufacturer with a minimum of ten years' experience in installing products comparable to those specified in this section.

2. Installer for automatic solar shade control system shall be a certified electrical engineer or controls specialist to set up the automated control system and coordinate with the commissioning agent, by others, to assure communication continuity and operational functionality between the central control system and the individual operating motors and groups of motors. Installer shall have a minimum of 5 years' experience in installing similar systems.
- C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components shall be FCC compliant.
- E. Internal communications: The back bone or Communication riser, Fiber optics or Copper and appropriate switches for communication at each floor or defined area shall be included as a turn-key installed solution . The designs of the riser and communication switches for the automatic solar tracking system are included under the work of this section.
- F. Internet Connection: An IP Interface shall be provided by the Automatic Solar Tracking systems subcontractor.
- G. Requirements for Controls, and Tracking system, switches:
 1. Electrical and electronic motor controls and accessories required for a complete Automated solar tracking motorized shade control system including a two-way appropriate interface to communicate with a standalone Automated Solar Tracking and sky modeling system; which in turn shall have two-way communication with the building BMS; and or Day Lighting, AV, systems.
 2. Automated solar tracking system shall maintain a historical data base for one complete year, plus 3 months for conversion or a total of 15 months of historical data on each full day's solar condition, from sunrise to sunset and shall log all shade moves i.e. Automatic; Manual Switch; Shadow Mode; Reflectance Mode.
 3. Local switches shall be wired back to and integrate with the Solar Tracking system. Shade movements by a local switch shall be recorded by the Solar Tracking system and integrated into the database.
 4. Automated solar tracking system shall provide standard reports on shade movement, solar condition at the time of each shade movement, and the control or switching system that moved the shades.
- H. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.
- I. PVC-Free Shadecloth: Comply with the following.

1. Environmental Certification: Submit written certification from the manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification as specified below. Initial submittals, which do not include the Environmental Certification, below will be rejected. Materials that are simply 'PVC free' without identifying their inputs shall not qualify as meeting the intent of this specification and shall be rejected.
 2. Third Party Evaluation: Provide documentation stating the shade cloth has undergone third party evaluation for all chemical inputs, down to a scale of 100 parts per million, that have been evaluated for human and environmental safety. Identify any and all inputs, which are known to be carcinogenic, mutagenic, teratogenic, reproductively toxic, or endocrine disrupting. Also identify items that are toxic to aquatic systems, contain heavy metals, or organohalogens. The material shall contain no inputs that are known problems to human or environmental health per the above major criteria, except for an input that is required to meet local fire codes.
 3. Recycling Characteristics: Provide documentation that the shade cloth can, and is part of a closed loop of perpetual use and not be required to be down cycled, incinerated or otherwise thrown away. Scrap material can be sent back to the mill for reprocessing and recycling into the same quality yarn and woven into new material, without down cycling. Certify that this process is currently underway and will be utilized for this project.
- J. Perpetual Use Certification: Certify that at the end of the useful life of the shadecloth, that the material can be sent back to the manufacturer for recapture as part of a closed loop of perpetual use and that the material can and will be reconstituted into new yarn, for weaving into new shade cloth. Provide information on each shade band indicating that the shade band can be sent back to the manufacturer for this purpose.
- K. Requirements for Electronic Hardware, Controls, and Switches:
1. Roller shade hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.
 2. Turn-key single-source responsibility for automated solar tracking control system (riser) to control the Motorized Interior Roller Shades. The design, engineering, and installation of the automated solar tracking shade control head end system and the riser and related controls for shade riser / backbone wiring specified in this section shall be by a single manufacturer and installer. Coordinate the following with work of related and adjacent trades.
 - a. Make connections to the floor controllers via a modular connection at each floor riser where floor controllers are located.
 - b. Coordinate and install Communication Gateways, and master override switches (if required within the same closet as the electrical IT riser).
- 1.5 SOLAR SHADING CONTROL INTENT

- A. Purpose: the intent of this paragraph is to provide program objectives for the solar shading system and guidelines for the following entities:
 - 1. For Control Manufacturer and Installer: requirements for design, bidding, shop drawings and installation;
 - 2. For Commissioning Agent: requirements for final calibrations and fine tuning of the shading control system.
 - 3. For Owner and Maintenance Personnel: development of operations materials and maintenance instructions to include explanation of how the system is expected to operate and why.
- B. Refer to Section 01 81 13.14 Sustainable Design Requirements – LEED V4 BD+C for LEED objectives.
- C. The design of the shading control system for the project includes:
 - 1. Automated operation of motorized shades
 - 2. Time switch operation of motorized shades.
 - 3. Manual override of automated motorized shades
 - 4. Programming
 - 5. Commissioning
- D. Automated Shading
 - 1. Programming shall be designed to achieve the following objectives:
 - a. Keep direct sun from hitting gate agents, podiums or information desks.
 - b. Control and eliminate direct sun penetration in Airside Concourses that might impact Hold Room locations.
 - c. Reduce sun penetration impacting media features in both Airside and Landside when passing through South and East clerestory windows adjacent to the Boulevard Ribbon skylight.
- E. Zones
 - 1. Each bay of windows or clerestory will be separately zoned for automated shading control.
 - 2. The system programming shall have the capability to combine separate zones into grouped zones that act simultaneously together.
- F. Future Expansion
 - 1. Size shading system for 20% expansion, scalable for additional shades required in the future.
 - 2. Provide conduit and j-boxes at specific shade pockets designated as future locations where shades are not initially installed but may be desirable in the future. Refer to drawings for locations.
- G. Hours of Operation:
 - 1. Normal hours of operation are between 5am and midnight daily. Other hours are considered “low activity” hours.

2. Shades intended to control direct sun penetration, solar glare, or sky glare should operate at all hours from sunrise to sunset.
3. All automated shades are expected to be fully retracted (in the full up position) from sunset until sunrise, or other hours as noted.

H. GENERAL NOTES ON SHADE CONTROL

1. Shade Control Zones
 - a. The areas of shading have been separated into zones to respond to orientation, potential for disability glare, task or function, thermal zone, and other considerations.
 - b. The shade control system is a stand-alone system
 - c. All shades indicated on the diagrams are to be motor-operated, and automatically controlled to close based on sun position and cloud cover.
2. Shade Positions
 - a. The shade controls must be capable of stopping the shades in various positions as indicated on the drawings or as follows:
 - 1) Full up
 - 2) Down to highest mullion
 - 3) Down to middle mullion
 - 4) Down to lower mullion
 - 5) Down to 6' AFF (Type B Holding rooms only)
 - 6) Down to 4' AFF (Type A Gate Agents only)
 - 7) Full down (Type C Clerestories only)
3. Daylight Responsive Controls
 - a. In addition to orientation and function, shading controls shall be designed to automatically respond to three conditions: 1) time of day i.e., potential of sun in the sky to enter through glazed openings, 2) the extent of sun penetration allowed or desired in the space, and 3) the sky conditions i.e., sunny, hazy, partly cloudy or overcast. Control systems shall have equipment, sensors, time-switches and algorithms to provide this level of sophistication in managing the control of shading.
 - b. Controller shall be remotely programmable and easily programmed by the facilities manager if future changes are required.
4. Open loop sensing:
 - a. Shades designed to control solar penetration shall be of the open loop variety responding to natural light alone. Shade control should not be linked to the dimming or modulation of electric lighting.
5. Time delays
 - a. Shading controls shall respond within one (1) minute to direct sun penetration that meets the shade deployment criteria, and have a five (5) to thirty (30) minute time delay before retracting, to avoid "cycling" or unnecessary movement in response to intermittent cloud cover.
 - b. Slowly retract shades and maintain in the full up position until the next possible sun event for that façade, or until over-ride is manually triggered.

6. Overrides
 - a. Shading controls shall have a means of override for authorized personnel including Gate Agents for conditions of reflected sunlight or sky glare.
 - b. Overrides are intended to increase the time shades are down, and may not be used to retract the shades prematurely.
 - c. Overrides may allow users to lower shades to any of the shade positions or be preset to allow only some limited position(s).
 - d. The override shall allow the shades to remain down for a set period not less than 30 minutes but not more than 90 minutes.
 - e. Locations for override keypads should be integrated into the Gate Agent podiums and Information Desks. Owner shall confirm locations during Submittal process.
7. Time-switch control
 - a. The system shall include one astronomical time-switch, or multiple time-switches synchronized with each other.
- I. Shop Drawings:
 1. Certify that proposed system complies with every aspect of shading zoning, control and other requirements of the design intent narrative. Indicate in detail how proposed system differs from the documents and design intent narrative and how proposed system will achieve the goals of these specifications.
- J. Programming and Commissioning
 1. Provide initial programming and 'sequence of operation' spreadsheet to the design team and Owner for review based on the zoning and criteria herein. The manufacturer shall provide a designated factory trained representative for multiple visits as needed to verify the control system is fully operational and calibrated to initial settings.
 2. Modify settings as needed during the initial 3 months of operation.
 3. In addition to above requirements provide up to two (2) additional on-site visits to fine-tune the shade controls and settings to meet Owner and/or design team requirements within the first 24 months of operation.
- K. Specific Area Comments
 1. Gate Agents / Podiums – Shades on East and North facades of North Concourse; and West and South facades of West Concourse.
 - a. Shades are required for Agent's performance of tasks. Provide completely automated shading control system for shades in vertical windows, with local overrides at Gate Agent podiums. Refer to drawings for shade zone and control locations.
 - b. Shades shall be down in the lowest position, to avoid both direct sun and reflected glare, but should be retracted in steps until all possibility of direct sun on Gate Agents or their work areas has past.
- L. Hold Rooms – On West façade of North Concourse; and South façade of West

Concourse.

1. Shades shall lower in steps to protect the occupants of passenger seating areas.
2. In areas without initial shades designated, provide conduit and junction boxes for potential future installation.

M. Boulevard Clerestories – Landside and Airside

1. Shades shall be programmed to automatically close one bay at a time to prevent direct sun penetration through the clerestory and interfering with
 - a. self-illuminated surfaces of the media features
 - b. Airside information desk
2. Retract shades once direct sun has past.
3. Provide separate algorithms for shades in Landside and Airside zones as needed to achieve shading objectives.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Power and control wiring shall be complete and certified fully operational with uninterrupted communication on the lines and minimal noise certified by commissioning agent.
 1. 485, ICON, Lonmark and Dry Contract Network: Noise on the line not to exceed shade manufacturer's limits.

1.8 WARRANTY

- A. Warranty: Provide manufacturer's standard warranties, including the following:
 1. Roller Shade Hardware and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
 - a. EcoVeil standard non-depreciating 10-year limited warranty.
 2. Electronic Roller Shade EDU's and EDU Control Systems: Manufacturer's standard non-depreciating five-year warranty.
 3. Roller Shade Installation: One year from date of Substantial Completion, including scaffolding, lifts or other means to access the work.
 4. Roller Shade Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.
 5. Automated Systems warranty: The PC controller, the operating system, and the

solar tracking program and other components comprising the complete Automated System shall be warranted for one year, including a one-year automated systems service maintenance program fully monitored by the manufacturer / supplier of the system. The one year warranty covers the integrated environmental, functional and operational requirements as specified herein.

6. Electronics warranty: including but not limited to total solar measuring sensors radiometers; IP interface connections and peripheral electronics to assure full operability and communication to the motor control network for one year.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design

1. Roller Window Shade: Subject to compliance with requirements, provide Roller Window Shade WT1 as indicated in Section 09 00 01 "Finish Key" or comparable approved product meeting all requirements including sustainability requirements.
2. Window Shade Control System: Subject to compliance with requirements, provide MechoSystems Inc; SolarTrac™ or comparable product meeting all requirements.
3. Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.

2.2 INTELLIGENT ENCODED ELECTRONIC DRIVE SYSTEM

A. Electronic Drive Unit (EDU):

1. Intelligent Encoded EDU, and Control System: Tubular, asynchronous (non-synchronous) EDU's, with built-in reversible capacitor operating at 120VAC/60Hz, (230VAC/50Hz) single phase, temperature Class B, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each EDU.
2. Quiet [42 – 46 db] (within 3 feet open air).
3. Conceal EDU's inside shade roller tube.
4. Maximum current draw for each shade EDU of 0.9Amps at 120VAC.
5. Use EDU's rated at the same nominal speed for all shades in the same room.
6. Use EDU's with minimum of 34RPM, that shall not vary due to load / lift capacity.
7. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade EDU and tube assembly.

B. EDU System: (software, two-way communication): Basis of design: Intelligent EDU Control System, WhisperShade®IQ® System as manufactured by MechoSystems.

1. EDU shall support two methods of control.
 - a. Local Dry Contact Control Inputs:
 - 1) EDU shall be equipped with dry contact inputs to support moving the

- EDU/shade to the upper and lower limits.
- 2) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to local switch preset positions.
- 3) Shall support configuring the EDU under protected sequences so that a typical user would not change the EDU's setup. At a minimum, the configuration should include setting limits, setting custom presets and configuring key modes of operation.
- b. Network Control:
 - 1) EDU shall be equipped with a bi-directional network communication capability to support commanding the operation of large groups of shades over a common backbone. The network communication card shall be embedded into the tubular EDU assembly.
- 2. Upper and lower stopping points (operating limits) of shade bands shall be programmed into EDU's using either a hand held removable program module / configurator or a local switch.
- 3. Alignment Positions: Each EDU shall support a minimum of 133 repeatable and precisely aligned shade positions (including limits and presets).
 - a. All shades on the same switch circuit or with the same network group address with the same opening height shall align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
 - b. Shades of differing heights shall have capability for custom, aligned intermediate stop positions when traveling from any position, up or down.
 - c. Alignment of shades mechanically aligned on the same EDU shall not exceed +/- 0.125 inches (3.175mm) when commanded to the same alignment position.
 - d. Alignment of shades on adjacent EDU's shall not exceed +/- 0.25" inches (6.35mm) when commanded to the same alignment position.
 - e. Local Switch Presets: A minimum of 3 customizable preset positions shall be accessible over the local dry contact control inputs and over the network connection.
 - 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to 25%, 50% and 57% of the shade travel.
 - 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator or local switch shall be capable of customizing the position of these presets.
 - f. Network Presets: A minimum of 29 customizable preset positions (including the 3 local switch presets) shall be accessible via network commands.
 - 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to the lower limit unless customized elsewhere.
 - 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A

removable program module / configurator shall be capable of customizing the position of these presets.

4. Network Control:
 - a. The system shall have the capability of two-way digital communication with the EDU's over a common backbone.
 - b. Each EDU shall possess 8 addresses capable of being employed for various levels of group control. These addresses shall be configurable via a handheld configurator and/or a PC controller. A 9th unique address shall enable the EDU(s) to be independently controlled and configured over the network via a handheld configurator and/or a PC controller.
 - c. Low Voltage Communication Network Implementation.
 - 1) The low voltage network shall employ a bus topology with daisy chained network connections between nodes over a CAT5 cable (4 UTP) or over a 2 UTP cable employing at least 1 pair at 16 AWG for power and 1 pair at 22 AWG for data.
 - 2) The low voltage network (+/- 13VDC) shall be powered by the nodes attached to it. These nodes could be line voltage powered EDU's attached to 120 VAC or 230 VAC. Alternatively, low voltage nodes shall be powered typically by a centralized low voltage power supply. If a CAT5 network cable is employed and the node draws less than 1W then the node may be powered by DC power supplied by an associated line voltage EDU.
 - 3) Network Capacity: 4000 ft max, 250 nodes max
 - a) The number and size of a centralized DC supply shall vary depending upon the network requirements.
5. Operating Modes:
 - a. Uniform or Normal Modes of Operation:
 - 1) Uniform mode shall allow for shades to only move to defined intermediate stop positions to maintain maximum uniformity and organization.
 - 2) Normal Mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer.
6. Wall Switches:
 - a. Shades shall be operated by, 5, 7, or 10-button low voltage standard switches, or programmable intelligent switches [IS]. Standard switch shall be wired to a bus interface and the bus interface will be programmed to transmit an address for the local switch.
 - b. Intelligent switches may be installed anywhere on the bus line. Each IS shall be capable of storing one control level address to be broadcast along the bus line.
 - c. An address that is transmitted by either a switch or central controller shall be responded to by those EDU's with the same address in their control table.

- d. IS shall provide for interface with other low voltage input devices via a set of dry contact terminals located on the switch.
- e. Standard switch or IS may control an individual, sub-group or group of EDU's in accordance with the address in each EDU.

2.3 SHADE BANDS

- A. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
 - a. Hembar shall be heat sealed on all sides.
 - b. Open ends are not accepted.
 - 2. Shade Band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

2.4 ROLLER SHADE FABRICATION

- A. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- C. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of

12 24 13 - 13

plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands.

- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.

2.5 ROLLER SHADE COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.

B. Motorized Shade Hardware and Shade Brackets:

1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.
2. Provide shade hardware system that allows for field adjustment of EDU or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the EDU axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade EDU (multi-banded shade, subject to manufacturer's design criteria).
4. All bands within a single EDU group shall be aligned within 1/4 inch (6 mm).

2.6 SHADECLOTH

A. Refer to Drawings for locations of each type of shadecloth.

~~B. Basis of Design Shade Cloth: Mermet USA Sun Control Textiles, E Screen group, fabricated of Enduris Glass Core with 36% fiberglass / 64% vinyl, basket weave, custom widths as required.~~

B. Basis of Design Shade Cloth: MechoShade Systems, LLC.; ThermoVeil Basket

Weave with 75 percent PVC / 25 percent polyester, basket weave, custom widths as required.

1. Type A:
 - a. Openness Factor (OF) = ~~1~~ 3 percent open
 - b. Visible Light Transmission (Tv) = ~~1 percent~~ 0.05.
 - c. Solar Reflectance Rs: ~~4 percent~~ 0.04.
 - d. Solar Absorption As: ~~95 percent~~ 0.93.
 - e. Solar Transmittance Ts: ~~4 percent~~ 0.03.
 - f. ~~Thickness: 0.020 inches (0.52 mm) ±5%.~~
 - g. ~~Weight: 13.3 oz. / sq. yd. (452 g/sq. m2) ±5%~~
2. Type B:
 - a. Openness Factor (OF) = ~~3~~ 5 percent open
 - b. Visible Light Transmission (Tv) = ~~4 percent~~ 0.07.
 - c. Solar Reflectance Rs: ~~5 percent~~ 0.04.
 - d. Solar Absorption As: ~~91 percent~~ 0.90.
 - e. Solar Transmittance Ts: ~~4 percent~~ 0.06.
 - f. ~~Thickness: 0.017 inches (0.43 mm) ±5%.~~
 - g. ~~Weight: 11.6 oz. / sq. yd. (393 g/sq. m2) ±5%.~~
3. Type C:
 - a. Openness Factor (OF) = ~~5~~ 10 percent open
 - b. Visible Light Transmission (Tv) = ~~4 percent~~ 0.16.
 - c. Solar Reflectance Rs: ~~6 percent~~ 0.04.
 - d. Solar Absorption As: ~~90 percent~~ 0.83.
 - e. Solar Transmittance Ts: ~~4 percent~~ 0.13.
 - f. ~~Thickness: 0.016 inches (0.41 mm) ±5%.~~
 - g. ~~Weight: 10.7 oz. / sq. yd. (363 g/sq. m2) ±5%.~~

C. Color: ~~Charcoal/Charcoal #030030 or as indicated in Finish Key 09 0001 selected from manufacturer's standard colors~~ As selected by Architect from Manufacturer's full range.

D. Microbial Resistance, ASTM E2180 and ASTM G21: Pass

E. Warranty: 10-Year Interior.

2.7 ROLLER SHADE ACCESSORIES

- A. Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.
 1. Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
 2. Provide "Vented Pocket" such that there will be a minimum of four 1 inch diameter holes per foot allowing the solar gain to flow above the ceiling line.

B. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Finish: to match Architect's sample.

C. Cable Guides

1. Manufacturer's standard cable guide system for roller shade 12 feet in height or greater.
 - a. Refer to drawings
 - b. Coordinate with adjacent trades.

D. Catch pin brackets.

2.8 AUTOMATED DAYLIGHTING SOLAR TRACKING SHADE CONTROL SYSTEM

A. Solar Tracking Control System: Automated Computer Shade Control System, SolarTrac™ as manufactured by MechoSystems Systems, Inc., Long Island City, NY.

B. Solar Evaluation and Sky Modeling System shall utilize approved scientific solar algorithms, which shall provide the following for every window under considerations in the building from sunrise to sunset, 365-1/4 days per year, as follows:

1. Solar heat gain in real time reported in BTU's / (W/M2) multiple times each minute 24/7.
2. Incident angle on every window.
3. Profile angle on every window.
4. Direct radiation on every window.
5. Diffuse radiation on every window.
6. Surface azimuth.
7. Solar surface azimuth.
8. Window geometry / profile.
9. Geometry of the solar ray and window geometry to determine solar penetration.
10. Adjustment by solar penetration.
11. Geometry of the solar ray, window geometry, and allowable solar penetration calculated to determine incremental shade position.
 - a. An algorithm integrated with the Solar Radiometers to provide in real time, a microclimatic sky condition for the project, 7/24/365, which shall be the basis of determining a clear, cloudy or overcast sky condition.
 - b. The system will then adjust the shades incrementally on the window to provide protection from direct solar radiation while maximizing view and

12 24 13 - 16

- daylighting for the project.
12. Adjustment by BTU / W-M 2 solar load on every window in the building 7/24/365.
 13. Sky modeling and evaluation for clear, cloudy, bright, overcast sky condition – utilizing total solar measuring devices.
 14. Sky modeling algorithms utilizing the instantaneous, real time total solar data to determine sky condition.
 - a. Control system shall adjust the shade position to maximize energy management, view and personal comfort based on micro-climactic conditions.
 - b. The goal is to maximize view without Thermal or Visual discomfort through:
 - 1) Thermal Comfort as assured by Solar Tracking
 - 2) Visual Comfort as assured by managing (on the window wall):
 - a) Brightness and glare
 - 3) Control Modules: Control system shall be capable of optimizing the position of the shades (incrementally), to continuously deploy the shades in response to changes in Proactive and Reactive requirements.
 - 4) Solar Tracking Module – Base Control System, Thermal Comfort:
 - a) Proactive Algorithms (Primary):
 - b) Sun angle
 - c) Solar intensity – total light spectrum
 - d) BTU load.
 - e) Reactive algorithms: real-time sky conditions via roof mounted radiometers.
 - c. Incremental positioning:
 - 1) Shades shall be capable of being aligned at up to 256 positions.
 - 2) The control system shall be capable of staggering the operation of shade motors to assure balanced loading of the electrical system.
 - d. Continuous Operation:
 - 1) 24 hours per day, 7 days a week, 365 – ¼ days per year.
 - 2) Shade positioning resolution shall be calculated every 60 seconds.
- C. Graphic User Interface (GUI): Configure screen as follows:
1. PC-GUI shall provide access to all adjustable parameters displaying current values including but not limited to:
 - a. Radiation.
 - b. Shade position.
 - c. User defined requirements.
 2. Displays Real-Time Microclimatic Sky Conditions.
 3. Key-Zone / Sensor Monitoring:
 - a. On main screen: able to display current operation of “Key-Zones” or “Sensors” anywhere in the building
 4. Alarms – On Main Screen: able to display overrides due to but not limited to:
 - a. Touch Screen.

- b. Main- SolarTrac-PC| Control System.
- c. Remote (3rd Party Interface (BMS, AV etc.)).
- 5. Manual / Master Override:
 - a. Interactive Floor Plan: PC shall provide a map of each floor showing the shade motor groups, control zones and sensor locations with their real time position of each control zone.
 - b. Universal Command View: From the main screen the Universal Command View shall provide Whole Floor and Whole Building emergency control.
- 6. Reports / Analysis:
 - a. Data Storage / Event Log: Continual record of each day's activities including shade position and shade mode changes.
 - 1) Stored on a change of state basis.
 - 2) Archived based on user defined file size.
 - b. Sensor Data: Daily Record of sensor's data stored into a history file on a 60 second basis, stored on a repetitive basis:
 - 1) Roof mounted radiometers.
 - 2) Interior / exterior photo sensors.
 - c. Control Zone Timeline Visual Record of Current Day's Activity by Zone: Reporting by Zone of current day operation by intermediate stop locations.
 - d. Trending Reports:
 - 1) Daily Report: Sky, Sensors, Event Log, and Timeline.
 - 2) Shade Position Report: Percentage of time shade at each position.
 - 3) Override Report: Reason for override, percentage of day overridden up / down.
 - e. Interface with Other Report Writers:
 - 1) Event log and sensor data available in native MBD format.
 - 2) Available in SQL format.
- D. Override: Control Software shall incorporate an Override Event Scheduler such that the building Owner may customize position of shades by motor, group, zone or whole building for any event, night or weekend requirements
 - 1. Manual Override:
 - a. Wall Switches.
 - 2. Master Override: SolarTrac-PC| control system shall have capability of whole building control for master override by zone or by motor.
 - 3. Remote Off-Site-Monitoring:
 - a. IP Interface for monitoring, maintenance and software upgrades.
 - b. Provide Maintenance and Support as specified under Warranty.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 SINGLE-SOURCE RESPONSIBILITY

- A. Turn-Key Single-Source Responsibility for Interior Roller Shades and Automated Solar Tracking Control System: The design, engineering, and installation of electronic drive roller shade control system, shades, addressable controls, communication interfaces, and any required sensors, switches and low voltage control wiring specified in this Section shall be by a single manufacturer and installer.
- B. Coordination:
 - 1. Confirm power panels and circuits indicated on electrical drawings are of sufficient size to accommodate roller shade power requirements.
 - 2. Coordinate requirements of this section with related and adjacent construction.
 - a. Ensure all components needed for completing the work of this section are installed prior to areas becoming inaccessible.
 - 3. Provide conduit with pull wire in all areas.
 - 4. Coordinate location(s) of duplex 120 VAC power receptacle in Electric closet or other designated location for floor/riser Communication Gateways.
 - 5. Verify that wiring conditions installed under other sections are acceptable for product installation in accordance with manufacturer's instructions.
 - 6. Comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.
 - 7. Protect installed product and finished surfaces from damage during all phases of installation including preparation, testing, and cleanup.
 - 8. Coordinate required electrical work including but not limited to roof penetrations, conduits, fireproofing, etc.
- C. Integration with Building Systems:
 - 1. Coordinate the interface of the Roller Window Shades control system with programs and wiring of Building Systems provided under separate sections where integration is specified.
 - 2. Integration of shade control network can be accomplished locally through dry contact closures, or RS-232.
- D. Installation:
 - 1. Furnish and install shade controllers, interfaces, splitters, coupler, sensors, switches, junction boxes, etc.

- a. Mount concealed above ceiling in accessible locations or as indicated in drawings;
 - b. Locations of visible devices to be coordinated with Architect.
 2. Inspect all material and components included under this section prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.
 3. Line Voltage Wiring:
 - a. Furnish and install power connection between Shade control system and EDU;
 - b. Be capable of providing single line voltage wire pull for each EDU.
- E. Shade Power Wiring
 1. Furnish and install line voltage cable from roller shade motor into line voltage side of control system.
 2. Provide wire connection from power junction box to each motor on the shade network.
 3. Furnish and install a disconnect plug at the end of the power wiring run to each EDU. The disconnect plug must mate with a matching disconnect plug on the motor cable. EDU cable disconnect plug must be prefabricated by the manufacturer to meet UL and ETL systems requirements.

3.4 INSTALLATION OF ROLLER SHADES

- A. Provide an on-site Project Manager.
 1. Attend all related jobsite scheduling meetings.
 2. Supervise the roller shade installation and setting of intermediate stops of all shades to assure the alignment of the shade bands within a single EDU group, which shall not exceed +/- 0.125 inches (3.175mm), and to assure the alignment between EDU groups, which shall not exceed +/- 0.25 inches (6.35mm).
 3. Provide field inspection on an area-by-area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.
- B. Verification of Conditions:
 1. Examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor and Owner of conditions detrimental to the proper and timely completion of the work.
 2. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of environmental and substrate conditions by the installer.
- C. Provide accurate field measurements to 0.0625 inch (1.5875mm) for custom shade fabrication on the Roller Shades manufacturers input forms.
- D. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and as specified herein.

1. Blocking for roller shades shall be installed plumb, level, and fitted to adjacent construction as required for installation or as indicated in the drawings.
2. Adhere to industry standard tolerances.
 - a. The horizontal surface of the shade pocket shall not be out-of-level more than 0.625 inch (15.875mm) over 20 linear feet (6.096 meters)
- E. Shades shall be located so the shade band is not closer than 2 inches (50 mm) to the interior face of the glass. Allow proper clearances for window frames, support structure, and operation hardware.
- F. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- G. Installer shall set Upper, Lower and up to 3 intermediate stop positions of all motorized shade bands, and assure alignment in accordance with the above requirements.
- H. Certify the operation of all motorized shades and turn over each floor for preliminary acceptance.
- I. Participate and cooperate with the Commissioning Agent and other trades as required to verify and certify the installation is in full conformance with the specifications and is fully operational. This work to occur during the commissioning stage and is in addition to preliminary acceptance required for each floor.
- J. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.5 COMMISSIONING

- A. Automated SolarTrac System: Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters.
 1. Minimum experience of 2 years training in the electrical/electronic field.
 2. Certified by the equipment manufacturer on the system installed
- B. The automated shade control system will be commissioned on a floor-by-floor basis and then finally as an entire system. Final commissioning shall be successfully completed prior to the first move-in date for client's occupants.
 1. Verify programming of user, defined attributes of system to owner.
 2. Final Acceptance shall be upon successful demonstration of all commissioning requirements described in section 3.3.C of these specifications.
- C. During Commissioning the following will be measured to determine system performance:
 1. Response of system (demonstrated by deployment of shade) if average illumination of window wall at sensor exceeds 2,000 cd/m² or other value established by Owner.

2. Sunlight penetration distance shall not exceed the Owner specified distance for each shade control zone.
 3. Response to variable external conditions including, but not limited to: partially sunny days; shading from other buildings in the neighboring urban landscape; and, reflections from other buildings in the neighboring urban landscape
 4. Proper consistent action of all shade groups on each façade for a 30 day period
 5. The shade log shall be plotted for each shade motor group for the 30-day period. The log shall be used to demonstrate to the Owner that the automated shade movement meets the specified criteria in these specifications.
 6. Return from manual override to automatic mode shall be demonstrated to be in accordance with these specifications using the log and also through direct observation under partly cloudy conditions.
 7. All aspects of rezoning, control monitoring, logging, fault diagnostics and reporting shall be demonstrated to the Owner.
- D. Final Acceptance shall be upon successful demonstration of all commissioning requirements described in these specifications.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate and maintain Roller Shade systems.
1. A minimum 20 hours of one-on-one training shall be provided to the System Operator.
 2. A separate 20 hours training shall be provided one-on-one to the System Administrator or other personnel designated by Owner.
- B. Provide an electronic-based educational guide in .pdf format to Building Occupants on the general workings of the shade control system and specific instruction on how to use the manual override feature(s).

3.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 24 13

SECTION 12 36 16 - METAL COUNTERTOPS

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 stainless-steel countertops and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Low Emitting Materials
 - a. Low Emitting Materials for Adhesives and Sealants
- C. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal countertops only after casework has been completed in installation areas.
- B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
- B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 07 92 00 "Joint Sealants."
 - 1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.

2. Joint Sealant: Latex.
3. Color: Clear.
4. Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 using the applicable exposure scenario.
 - a. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional requirements.

2.2 STAINLESS-STEEL COUNTERTOPS AND SINKS

- A. Countertops: Fabricate from 0.062-inch-thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects.
 1. Joints: Fabricate countertops without field-made joints.
 2. Weld shop-made joints.
 3. Form the backsplash coved to and integral with top surface, with a 1/2-inch-thick top edge and 1/2-inch return flange.
 4. Where stainless-steel sinks occur in stainless-steel tops, factory weld into one integral unit.
- B. Stainless-Steel Sinks: Fabricate from stainless-steel sheet, not less than 0.050-inch nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.
 1. Provide sizes indicated or manufacturer's closest standard size of equal or greater volume, as approved by Architect.
 2. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch diameter.
 3. Factory punch holes for fittings.
 4. Provide sinks with stainless-steel strainers and tailpieces.
 5. Apply 1/8-inch-thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.
- C. Core Material: Marine grade plywood.
- D. Core Material at Sinks: MDF made with exterior glue.
- E. Core Thickness: 3/4 inch.
 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
- F. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.3 WALL-MOUNTED SHELVES

- A. Wall-Mounted Shelves: Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Weld shop-made joints. Fold front edge down a minimum of 3/4 inch (19 mm); fold back edge up a minimum of 3 inches (75 mm).

Provide integral stiffening brackets, formed by folding up ends a minimum of 3/4 inch (19 mm) and by welding to upturned edges.

2.4 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

2.5 WOOD MATERIALS

- A. Manufacturers
 - 1. Boise Cascade Company
 - 2. Collins
 - 3. Timber Products Company
- B. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
- C. Composite Wood: Provide composite wood products that meet the California Air Resources Board (CARB), Airborne Toxic Measure ATCM requirements for ultra-low emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

2.6 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products according to test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant MDF: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less according to ASTM E 84.

2.7 MISCELLANEOUS MATERIALS

- A. Low Emitting Adhesives and Sealants

1. Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 using the applicable exposure scenario.
 2. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional requirements.
- B. Adhesive for Bonding Stainless Steel: As selected by fabricator to comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
- B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
- C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
- D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
1. Refer to Section 01 35 46 "Indoor Air Quality Management" and Section 01 74 23 "Final Cleaning" for additional requirements.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C PHASE 1 (WS110)

METAL COUNTERTOPS
Section 12 36 16

END OF SECTION 12 36 16

SECTION 12 36 23.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

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 plastic-laminate-clad countertops.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. **Product Data:** For Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Documentation on Low Emitting Materials.
 - 3. **Product Certificates:** Provide the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's)
 - c. Health Product Declarations (HPD's)
- C. Shop Drawings: For plastic-laminate-clad countertops.
 - 1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
 - 2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.
 - 3. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.
- E. Samples for Initial Selection: For plastic laminates.
- F. Samples for Verification: As follows:
 - 1. Plastic Laminates: For each type, color, pattern, and surface finish required, 8 by 10 inches in size.
 - 2. Fabrication Sample: For each type and profile of countertop required, provide one sample applied to core material with specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For the following:
 - 1. Composite wood and agrifiber products.
 - 2. High-pressure decorative laminate.
 - 3. Adhesives.
- C. Quality Standard Compliance Certificates: AWI Quality Certification Program.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 - 1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
 - 1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grades specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Acoustical Panel Ceiling types as indicated in Section 09 00 01 "Finish Key" or comparable approved product meeting all requirements including sustainability requirements.
 - a. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.
- D. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- E. Core Material: MDF.
- F. Core Material at Sinks: MDF made with exterior glue.
- G. Core Thickness: 3/4 inch.
 - 1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
- H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

- A. Manufacturers
 - 1. Boise Cascade Company
 - 2. Collins
 - 3. Timber Products Company
- B. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
- C. Composite Wood: Provide composite wood products that meet the California Air Resources Board (CARB), Airborne Toxic Measure ATCM requirements for ultra-low emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products according to test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant MDF: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less according to ASTM E 84.

2.4 MISCELLANEOUS MATERIALS

- A. Low Emitting Adhesives and Sealants
 - 1. Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 using the applicable exposure scenario.
 - 2. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional requirements.
- B. Adhesive for Bonding Plastic Laminate: As selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times countertop fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.
- D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
1. Seal edges of cutouts by saturating with varnish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 2. Shop seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical-treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

- F. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semiexposed surfaces.
- C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.
- D. Refer to Section 01 74 23 "Final Cleaning" for additional cleaning requirements.

END OF SECTION 12 36 23.13

SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.
5. Solid surface material utility ledges.
6. Integrated solid surface sink bowls.

B. Related Requirements:

1. Section 22 40 00 "Plumbing Fixtures" plumbing fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Sustainable Design Submittals:

1. Product Data: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for Leadership Extraction Practices for the following:
 - a. Extended Producer Responsibility
 - b. Recycled content
 - c. Regional material requirements
2. Product Certificates: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" for the following:
 - a. Environmental Product Declarations (EPD's)
 - b. Corporate Sustainability Reporting (CSR's)
 - c. Health Product Declarations (HPD's)
3. Adhesives and Sealants: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C" subparagraph "Documentation on Low Emitting Materials" for Volatile Organic Chemical Emission requirements.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

D. Samples for Initial Selection: For each type of material exposed to view.

E. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. Wood trim, 8 inches long.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups as indicated in Section 01 43 39 "Visual Mock-up Requirements".
 - 1. Build mockup of typical countertop as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.7 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Products: Provide products indicated in Section 09 00 01 "Finish Key".
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
 - 4. Colors and Patterns: As indicated by manufacturer's designations.
 - 5. Composite Wood Products: Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 using the applicable exposure scenario. Manufacturer claim of compliance must state the range of total VOCs after 14 days and measured as specified in the CDPH standard v1.1 2010

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:

1. Front: Straight, slightly eased at top.
 2. Backsplash: Straight, slightly eased at corner.
 3. End Splash: Matching backsplash where indicated.
- C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.
- D. Backsplashes: 1/2-inch-thick, solid surface material where indicated.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
1. Install integral sink bowls in countertops in the shop.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 3. Fittings: Drill or cut countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items and items provided by others.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
1. Provide products that do not contain excessive levels of VOC's in accordance with the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings or the South Coast Quality Management District(SCAQMD) Rule 1113 June 2011.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 12 36 61.19 - QUARTZ AGGLOMERATE COUNTERTOPS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Quartz agglomerate countertops.
 - 2. Quartz agglomerate backsplashes.
 - 3. Quartz agglomerate end splashes.
 - 4. Quartz agglomerate apron fronts.
- B. Related Requirements:
 - 1. Section 22 40 00 "Plumbing Fixtures" for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Low Emitting Materials
 - a. Low Emitting Materials for Adhesives and Sealants
- C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
 - 1. Show locations and details of joints.
 - 2. Show direction of directional pattern, if any.
- D. Samples for Initial Selection: For each type of material exposed to view.
- E. Samples for Verification: For the following products:
 - 1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as shown on Drawings.
 - 2. Refer to Section 01 43 39 "Visual Mock-up Requirements" for additional requirements.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Refer to Section 09 00 01 "Finish Key".
 - 2. Colors and Patterns: As indicated by manufacturer's designations.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front: Straight, slightly eased at top.
 - 2. Backsplash: Straight, slightly eased at corner.
 - 3. End Splash: Matching backsplash.
- C. Countertops: Quartz agglomerate, thickness as indicated in Section 09 00 01 "Finish Key".
- D. Backsplashes: Match Countertop.

- E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
- F. Joints: Fabricate countertops without joints to extent possible.
 - 1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
 - 2. Joint Type: Bonded, 1/32 inch or less in width.
 - 3. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.
- G. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - 2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
 - 3. Fittings: Drill or cut countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items and items provided by others.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
 - 1. Provide manufacture statements that confirm that the product used meets the California Department of Public Health (CDPH) Standard Method v1.1 2010 using the applicable exposure scenario.
 - 2. Refer to Section 01 81 13.14 "Sustainable Design Requirements - LEED v4 BD+C" for additional requirements.
- B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.19

SECTION 12 48 16 - ENTRANCE FLOOR GRILLES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes recessed floor grilles and frames.

1.3 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor grilles and frames.

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 entrance floor grilles and frames.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:
 - a. Leadership Extraction Practices for Recycled Content
 - 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)
- C. Shop Drawings:
 - 1. Items penetrating floor grilles and frames, including door control devices.
 - 2. Divisions between grille sections.
 - 3. Perimeter floor moldings.
- D. Samples: For the following products, in manufacturer's standard sizes:
 - 1. Floor Grille: Assembled section of floor grille.
 - 2. Frame Members: Sample of each type and color.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor grilles and frames to include in maintenance manuals.

1.6 FIELD CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide the following:

1. Refer to Section 09 00 01 "Finish Key".

2.2 ENTRANCE FLOOR GRILLES, GENERAL

- A. Structural Performance: Provide floor grilles and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Uniform floor load of 300 lbf/sq. ft..
2. Wheel load of 350 lb per wheel.

- B. Accessibility Standard: Comply with applicable provisions in the Florida Building Code Fifth Edition - Accessibility.

2.3 FLOOR GRILLES

- A. General: Provide manufacturer's standard floor-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

- B. Stainless-Steel Floor Grille: Type 304.

- C. Lockdown: Hidden.

2.4 FRAMES

- A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.5 SUPPORT SYSTEM

- A. Level Bed Applications: Provide manufacturer's standard, vinyl cushion support system.

2.6 MATERIALS

- A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

- B. Stainless-Steel Angles: ASTM A 276 or ASTM A 479/A 479M, Type 304.

2.7 FABRICATION

- A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for

maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.8 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.
- C. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of floor grilles and frames.
- B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before floor grille and frame and drain pan installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed floor grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of floor grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set floor-grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in floor-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C PHASE 1 (WS110)

ENTRANCE FLOOR GRILLES
Section 12 48 16

END OF SECTION 12 48 16

SECTION 12 48 43.23 - ANTI-FATIGUE FLOOR MATS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Anti-fatigue floor mats.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include layouts and edge ramps.
- C. Samples: Full-size units of anti-fatigue floor mat and edge ramp.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For anti-fatigue floor mats to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store anti-fatigue floor mats and accessories in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store anti-fatigue floor mats on flat surfaces.

PART 2 - PRODUCTS

2.1 ANTI-FATIGUE FLOOR MATS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide SATECH, Inc., SmartCells or comparable approved product meeting all requirements including sustainability requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.
- B. Thickness: 1-inch
- C. Tile size: 36-inch by 36-inch
- D. Installation: Loose laid

2.2 ACCESSORIES

- A. Transitions: Manufacturer's standard 12-inch ramp
 - 1. Comply with Florida Building Code Fifth Edition (2014) – Accessibility
- B. Tile Connector: Manufacturer's standard connector.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates 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 PREPARATION

- A. Prepare substrates according to anti-fatigue floor mats manufacturer's written instructions.
- B. Immediately before installation, sweep and vacuum clean substrates to be covered by anti-fatigue floor mats.

3.3 ANTI-FATIGUE FLOOR MAT INSTALLATION

- A. Comply with manufacturer's written instructions for anti-fatigue floor mats.
- B. Scribe, cut, and fit anti-fatigue floor mats to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- C. Extend anti-fatigue floor mats into toe spaces, door reveals, closets, and similar openings.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting anti-fatigue floor mats.
- B. Protect anti-fatigue floor mats from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- C. Cover anti-fatigue floor mats until Substantial Completion.
- D. Refer to Section 01 35 46 "Indoor Air Quality" and Section 01 74 23 "Final Cleaning" for additional requirements.

END OF SECTION 12 48 43.23

SECTION 12 92 33 - INTERIOR TREES

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section includes preserved palm trees, manufactured palm trees, and manufactured cypress trees.
- B. All trees to be flame retardant.
- C. All trees to be engineered to meet minimum structural and overturning requirements outlined in the Florida Building Code.
- D. Tree manufacturer shall coordinate with structural engineer to verify the floor can sustain tree loads.
- E. All steel elements shall conform to the following standards and grades.
 - 1. Steel pipe – ASTM A53 GR B
 - 2. Steel Plate – ASTM A36 GR B
 - 3. Bolts – ASTM A307 GR A
- F. All welding of structural steel members shall be performed by AWS certified welder. All welds prequalified.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, details, engineering calculations, and attachments to other work.

PART 2 - PRODUCTS

2.1 PRESERVED PALM TREES

- A. Basis-of-Design Product – Subject to compliance with requirements, provide products from International TreeScapes, LLC or comparable approved product meeting all requirements.
 - 1. Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.
 - 2. Preserved portion of the trees shall include leaves, and boots on the trunk.
- B. Types of Palms

1. Types of preserved palms shall be limited to trees in pots and not bolted to the floor.
2. Palm type to be Washington Palm (*Washingtonia robusta*) at 18' overall height, 12' wide canopy.
3. Minimum branching height shall be 8'-0".
4. For Palms installed in pots, the structural base shall be able to withstand emersion in water due to plant watering.

2.2 MANUFACTURED PALM TREES

- A. Basis-of-Design Product – Subject to compliance with requirements, provide products from International TreeScapes, LLC or comparable approved product meeting all requirements.
 1. Refer to Sections 01 25 00 "Substitution Procedures" and 01 60 00 "Product Requirements" for comparable product requirements.
 2. A combination of manufactured palm trunk for an 8' height and a preserved trunk for the rest of the height will be acceptable. Connection should merge seamlessly
- B. Types of Palms

Types of manufactured palms shall include all other palms not specified in 2.1.B.2

 1. Palm types to include
 - a. California Fan Palm (*Washingtonia filifera*) at 50' overall height, 18' wide canopy
 - b. Washington Palm (*Washingtonia robusta*) at 35' overall height, 15' wide canopy
 - c. Royal Palm (*Roystonea regia*) at 25' overall height, 12' wide canopy
 - d. Bald Cypress (*Taxodium distichum*) at 30' overall height, 18' width
 - e. Bald Cypress (*Taxodium distichum*) at 25' overall height, 18' width
 2. Minimum branching height shall be 8'-0" above floor height.
 3. Manufactured portions of the tree shall include all elements of the trunk. If possible, leaves shall be preserved.
 4. For Palms installed in pots, the structural base shall be able to withstand emersion in water due to plant watering.
 5. Trees trunks to be made of a material to withstand abuse from luggage, push carts, and other small utility

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Contractor to provide engineering calculations, installation and shop drawings for approval prior to construction.

END OF SECTION 12 92 33

SECTION 12 93 00-SITE FURNISHINGS

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 the following:

- 1. Benches
- 2. Bicycle Racks.
- 3. Trash Receptacles.
- 4. Bollard.
- 5. Fence.

1.3 SUBMITTALS

- A. Product Data for each type of product indicated.
- B. Samples for Initial Selection for units with factory-applied color finishes.
- C. Samples for Verification for each type of exposed finish required, prepared on samples not less than 6-inch-long linear components and 4-inch-square sheet components.
- D. Product Schedule for site furnishings. Use same designations indicated on Drawings.
- E. Material Certificates for site furnishings, signed by manufacturers.
- F. Maintenance Data for site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.

PART 2 -PRODUCTS

2.1 SITE FURNISHINGS

- A. Products: Products specified for this project are listed on the Site Furnishings Schedule within the construction drawings
- B. Product substitution will be considered only if the alternative product is considered equal or better

in terms of materials, sizes, dimensions, finishes, features, accessories, maintenance requirements and performance

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211.
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221.
3. Structural Pipe and Tube: ASTM B 429.
4. Sheet and Plate: ASTM B 209.
5. Castings: ASTM B 26/B 26M.

- B. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Perforated Metal: From steel sheet not less than 0.140 nominal thickness; manufacturer's standard perforation pattern.
7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
8. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
9. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

- C. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

- D. Anchors, Fasteners, Fittings, and Hardware: Stainless steel, Galvanized steel, Zinc-plated steel, Manufacturer's standard, corrosion-resistant-coated or non-corrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged].

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to or below-grade substrate; extent as indicated.
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; extent as indicated on Drawings.

- E. No-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- F. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- G. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
 - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

PART 3 -EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored or positioned at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and

12 93 00 -3

concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

- F. Pipe Sleeves: Use 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 non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component at Contractor's cost.
- B. Refer to Section 01 74 23 Final Cleaning for all final cleaning.

END OF SECTION

SECTION 13 12 00 – EME FOUNTAINS

PART 1 GENERAL

1.01 STIPULATIONS

A. INCLUDED:

1. Contract Documents including Drawings, Specifications, and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections and stipulated Specification Sections shall apply to this Section.
2. Related Specification Sections:
 - a. 05 50 00 – Metal Fabrications
 - b. 22 11 16 – Domestic Water Piping
 - c. 22 11 23 – Domestic Water Pumps
 - d. 22 13 16 – Sanitary Waste and Vent Piping
 - e. 26 05 00 – Common Work Results for Electrical
 - f. 26 05 19 – Building Wire and Cable
 - g. 26 05 26 – Grounding and Bonding
 - h. 26 05 29 – Hangers and Supports
 - i. 26 05 33 – Conduit
 - j. 26 05 34 – Outlet Boxes
 - k. 26 05 35 – Pull & Junction Boxes
 - l. 26 05 53 – Identification for Electrical Systems
 - m. 27 05 00 – Common Work Elements for Communications
 - n. 27 10 00 – Premise Distribution Systems
 - o. 27 10 05 – Passive Optical Network
 - p. 27 10 10 – Voice Over IP Telephone System
 - q. 27 10 15 – Wireless Local Area Network System
 - r. 27 51 13 – Emergency Communication System
 - s. 28 23 00 – Video Surveillance System
 - t. 27 42 23 – Experiential Media Environment (EME) - Media Features
 - u. 27 42 24– Experiential Media Environment (EME) – Specialized AV Systems Integrator

B. DEFINITIONS

1. COMPLETE BUILD SCENARIO:

- a. This phrase identifies the total responsibility of the EME Fountain Contractor to provide completely operational assemblies and systems inclusive of Delegated Engineering Services and Shop Drawings, executing required efforts and services to result in completed systems compliant with permitting requirements, and compliance with related codes. Provision of equipment, materials, and services shall further include those necessary for Owners' acceptance, compliance with the EME Media Feature Construction Documents, and compliance with these Specifications.

2. CMAR:

- a. Usage of this term in all EME-related specifications and drawings refers to the full scope of the General Contractor (Construction Manager at Risk) for the Project and shall be considered to include all primary building contractors (electrical, mechanical, plumbing, structural, etc.) working under the General Contractor.
- 3. CONCRETE:
 - a. The term "concrete" as used in this Section, refers only for concrete (SHOTCRETE and CAST IN PLACE READY-MIX CONCRETE) as specified for this Section only.
- 4. CRITICAL:
 - a. This word describes dimensions that are not subject to deviation. Violation of a "critical" dimension will require re-work to bring the item back into compliance.
- 5. FURNISH:
 - a. The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- 6. INSTALL:
 - a. The term "install" describes operations at the Project site including the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, start-up, commissioning, and similar operations. Included within the "Install" responsibilities are the miscellaneous hardware and materials required to complete the "Install".
- 7. INSTALLER:
 - a. The word "installer" or "commercial pool installer" or similar terms denotes an individual or firm that is retained / hired by the Contractor to perform designated, sub-contracted, specialty work. The installer shall be licensed and qualified in the areas of layout, forming, trim, piping, and finishes as required or specified to comply with the specific requirements of the Local Governmental Agency for the project's locale. If the Contractor acts as the installer (self-performs), the Contractor shall demonstrate the specified Quality Control requirements herein.
- 8. POOL:
 - a. The use of the word "pool" within these Specifications shall also refer to a basin, feature, fountain, water feature,
- 9. PROVIDE:
 - a. The term "provide" means to furnish, install, connect, test, and complete / ready for the intended use.
- 10. SLIP-RESISTANT (NON-SLIP):
 - a. A horizontal, non-skid textured surface with a dynamic coefficient of friction rated at a minimum 0.42 (per ASTM C1028) for wet conditions. The words "non-slip" and "slip-resistant" are equivalent as used in these specifications.
- 11. PLASTIC PIPING:
 - a. Any piping that is non-metallic, "plastic", "petro-chemical-based", "polymer" or "synthetic" such as PVC, UPVC, CPVC, and HDPE.
- 12. ADE:
 - a. ADE is the Fountain Engineer engaged by VER. This acronym refers to Aquatic Design & Engineering, Inc. In addition, the use of "This Engineer", or "This Consultant" may be utilized herein interchangeably and refers to ADE.


1.02 SUMMARY

A. SECTION INCLUDES:

1. Refer to Specification Sections 27 05 00, 27 42 23 and 27 42 24 in addition to the following.
2. The Work defined in this Specification Section includes materials, systems, components, and installation requirements for the Moment Vault fountain, an integral part of the Moment Vault media feature forming part of the South Terminal Complex (STC) Experiential Media Environment (EME), and the related work required for a complete and working fountain installation, in compliance with all codes and regulations of authorities having jurisdiction (AHJ). EME Fountain Contractor is responsible for obtaining all relevant approvals and permits required by AHJ.
3. The Moment Vault fountain shall be engineered to meet the design intent of the EME Media Feature Construction Documents.
4. The Work also includes requirements for submittals, quality assurance, product handling, record documents, warranty, project conditions, installation, system performance, demonstrations, testing, and certifications for work related to the Moment Vault fountain. Refer to additional requirements specified under related trades including the provisions of Sections 27 05 00 and 27 42 23.
5. EME Fountain Contractor shall be responsible for meeting the design intent through engineering, shop drawings, mock-ups, fabrication, installation, and commissioning of all elements comprising the Moment Vault fountain as described herein and in related Contract Documents.

1.03 SCOPE OF WORK

A. SECTION INCLUDES:

1. Refer to Specification Sections 27 05 00 and 27 42 23 in addition to the following.
2. Refer to drawing sheet MS00.00.03 for the work responsibility matrix for the scope of work required for the Moment Vault fountain. 
3. Where listed on the work responsibility matrix drawing and described herein, the following components shall be provided by the EME Fountain Contractor as described in this specification section unless otherwise noted and be defined as follows:
 - a. Fountain/Water Feature: Three stainless steel fountain basins, complete with skirting panels, with stone finished surface, and fountain head bollards designed to incorporate cameras/sensors (furnished and installed by EME Specialty AV Systems Integrator).
 - b. Mechanical equipment: Water pumping system dedicated to the Moment Vault fountain including complete installation and integration of equipment in pump room, chemical room, and fountain basins.
 - c. Filter & chemical treatment equipment: A dedicated low-water usage filtration system and automated water chemistry feed equipment
 - d. Pipe systems: Complete piping of all mechanical systems within pump room, chemical room, and within fountain basins and piping between pump room and fountain basins (including floor penetrations).
 - e. Control system: A dedicated fountain control system.

- f. Electrical distribution: All conduit and wiring from electrical distribution panel within pump room and chemical room to equipment
- g. Mechanical system: Provide and install all mechanical equipment related to the Moment Vault fountain.

1.04 REFERENCES

- A. Refer to Specification Section 27 05 00 for requirements.

1.05 SYSTEM DESCRIPTION

- A. The Moment Vault fountain mandate includes the following principal components:
 - 1. Three stainless steel and stone fountain basins integrated as part of the Moment Vault EME Media Feature, located in the Airside Terminal Hub (Palm Court).
 - 2. Pump and control equipment located in the Moment Vault Pump room (01-0276) on the Ramp level of the Airside Terminal Hub
 - 3. Water treatment equipment located in the Moment Vault Pump room (01-0276) on the Ramp level of the Airside Terminal Hub
 - 4. Electrical distribution as required to connect to base building infrastructure and support a fully functional fountain installation
 - 5. Pipes, valves, connectors, and the like, as required to interconnect system components, connect to base building infrastructure, and support a fully functional fountain installation
- B. Coordination
 - 1. Refer to requirements of Section 27 05 00 Common Work Elements for Communications Systems in addition to the requirements included herein.
 - 2. Coordinate any requirements with Contractor
 - 3. Coordinate miscellaneous steel, metal fabrications, ornamental metal materials, fabrication, and finish requirements with the requirements of related trades provided under Division 5, Metals, Series Specifications; with the intent of ensuring consistency in metal project materials, fabrication, finishes, and erection in the completed work.
 - 4. EME Fountain Contractor shall coordinate with Contractor and EME Media Feature Contractor for the following:
 - a. Coordination of project and construction schedule
 - b. Coordination of deliverable schedule
 - c. Attendance at project coordination meetings
 - d. Coordination for integration and installation of speakers and cameras (by EME Specialized AV Systems Integrator)
 - e. Coordinated compliance with state and local department of health and building agency requirements including specified construction inspections, as required.
 - f. Coordinated documentation & submission of accepted modifications of the approved documents to permitting authorities, as required.
 - g. Coordination of job site access and work carried out on site
 - h. Coordination of schedule inspections
 - i. Coordination of base building infrastructure component placement, including drains, building penetrations, water supply lines, ventilation, electrical, & structural pads
 - j. Coordination of services and work with other disciplines to afford and enable a timely project completion.

- k. Coordination of pipe fasteners, hangers, and similar support systems requiring a structural interface or dependency on the Architect's building structure
- 5. Coordinate commissioning, integration and Performance Verification Testing with EME Media Feature Contractor, EME Specialized AV Systems Integrator and EME Team.
- 6. Coordinate final documentation with EME Media Feature Contractor, EME Specialized AV Systems Integrator and EME Team to ensure consistency and coherence.
- 7. Coordinate final SolidWorks models of EME Media Features (see Submittals, below) with Architect, Engineer, EME Fountain Contractor and EME Team to ensure coordinated integration of EME Media Features with base building REVIT model.
- 8. Coordinate final SolidWorks models of EME Media Features (see Submittals, below) with Architect, Engineer, EME Fountain Contractor and EME Team to ensure coordinated integration of EME Media Features with base building REVIT model.

C. COMPLETE BUILD SCENARIO OVERVIEW

- 1. EME Fountain Contractor shall provide the following Complete Build scenario services and documentation.
 - a. EME Fountain Contractor is responsible for all equipment beyond the structural, electrical, mechanical and IT technology demarcation points indicated on the related Construction Documents to meet the EME design intent.
- 2. Custom Stainless-Steel Basins
 - a. Provide Delegated Engineering Services for creation and generation of the required submittals and signed and sealed shop drawings.
 - 1) Refer to SUBMITTALS.
 - 2) Refer to QUALITY CONTROL
 - b. Provide completed assemblies, equipment, materials, and products
 - c. Implementation including design, construction, and installation services
- 3. Electrical distribution, control systems, grounding, & bonding systems.
- 4. Any ducting and powered ventilation system or similar activities required for system functionality, beyond the demarcations indicated on the related Construction Documents
- 5. Pipe fasteners, hangers, and similar support systems requiring a structural interface or dependency on the Architect's building structure.
- 6. Pre-cast or fiberglass tanks, basins, or similar structures

D. FACILITY PROVISION

- 1. The following shall be provided by the CMAR as part of base building facility:
 - a. Pump and chemical room interior finishes and fit-out
 - 1) Room illumination shall achieve minimum 30-foot candles as measured at the floor level.
 - 2) Utility convenience electrical outlets.
 - b. Pump and chemical room electrical panel(s), with breakers and main feed for distribution to mechanical equipment in room.
 - c. Air ventilation, drainage, and venting systems to outdoors.
 - d. Positive draining slopes within containment basins, on floors, or on slabs shall slope to drains designed & located by CMAR.

- e. Civil engineering inclusive of site utilities, drain piping (from EME Fountain Contractor points of connections with a recommended minimum 2% slope in drain piping to accept the EME Fountain Contractor estimated water flows).
- f. The Civil or MEP Engineer shall determine the outfall and slope as appropriate.
- g. Project structural engineering for equipment & chemical rooms, pilings, piers, retaining walls, reinforced concrete tanks and vaults, fountain/pool basins and their waterproofing, and on-structure basins, if required.
- h. Project MEP, HVAC, Detailed Dehumidification, Electrical Power, and Control Panels inclusive engineering services
- i. Indoor & outdoor MEP to EME Fountain Contractor's points of connections
- j. Provide and meter the water used in the leak testing.
- k. Provide and meter the electrical power during the construction period.
- l. Provide the design for backflow prevention, pressure reducing, and water hammer prevention assemblies within the water supply piping systems to the pool equipment rooms. Refer to the MEP's Drawings for the design of the water hammer arrestor(s) and pressure reducing assemblies to protect the auto-fill system(s) from hydraulic potential water hammer or shock.
 - 1) The following recommended minimum ventilation standards are at least (and greater if the MEP engineer deems appropriate):
 - a) Pool mechanical equipment rooms: 10 x air changes / hour
 - b) Chemical equipment rooms: 20 x air changes / hour

1.06 GENERAL DESCRIPTION OF WORK & SYSTEMS

A. WORK ELEMENTS

- 1. All noted and specified components, equipment systems, materials, labor, and supervision.
- 2. Project benchmarks, control points, and elevation control.
- 3. Commissioning of pool systems, documentation, color-coding, directional-flow arrows, comprehensive labeling, and specified operator training.

B. SYSTEMS

- 1. Tank structures.
- 2. Pool hydraulic/mechanical systems, including water recirculation, filtration systems, activity & specialized static and automated feature, weir, & nozzle pumping systems, primary & automated water chemical treatment equipment systems, UV sterilization systems, and pH feeder systems.
- 3. Nozzle, hydraulic/mechanical systems including related piping control systems.
- 4. Coordination & provision for electrical interlocks, flow and safety controls for pools, safety cut-off, specialty equipment control systems, water level, and wind velocity control systems.
- 5. Equipment assemblies located in the Chemical / Equipment Room(s) Vaults including:
 - a. Specified filtration systems with metering, gauges, valving, and flow controls,
 - b. Specified feature and special pumping systems,
 - c. Chemical automated controls, designated chemical feed, UV sanitizing, including related assemblies, specialized components with equipment, and noted automated monitoring systems,

- d. Electrical power panels, control panels, sub-panel(s), relays, controls, safety disconnects, safety-off controls with relays, control wiring panels, motor control systems, circuit breakers, magnetic motor starters, VFD's, grounding, bonding, and other electrical componentry.
6. Chemical supply as noted in the chemical equipment sections below.
7. Chemical Room(s) vaults shall house chemical feeder systems, chemical tanks, chemical storage, and the safety drench shower with its eyewash station.
8. Miscellaneous pool systems testing equipment, safety procedures implementation, and noted equipment automation control systems.

1.07 REGULATORY REQUIREMENTS

A. GENERAL REQUIREMENTS

1. Work (materials and workmanship) performed under this contract shall be in conformance with applicable codes, Department of Labor (OSHA), Department of Justice, Department of Health, state and local building codes, any other agency that has legal jurisdiction, Virginia Graeme Baker Pool and Spa Safety Act (VGB), and the Contract Documents.
2. Specialty Designated Engineering shall be by a licensed professional engineer (per the statutes of the project's locale) with a professional resume that demonstrates his expertise in the specialty area. This may also be referred to as Delegated Engineering Services.
3. Bring any contradictions or ambiguities concerning any referenced codes, regulations, requirements, standards, specifications, state or local laws, regulations, local ordinances, fire insurance carrier's requirements, or the Contract Documents to the attention of the Contractor.
4. As a Contractor-responsibility, all pool waste water shall be piped to the authorized outfall (sanitary sewer). If local & state codes disallow and prevent discharge/authorized outfall to the sanitary sewer, then without exception Contractor shall provide the discharge/authorized materials' delivery to the outfall in accordance with local environmental requirements.

B. NONCOMPLIANCE

1. Correct and pay for work that has been determined as non-compliant with the applicable building codes, regulations, ADA, NEC, OSHA requirements, state codes & laws, local ordinances, referenced standards, fire insurance carrier's requirements, and the Contract Documents

C. BUILDING CODES AND LEGISLATION ACTS

1. Applicable codes shall include federal & state laws, statutes, local ordinances, and the applicable requirements of the following accepted & referenced building codes and related legislation:
 - a. Florida Building Code – 5th Edition
 - b. Florida Building Code - Energy Conservation – 5th Edition
 - c. Florida Administrative Code, Chapter 64E-9
 - d. National Electrical Code
2. The latest edition of the applicable codes, at the time the Agreement was signed, shall apply to this project.

D. REFERENCED STANDARDS

1. Standards, Regulations, Codes, and Requirements shall be the latest revisions, editions, and additions of the documents and shall supersede the editions listed.
2. Applicable criteria and specifications may include the following:
 - a. American Concrete Institute (ACI):
 - 1) ACI 117 - Standard Tolerances for Concrete Construction and Materials
 - 2) ACI 211.1 - Standard Practice for Selecting Proportions for Normal Heavyweight, and Mass Concrete
 - 3) ACI 301 - Specifications for Structural Concrete for Buildings
 - 4) ACI 302.1R - Guide for Concrete Floor and Slab Construction
 - 5) ACI 304 – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
 - 6) ACI 305R - Hot Weather Concreting
 - 7) ACI 306R - Cold Weather Concreting
 - 8) ACI 308 - Standard Practice for Curing Concrete
 - 9) ACI 309R - Guide for Consolidation of Concrete
 - 10) ACI 311.4R - Guide for Concrete Inspection
 - 11) ACI 315 - Details and Detailing of Concrete Reinforcement
 - 12) ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary
 - 13) ACI 347R “Guide to Formwork for Concrete.”
 - 14) ACI 506.2-13 – Recommended Practice for Shotcreting
 - 15) ACI 506.2 - Specification for Materials, Proportioning, and Application of Shotcrete.
 - 16) ACI 506.3R-82 - Certification of Shotcrete Nozzlemen
 - 17) Comply with building code requirements which are more stringent than the above
 - b. American National Standards Institute (ANSI):
 - 1) ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch [100 mm] through 12-inch [305 mm], for Water
 - 2) ANSI / ASTM A13.1-2007 Standard for the Identification of Pipes
 - 3) ANSI A108 - Installation of Ceramic Tile
 - 4) ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland cement mortar.
 - 5) ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland cement mortar Setting Bed with Dry-Set or Latex Portland cement mortar.
 - 6) ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland cement mortar -or- Installation of Ceramic Tile on a Cured Portland cement mortar Setting Bed with Dry-Set or Latex Portland cement mortar.
 - 7) ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland cement mortar or Latex-Portland cement mortar.
 - 8) ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
 - 9) ANSI A108.8 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
 - 10) ANSI A108.9 - Specifications for Ceramic Tile Installed with Modified

- 11) Epoxy Emulsion Mortar/Grout.
- 12) ANSI A108.10 - Specifications for Installation of Grout in Tilework.
- 13) ANSI A118.1 - Standard Specification for Dry-Set Portland cement mortar.
- 14) ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
- 15) ANSI A118.4 - Latex-Portland cement mortar.
- 16) ANSI A118.5 - Chemical-Resistant Furan Mortar and Grout.
- 17) ANSI A118.6 - Standard Ceramic Tile Grouts.
- 18) ANSI A118.7 - Polymer Modified cement grouts
- 19) ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
- 20) ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units
- 21) ANSI A118.10 - Load bearing, Bonded, Waterproof Membranes for Thin Set Ceramic Tile and Dimensional Stone.
- 22) ANSI A118.1 - ANSI A118.13 - Installation of Ceramic Tile
- 23) ANSI A118.3 - Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy Water Cleanable Tile Setting Epoxy Adhesive
- 24) ANSI A137.1 - Standards Specifications for Ceramic Tile
- 25) ANSI B2.1 – Valves
- 26) ANSI B16.5 – Class 150 Pipe Flanges
- 27) Comply with building code requirements which are more stringent than the above
- c. ASHRAE - American Society of Heating, Refrigeration, and Air Conditioning Engineers.
- d. ASME - American Society of Mechanical Engineers
 - 1) ASME 112.19.8 - Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs
- e. American Society of Civil Engineers (ASCE)
 - 1) ASCE 7-05: Minimum Design Loads for Buildings and Other Structures
- f. ASTM - American Society for Testing and Materials
 - 1) ASTM A123 / A123M-09 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2) ASTM A193 Standard Specification for Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications
 - 3) ASTM A194 / A194M-11 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High-Temperature Service, or Both
 - 4) ASTM A235-10 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - 5) ASTM A276 Standard Specification for Stainless Steel Bars and Shapes
 - 6) ASTM A240 / A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - 7) ASTM A307-10 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 8) ASTM A490-12 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

- 9) ASTM A563-07a - Standard Specification for Carbon and Alloy Steel Nuts
- 10) ASTM A615 - Deformed Steel Bars for Concrete Reinforcement
- 11) ASTM A666, Standard Specification for Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar
- 12) ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement
- 13) ASTM A307-10 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
- 14) ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- 15) ASTM B221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
- 16) ASTM B455, Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes
- 17) ASTM C31 – Making and Curing Concrete Test Specimens in the Field
- 18) ASTM C33 - Concrete Aggregates
- 19) ASTM C39 – Compressive Strength of Cylindrical Concrete Specimens
- 20) ASTM C94 - Standard Specification for Ready-Mixed Concrete
- 21) ASTM C143 – Standard Method of Test for Slump of Portland cement concrete
- 22) ASTM C150 - Portland cement
- 23) ASTM C260 - Specification for Air-Entraining Admixtures for Concrete
- 24) ASTM C172 – Method for Sampling Fresh Concrete
- 25) ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- 26) ASTM C231 – Standard Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method
- 27) ASTM C260 – Specification for Air-Entraining Admixtures for Concrete
- 28) ASTM C309 - Specification for Liquid Membrane –Forming Compounds for Curing Concrete
- 29) ASTM C330 - Lightweight Aggregates for Structural Concrete
- 30) ASTM C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement
- 31) ASTM C494 – Specification for Chemical Admixtures for Concrete
- 32) ASTM C578-10, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- 33) ASTM C618 – Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
- 34) ASTM D256-10 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
- 35) ASTM D570-98 - Standard Test Method for Water Absorption of Plastics
- 36) ASTM D638-10 - Standard Test Method for Tensile Properties of Plastics
- 37) ASTM D648-06 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
- 38) ASTM D695-10 - Standard Test Method for Compressive Properties of Rigid Plastics

- 39) ASTM D696-08 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer
- 40) ASTM D732-10 - Standard Test Method for Shear Strength of Plastics by Punch Tool
- 41) ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- 42) ASTM D792-08 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- 43) ASTM C1028-07 - Standard Test Method for Determining Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method:1.02
- 44) ASTM D1238-04 – Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
- 45) ASTM D1505 - Density of Plastics by the Density-Gradient Technique
- 46) ASTM D1784 – PVC / CPVC Plastic Pipe Properties
- 47) ASTM D1785 - PVC Plastic Pipe, schedules 40 & 80
- 48) ASTM D1998 - Standard Specification for Polyethylene Upright Storage Tanks Section 11.3: Low temperature. Impact Test and Section 11.4: Gel Test
- 49) ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
- 50) ASTM D2466 – PVC Schedule 40 Fittings
- 51) ASTM D2467 – PVC Schedule 80 Fittings
- 52) ASTM D2583 - 07 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- 53) ASTM D2584-11 - Standard Test Method for Ignition Loss of Cured Reinforced Resins
- 54) ASTM D2563 - Fabricated, Fiberglass Wrapped PVC Pipe Fittings
- 55) ASTM D2564 - PVC Pipe and Fittings Solvent Cement.
- 56) ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with PVC Pipe and Fittings.
- 57) ASTM D4101 – Polypropylene Materials
- 58) ASTM E84-12 - Standard Test Method for Surface Burning Characteristics of Building Materials
- 59) ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester - Rustic Board Pattern: 43.40; Slate Pattern: 34.90; Slate Smooth: 33; Ripple Pattern: 44.75
- 60) ASTM E648-03 is for "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source – Passed
- 61) ASTM E903-96 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
- 62) ASTM F593-02 - Standard Specifications for Stainless Steel Bolts, Hex Cap Screws, and Studs
- 63) ASTM F402 – Standard Recommended Practice for Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings
- 64) ASTM F437 – CPVC Fittings
- 65) ASTM F439 – CPVC Fittings

- 66) ASTM F441 – CPVC Plastic Pipe
- 67) ASTM F493 - CPVC Pipe and Fittings Solvent Cement
- 68) ASTM F656 – PVC Primers
- 69) ASTM F1292 - Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment: Critical Fall Height 1' or More.
- 70) ASTM F1790 – Ball Valves & Check Valves
- 71) ASTM G154 – Ability to Withstanding UV Exposure
- 72) Comply with building code requirements which are more stringent than the above
- g. American Water Works Association
 - 1) AWWA D121-12 - Standard for Bolted Aboveground Thermosetting Fiberglass-Reinforced Plastic Panel-Type Tanks for Water Storage
- h. Concrete Reinforcing Steel Institute (CRSI) - Manual of Practice
 - 1) CRSI 63 - Recommended Practice for Placing Reinforcing Bars
 - 2) CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications and Nomenclature
 - 3) Manual of Standard Practice
- i. Eslon Engineering Manual for Plastic Piping Systems
- j. IEEE - Institute of Electrical and Electronic Engineers
- k. IPCEA - Insulated Power Cable Engineer's Association
- l. ISO – International Organization for Standardization
 - 1) ISO-10352 - Fiber-reinforced plastics
 - 2) ISO-1172 - Textile-glass-reinforced plastics
 - 3) ISO-12114 - Fiber-reinforced plastics
 - 4) ISO-2577 - Plastics - Thermosetting molding materials
 - 5) ISO-1183A - Plastics -- Methods for determining the density of non-cellular plastics
 - 6) ISO-14125 - Fiber-reinforced plastic composites
 - 7) ISO-179 - Plastics -- Determination of Charpy impact properties
 - 8) ISO-527-4 - Plastics -- Determination of tensile properties
- m. MET – Met Laboratories, Inc.
- n. Model Aquatic Health Code
- o. National Association of Architectural Metals Manufacturers (NAAMM)
 - 1) NAAMM AMP-500 Metals Finishes Manual for Architectural and Metal Products
 - 2) ANSI/NAAMM A202.1 (MBG-531) Metal Bar Grating Manual
- p. National Plaster's Council "Pool Plaster Technology."
- q. NEC - National Electrical Code
 - 1) NEC Article 300.50 – Underground, Underwater, & Wet Locations
 - 2) NEC Article 310.10 – Underwater & Wet Locations
 - 3) NEC Article 680 - Swimming Pools, Fountains, and Similar Installations
- r. NEMA - National Electrical Manufacturer's Association
 - 1) NEMA MG-1 -- Motors and Generators.
- s. NFPA - National Fire Protection Association
- t. NSF 50 - Circulation System Components for Swimming Pools

- u. NSF/ANSI 61 (2010) Drinking Water System Components - Health Effects
 - v. TCNA (Tile Council of North America) - Handbook for Ceramic, Glass, and Stone Tile Installation - 2016
 - 1) TCNA 759 – Dry Set Mortar
 - w. UL - Underwriters Laboratories (or equivalent)
 - 1) UL 1081 - Swimming Pool Pumps, Filters, & Chlorinators (brominators)
 - x. United States Army Corps of Engineers (USACE):
 - 1) Concrete Research Division, Handbook for Concrete, and Cement
 - 2) CRD-C 527 – Corps of Engineers Specifications for Polyvinyl Chloride Waterstop
 - y. USEPA UVDGM- U.S. Environmental Protection Agency Ultraviolet Guidance Manual
- 3. The above mention of a Code or Standard does not imply that those codes or standards that are "not mentioned" do not apply. Specific mention of a code or standard is to bring attention to that standard.
 - 4. Any apparent silence of the Specification as to any, or the omission from them of any item, description, or a point, shall be regarded as that only the most suitable general practice for the concerned item, description, or point, is to be used.
 - 5. Items or materials that have not been individually specified shall be regarded, as a minimum, to be in accordance with the relevant code or standard where applicable.

1.08 MANUFACTURERS AND SUBSTITUTIONS

A. PRE-REQUISITES FOR SUBSTITUTIONS

- 1. The naming of a certain brand or manufacturer in these Specifications is to establish the quality and performance standard for the equipment or component specified. Do not switch or substitute specific brands or the manufacturer / fabricator indicated unless Contractor and This Engineer provide prior written authorization.

B. SUBSTITUTIONS

- 1. Refer to Section 01 25 00 for substitution procedures.
 - a. Substitutions that are not equivalent or do not result in substantial costs savings for the Owner / Client may not be considered.

1.09 SUBMITTALS

A. GENERAL:

- 1. Refer to Specification Sections 27 05 00 and 27 42 23 in addition to the following.
- 2. Partial or incomplete submittals will not be accepted.
- 3. Submit one set of electronic PDFs for shop drawings, catalog pages, manufacturer's sales literature, specification sheets, operation and maintenance manuals, engineering Drawings, and brochures for fixtures, equipment, fabricated items, and materials.
 - a. Refer to Division 01 for additional submittal requirements.
- 4. Prior to the preparation of Shop Drawings, SolidWorks models of all final EME Media Features shall be provided for review and approval by EME Team.
 - a. Refer to requirements listed in 27 42 23 as well as the following.
 - b. Coordinate with EME Media Feature Contractor for submittal. Provide single coordinated submittal.

- c. Approved models will be used to update the base building Revit model; this work shall be coordinated with Architect and Engineer.
 - d. No Shop Drawings may proceed without formal approval of SolidWorks models by Architect, Engineer and EME Team.
- 5. Do not proceed with ordering, purchasing, fabricating, or installing any equipment without reviewed and approved Shop Drawings.
 - a. Review is to determine conformance with the design intent of the Contract Documents.
 - b. The Shop Drawings and submittals process shall not modify the design intent of these Drawings.
 - c. Any action shown is subject to the requirements of the Contract Documents.
 - d. Confirmed dimensions and coordination at the site are solely the Contractor's responsibility.
- 6. Product Data: Contractor shall provide the Manufacturer's data sheets on each product to be used, including:
 - a. Manufacturer's preparation instructions and recommendations.
 - b. Manufacturer's storage and handling requirements and recommendations.
 - c. Manufacturer's installation methods.
- B. SHOP DRAWINGS:
 - 1. Refer to Specification Section 27 42 23 in addition to the following.
 - 2. The drawings accompanying this Technical Specification are diagrammatic in nature and show the general arrangement of equipment, piping, ductwork, services, supports, etc. Because of the small scale of the drawings, it is not possible to show offsets, fittings, and accessories that may be required. Contractor shall carefully investigate the structural and finish conditions of the work and shall arrange such work accordingly; furnishing fittings, pipes, valving, supports, testing apparatus and equipment, and numerous accessories that may be required to meet such conditions. Any deviations from the specified criteria shall be documented, reviewed, and agreed to in writing by the Authority and OAR prior to submission of bids. Refer to Division 01, and all related Division 27 Specification Sections for any substitutions and/or project deviation requests.
 - 3. Shop drawings shall be submitted to EME Team, OAR and Engineer, and favorable review of shop drawings shall be obtained before proceeding with fabrication. Shop drawings shall not be "doctored" reproductions of Architect/Engineer/Owner's drawings. Contractor shall include the proposed locations of pipe hangers and supports.
 - 4. Shop Drawings to be fully coordinated with EME Media Feature Contractor shop drawings. Coordinate joint submittals of integrated Shop Drawings, showing entire EME Media Feature and base building context, with EME Media Feature Contractor.
 - a. Final approval of Shop Drawings for the EME Fountain will not be granted until fully integrated shop drawings showing entire Moment Vault media feature are coordinated and submitted as a full package for final release.

5. Shop Drawings, at 1/4-inch=12-inch scale, shall be provided and shall include sufficient engineering data, indicate working & erection dimensions, electrical characteristics, locations at which materials & equipment are to be installed, supported, other essential data, manufacturer-confirmation of the product's suitability, and requested detailing.
 - a. Specialty Designated Engineering drawings for electrical, dehumidification, venting, and exhaust systems for this work, water supply, and water discharge wells, must be signed and sealed by a licensed Florida professional engineer(s) or surveyor.
 - 1) Each Specialty Designated Engineer shall submit a professional resume demonstrating and certifying ample experience to enable the Specialty Designated Engineer has the expertise within the specific specialty area.
6. Shop Drawings shall include the following:
 - a. Fully detailed shop drawings showing components of the fountain's plumbing system, fountains, basins and all associated parts and accessories required for full functionality.
 - b. Shop drawings detailing installation methods. Coordinate placement with locations noted on the Contract Drawings.
 - c. Fully engineered basin drawings that include full details of all parts required for the complete fabrication of the basin so as to meet both visual and functional design intent.
 - d. Fountain basin shop drawings must show the following:
 - 1) Integrated drawings (plans, sections, multiple representative horizontal sections through the body of each basin) inclusive of all the following basin components
 - a) Every part and member must be drawn in true scale and detailed in three or more views (plan, section, elevation, and axonometric). Each part must be called out to describe material, gauge, thickness, dimensions, radius (for bent and curved members and parts), finishes, attachments to adjacent parts, and fasteners sizes and types.
 - b) Structural support system including all vertical support members and any required lateral structural members between vertical support elements. Fountain structural support system shop drawings to show all components, parts and members, fully detailed and dimensioned; specific welding details for each part or member; fastener and/or bolt specifications and dimensions.
 - c) Main frame components of each basin, including but not limited to the upper trough, the stone supporting inclined surface, the lower trough, the basin edging, the camera/water pipes, cavity housing audio equipment, and the access panels openings, receiving reveals, and kick plates support.
 - d) Basin drip pan system. Provide detailed isolated and integrated drawings for the drip pan. These drawings must show the drip pan in its entirety and must be dimensioned to show sizes, gauges, slopes, high points, low points and edging. Include methods of fabrication, including bend requirements and welding requirements. Show attachments to plumbing fittings.

- e) Basin cladding (passenger side skirt). Show the dimension of every panel including bent radiuses; plate thickness; cleat sizes; methods of attaching cleats to front panels and to basin main frame; finishes; attachments to adjacent parts; fastener sizes and types.
- f) Basin access panels. Provide horizontal and vertical sections between the accessible panel edges and basin frame to ensure the panels are aligned (flush) with adjacent surfaces. Shop drawings to clearly show any reinforcements required to maintain the form and integrity of access panel and avoid fatigue caused by repeated handling.
 - 1 Shop drawings to show the perforation pattern for each access panel.
- g) Fountain stone platforms, including stone cutting patterns, edge details, tolerances, and details of all stone-to-stone and stone-to-stainless steel transitions.
- e. Method of attachment of each basin to the building structure, together with method(s) and mechanism(s) provided for field adjustments to ensure appearance and function meet design intent when field installed. Piping elevations, locations, routing, and slopes
 - 1) Graphically illustrate individual pipes with their identification and sizes

C. PRODUCT DATA

- 1. Provide Manufacturer's literature and data indicating performance characteristics, rated capacities, weights, materials, surface finish, accessories, electrical nameplate data, wiring diagrams.
 - a. Certificate of conformance with specified codes and Contract Documents shall be submitted for review.
- 2. Provide data on the following equipment, and accessories:
 - a. Equipment room equipment:
 - 1) Pumps and motors, including manufacturer-supplied performance curves at the flow and pressures to include the following minimum requirements:
 - a) Pump compliance with specified epoxy-fused coatings
 - b) Stainless steel shaft
 - c) EPDM seals
 - d) Hair and Lint strainer (if integral)
 - e) Compliance (or equivalence) with national listing agency
 - f) Self-priming pumps shall include the manufacturers' certification for water-lift capabilities surpassing those required for this project.
 - 1. Self-priming pumps larger than 3 hp shall include self-priming assist connections, equipment, and materials to the potable water supply.
 - 2) On pump motors, include specific:
 - a) Manufacturer confirmed VFD-Duty certification
 - b) Documented certification for premium efficiency. NEMA Premium (12.12) for Imperial and IE3 if Metric.
 - c) Insulation description and rating
 - d) A minimum TEFC-type enclosure or an approved equivalent
 - 3) Chemical and equipment room controllers, chemical safety (dual-wall) tanks (with accessories), chemical feeders, UV sterilizers, and specified chemical supply hoses, labels, conduits, sleeves, labeling, & related materials.

- 4) Motor starters with soft start feature.
- 5) Chemical storage safety tanks with factory-provided penetrations & labeling
- b. Link-Seal (with Century Line thermoplastic wall sleeves) waterproof piping penetration assemblies including 316L stainless steel hardware
- c. Water stops (No-Leak water stops, pre-fabricated water stops, water stop fittings, & metallic water stops)
3. Complete Build Specialty Designated Engineering submittals with signed & sealed documents:
 - a. These are Complete Build activities.
 - 1) Custom stainless-steel structures and/or basins
 - 2) Any ducting and ventilation system required for system functionality, beyond the demarcations indicated on the related Construction Documents
 - 3) Piping hangers, supports, braces, and expansion components, with interface approved by the Project's Structural Engineer.
 - 4) Electrical power distribution and control systems, including, but not limited to:
 - a) Control wiring schematics and componentry; submittals that do not have the confirmed, correct electrical power supply shall be rejected for corrections.
 1. Under-deck, underground, underwater, and wet-rated conductors and similar wires
 2. CAT 6 data cables are acceptable for under-deck, underground, and underwater conduits (must be rated as suitable for wet conditions).
 - b) Equipment room electrical panels shall clearly show the code-specified 48 in [1.22 m] uninterrupted clearance in front of panels, motor starters, transformers, disconnects, power supplies, automation panels, etc.
 - c) Underwriter's Laboratories (UL)-listed pressure-type or exothermic weld (in compliance with NEC) for ground wires' and earthing connections.
- D. COLORS / SAMPLES:
 1. Refer to sample requirements in Specification Section 27 42 23 in addition to the following.
 2. All samples must be submitted for review and approval by EME Designer prior to actual fabrication to demonstrate that the design intent has been satisfied.
 3. Samples to be submitted to EME Designer for review and approval include, but may not be limited to, the following:
 - a. Interior finishes
 - 1) Provide one (1) sample of custom-perforated stainless steel audio speaker cover screen, 3/16" thickness, 18.5" width, at the full height of the fountain panel as shown on EME Drawings. Screen to be minimum 60% perforation with a 10 +/- gradient on top and bottom, with matte black acoustically transparent grille cloth on inside surface. Finish to be polished stainless steel, level 4 finish, 320 grit.
 - 2) Provide four (4) 4" x 4" length samples of stainless steel for fountain stems. Finish to be polished stainless steel, level 4 finish, 320 grit.
 - 3) Provide four (4) 4" x 4" samples of stainless steel showing basin interior finish.
 - 4) Provide four (4) 4" x 4" samples of stainless steel showing polished exterior finish. Finish to be polished stainless steel, level 4 finish, 320 grit.

- 5) Provide four (4) 4" x 4" camera lens protection samples for EME team for approval
- 6) Prior to mock-up, provide samples of at least three different natural stones, color black, suitable for permanent installation in submerged environment.
 - a) For each stone so provided, furnish two (2) 4 x 4 samples, each no less than 3cm thickness, for each of the following four (4) finishes: flamed, groove textured, chiseled, and cleft.
 - b) Refer to "MOCK-UPS," below.
- b. UV inhibitor coating on "exposed to sunlight" PVC (if required)
- c. Metallic primers and top coat paint materials (if required)

E. BASIN ITEMS:

1. Stainless steel fabrication requirements
 - a. A carefully defined edge must be established between dissimilar materials and surfaces of the fountain basins. Shop Drawings must be submitted for review and approval by EME Team prior to actual fabrication to validate that the design intent has been satisfied.
2. Structural requirements
 - a. Shop Drawings must be submitted for review and approval by EME Team prior to actual fabrication to validate that the design intent has been satisfied. Fabrication Shop Drawings must include every component of the basins, and indicate every weld, finish, and material thickness.
 - b. All surfaces subject to immediate contact with passengers and daily maintenance traffic must be minimum 3/16" thickness. Final thickness shall be determined during Shop Drawing engineering process. All calculations shall be submitted to EME Team for review.
 - c. Removable panels must be engineered and designed to sustain stress without deformation due to repeated handling fatigue.
 - d. The structure of basin must be designed to ensure that the maximum deflection of any point of the basin does not exceed 1/16".
 - e. Basin structures must be engineered and designed to handle all applicable loads, including but not limited to the self-weight, the weight of the stone slabs, and the weight of circulating water.
 - f. All stainless-steel plates must be of suitable gauge or be reinforced so as to avoid any possible oil canning effect on any plate surface.
 - g. Fabrication and final installation tolerances should not exceed 1/16" per 10' linear, non-cumulative. The proposed solution must support adjustment to achieve level surface required by design intent, regardless of field conditions.
3. Waterproofing Systems & Waterstops Description
 - a. Refer to Architect

F. EQUIPMENT ROOM & SITE ITEMS:

1. Specifications of piping, piping cement, glue, cleaners, primers, valves, fittings, supports, and hangers – for the entire project. Includes but is not limited to:
 - a. Flexible piping connectors
 - b. Specialty piping, eccentric and other reducers, and fittings
 - c. Piping manifolds

- 1) Provide thoroughly dimensioned shop drawings and indicate flanged connectors.
- 2) Provide anchoring details for manifold supports
- d. Valve and piping tagging, with a color-coded I.D. system and corresponding valve chart
 - 1) Submit two (2) copies of laminated 18" x 24" [455mm x 610mm] valve charts for each piping system, consisting of Isometric Drawings or piping layouts showing and identifying each valve and describing its function to Contractor and This Engineer for prior approval. These shall be suitable for mounting in the equipment room.
- e. Valves, check valves, valve operators, flanges, and flange hardware
- f. Gauges, meters, thermometers, and sensors
- g. If Type 6 (galvanized steel) piping is proposed or specified:
 - 1) indicate its intended purpose
 - 2) Cut sheets for the required chlorine impervious coating.
- h. Water hammer arrestor devices and reduced pressure backflow preventers
2. Color printed sample representations (actual size) of the labeling and valve tags specified herein.
3. Details of assembly and installation if any deviations from the Drawings are anticipated.
 - a. Submit laboratory confirmation (using the positive analytical method) of adhesives, admixes, mortars, epoxy grouts, and other installation materials:
 - 1) Identify proper usage of specified materials.
 - 2) Identify compatibility of specified materials.
 - 3) Identify proper color matching of specified materials.

G. MOCK-UPS

1. Refer to Specification Section 27 42 23 in addition to the following.
2. Coordinate with EME Media Feature Contractor and provide required material for mock-ups detailed in Section 27 42 23.
3. For purposes of evaluating fountain effect, provide three mock-up panels being a minimum of 3 feet [0.91 m] long illustrating the fountain edge(s). Attention shall be given to:
 - a. The finishes, color, and texture:
 - a) Based on materials provided under "SAMPLES," above, EME Designer will confirm stone material for mock-up.
 - b) Based on finishes provided under "SAMPLES," above, EME Designer will confirm preferred texture(s) for mock-up.
 - c) Stone for final installation to be confirmed by EME Designer following mock-up.
 - b. Demonstrate that water-level sensitive edges & trims (gutter lip, infinity edge, and weirs) are precisely level
 - c. Provide functioning mock-up confirming water flow and effect over mock-up surfaces.

H. APPROVAL / INSPECTION / SCHEDULES DOCUMENTS

1. Schedule of Values:

- a. Provide to Contractor and This Engineer a copy of the Schedule of Values developed for this project relevant to Section 13 12 00 for written approval.
 2. Coordinate with Contractor for requirements related to written approvals, record of successful inspections, and completed operating permits for the following governmental agencies:
 - a. Building Official and Building Department(s)
- I. QUALIFICATION DOCUMENTS:
 1. Submit mandatory qualifications for review and approval
 - a. Include certificates of insurance
 2. Submit listings of previous similar projects to Owner / Client and EME Media Feature Contractor with contact info
 3. Submit Contractor's Specialty Designated Engineers' professional resumes and include:
 - a. Mandatory qualifications & resumes for review and approval
 - b. Listings of previous similar projects with current Client / Operator contact info
- J. OPERATION & MAINTENANCE (O & M) DOCUMENTS
 1. Refer to Specification Section 27 42 23 in addition to the following
 2. Provide thorough instructions & operating manuals to the pool operator via this submittal process. Prior to turn over to the operator / Owner, EME Fountain Contractor shall provide comprehensive operating manuals to Contractor and This Engineer for review and approval. At a minimum, the manuals will include:
 - a. Written instructions for total operation & maintenance of each system
 - b. Comprehensive valve charts and schedules
 - c. Include specific valve operating directions for the following functions:
 - 1) Normal filtration
 - 2) Backwash events
 - 3) Filter cleaning events
 - 4) Basin draining events
 - d. Manufacturer-issued "owner operating & maintenance manuals" and warranties
 - e. A written contact list of the applicable contractors' employees (names, phone numbers, and email addresses)
 - f. A written list of each manufacturer's local representative (or the contact person's info at the actual manufacturer) with names, phone numbers, and email addresses.
 - g. A copy of each submittal document with the engineer's review stamp affixed
 3. Operations and Maintenance (O & M) Manual
 - a. Contractor shall deliver to the Architect/Engineer/Owner an electronic copy of the O&M Manual submittal for review and approval as well as a Final Approved O&M Manual. Once approved, O & M Manual shall also be provided in hard copy bound format, duplicate of four (4) each.
 - b. O&M Manual shall contain operating and maintenance instructions for the pool basin structure(s), finishes, and component equipment including, but not limited to, the following:
 - 1) Table of contents.
 - 2) Equipment cut sheets.
 - 3) Accurate parts list.

- 4) Pool start-up, commissioning, and emptying-of-water instructions.
 - 5) Pool cleaning, chemical re-supply, and maintenance instructions
 - 6) Auto pool cleaner operation & maintenance
 - 7) Pool maintenance requirements, detailed and based upon: Daily, Weekly, Monthly, Seasonally, and Annually
 - 8) Narrative on the pool operation through sequences.
 - 9) Troubleshooting information and procedures.
 - 10) A piping diagram (schematic) as installed.
 - a) Incorporate the updated valve I.D. & numbers for installed valves into this diagram
 - 11) Valve charts for each piping system, consisting of isometric drawings or piping layouts showing and identifying each valve and describing its function.
 - 12) Record Drawings
 - 13) Warranties
 - c. A DVD of complete start-up and shut-down procedures as well as the training session.
4. Control systems data / info / narratives:
- a. The scope of the project will determine the various control systems' narratives specified within the operators' manual. The controls narrative shall thoroughly describe each Contractor-provided electrical control system and lighting control system.
 - b. Typical control system descriptions will include:
 - 1) Chemical automation control
 - a) Chemical systems' electrical interlocks with filter pump operation
 - 2) Electrical control protocols with building management system
 - 3) Chemical operations / water level systems / flow sensor & flow switches
5. Equipment Certification(s) from Contractor
6. Manufacturers' "approval of installation" certificates and pre-paid preventative maintenance certificates shall be provided to the Engineer for transmittal to the Owner. Ensure the following documentation packages are included:
- a. Pump(s) documentation to include:
 - 1) Types A, B, C, D, E, G, AND K
 - 2) Larger than 10 hp [7.45 kW]
- K. PERMITS, INSPECTIONS, AND TEST RESULTS
1. After project startup and before project completion, the Contractor shall submit the following:
 - a. One set of completed inspection and test documents.
 - b. Field reports or memos required by regulatory agencies.
- L. REVIEW OF PROJECT DOCUMENTS
1. Submit three (3) sets of "as-built" drawings and one (1) set of electronic PDF files. As-Built Drawings shall reflect "as-installed" deviations in red ink on the "For Construction" Drawings.
 2. As-Built Drawings shall accurately record actual and verified:
 - a. location and elevation of each pool basin
 - b. conduits, transformers / power supplies
 - c. piping locations and elevations

- d. related equipment
- e. written description of irregularities encountered during the construction phase
- 3. Submit 3 DVDs containing operating instructions, photos, and maintenance duties of the Owner's personnel.
- 4. Warranty and fully-paid purchased preventative maintenance certificates

1.10 QUALITY CONTROL

A. PROCEDURES

- 1. Quality Control shall be assisted on this project by the following specified procedures:
 - a. Use of qualified installers and personnel
 - 1) Pool installer shall meet local and verified state certifications and license requirements prior to bidding. Copies of required certificates and licenses shall be made available upon request.
 - b. Performance of work per applicable codes and standards
 - c. Hold clearance dimensions and mounting heights specified by the NEC and as detailed. Submit conflicts for written direction.
 - d. Perform work in accordance with applicable municipal, county, and state codes along with applicable permits.
 - e. Water-level sensitive edges & trims (gutter lip, infinity edge, and weirs) shall be precisely level
 - f. Excellent workmanship is required.

B. QUALIFIED PERSONNEL

- 1. Commercial pool installer requirements:
 - a. The commercial pool installer shall have not less than ten (10) years of successful experience in the installation of similar commercial-type pools.
 - 1) The commercial pool installer shall supply a 100% performance, labor, and material bond for the work.
 - 2) The commercial pool installer (or his designee) shall be licensed as a commercial pool contractor or installer and be legally authorized to perform the work outlined in the Contract Documents or shall employ such a qualified, licensed installer to complete this job.
- 2. Delegated Engineering Services to be employed by the Installer:
 - a. Delegated Engineering Services may also be specifically referred to as a Specialty Designated Engineer, Specialty Electrical Engineer shall be licensed in the governmental locale of the project. The Contractor, as a Complete Build activity, provides these engineers.
 - 1) Specialty Electrical Engineer: A locally-licensed, professional engineer to provide the electrical power, control wiring, bonding, earthing, and grounding design for the pools.
 - b. Manufacturer: A company specializing in manufacturing the products specified with a minimum of ten years documented experience
- 3. Natural stone Installer qualifications:
 - a. Stone installing company specializing in the installation of natural stone, movement joints, and epoxy grouts with five (5) years documented experience with aquatic-type installations of similar scope, materials, and design.

- 1) Demonstrate a prior knowledge of natural stone and finish movement joints
- b. Installers shall install water-level sensitive edges & trims (skimmers, trims) to be precisely level
4. Electrical Contractor / Installer: Specified electrical work to be performed by a locally-licensed electrical contractor with a documented 5 years' experience on similar projects.

C. MATERIALS AND REGULATIONS

1. Use of materials and equipment:
 - a. Use only approved materials and equipment.
 - b. Materials and equipment shall be in "new" condition and carry a comprehensive manufacturer's warranties beginning on the date of Substantial Completion.
 - c. The manufacturer's maintenance and installation instructions and warranty information shall accompany equipment.
 - d. Affirm materials and equipment are not damaged or impaired by on-site storage from the time of delivery to the date of installation.

D. ARCHITECTURAL/ENGINEERING OBSERVATIONS

1. Include and anticipate a minimum of five (5) Architectural / Engineering observations in the EME Fountain Contractor's scope of work as follows:
 - a. Observation of under-deck piping during the required water pressure testing. Observations shall follow interface of the piping with the Equipment Room.
 - b. Additional and follow-up observations of water-pressure testing on the Equipment Room piping systems.
 - c. Observation of basin just prior to the application of interior surface finishes material. Movement joints shall be in place prior to this observation.
 - d. Owner's review and Substantial Completion.
2. Provide 72-hour notice of these observations.
3. Coordinate additional inspections with the local building department and other regulatory agencies as may be specified.

1.11 CONSTRUCTION FACILITIES

A. SITE WORK AND PLENUMS.

1. CMAR shall provide all core-drilling and/or concrete penetrations and/or penetrations of rated building partitions.
2. Piping between the Equipment Room, basin, and perimeter basin piping shall be located only in designated passageways within "on-structure" projects.
3. No PVC or similar petrochemical piping may be installed into plenums.

1.12 MATERIAL AND EQUIPMENT - GENERAL REQUIREMENTS

A. PRODUCTS

1. Except as specifically noted in the Contract Documents, the products of a single manufacturer for each type category of material or equipment shall be utilized throughout.

B. EQUIPMENT DUTY RATING

1. Equipment and materials shall be capable of both continuous and intermittent duty rating and operation.

C. CONDITION OF MATERIALS AND EQUIPMENT

1. Materials and equipment shall be new, undamaged, and protected and secured throughout the construction period in order that the equipment and materials remain in a new condition at the time of Substantial Completion. Deliver and store equipment, materials, and products components with labels intact and legible.
 - a. Immediately inspect all delivered equipment, materials, and products to ensure they are undamaged and in good condition. Report damages and unacceptable conditions on the contractors' daily report.
 - b. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
2. Store expansion joints & water stops indoors or under appropriate tarps to protect from premature exposure to oil, sunlight, moisture, and water.
3. Store and dispose of solvent-based materials such as construction adhesive, and materials used with solvent-based materials, in accordance with requirements of local authorities having authority.
 - a. Store materials to be protected from exposure (the sun, rain, & moisture) to harmful environmental conditions and at a minimum temperature of 20 degrees F (-7 degrees C) and a maximum temperature of 100 degrees F (38 degrees C).

D. PERFORMANCE CERTIFICATION REQUIRED:

1. The equipment suppliers and manufacturers shall guarantee that their equipment to be furnished is the correct capacity, that the various parts are designed to operate correctly, and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the suppliers instructions, their systems will perform the prescribed functions correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of authorities having jurisdiction.

1.13 WARRANTIES & SPECIAL PROJECT REQUIREMENTS

A. WARRANTY – EQUIPMENT AND MATERIALS INSTALLATION:

1. Provide a minimum one (1) year warranty covering pool workmanship, materials, and equipment from the date of substantial completion of the work (or longer if specified in the General Conditions and herein).
2. It is the responsibility of the Contractor to coordinate warranty requirements with any related sections or adjacent Work. Notify OAR immediately of any potential lapses or limitations in warranty coverage.
3. Standard manufacturer's warranties shall apply to equipment, materials, and products provided by Contractor.

B. MANUFACTURER'S WARRANTY:

1. General:
 - a. 2-year manufacturer's warranty minimum for defects in materials and equipment (or longer if so specified elsewhere by the specific manufacturer).
 - b. Owner to be named on manufacturers' warranties.
 - c. Replace equipment that fails or shows undue wear.
 - d. Additional warranties shall be as specified in the Architect's Division 1 - "General Conditions."
 - e. If equipment items are provided with a longer warranty than the minimum warranty period, those warranties also shall be transferred to the Owner within the project Close-Out Documents.

2. Specific other warranties:

a. Pumps:

- 1) Manufacturer's standard pump warranty. Warranty on mechanical seals covering 100% of the cost of parts and labor extending over the same time period as the provided pump warranty.
- 2) Pump failure of any pump component directly attributable to materials or workmanship within two (2) years after shipment shall be repaired or replaced FREE of charge by the pump manufacturer.
- 3) Motor failure of any motor component directly attributable to materials or workmanship within 3 years after shipment shall be repaired or replaced FREE of charge by the pump manufacturer.

- b. SST panels Warranty shall be for a minimum (3) years from the date of installation & cover any failure in the material defect.

1.14 ATTIC STOCK

A. GENERAL

1. Obtain receipt for all attic stock items from the Owner to prove delivery

B. MATERIALS

1. Furnish to the Owner an extra stock of 10 percent minimum (of the installed materials) for the following items:
 - a. Natural stone, copings, and trim shapes of each type, color, pattern, and size used in the Work
 - 1) Attic stock (for finish materials) is to be from same production run or batch as original stone and installation materials.
 - b. Extra stock (10% of the amount used) of adhesives, mortars, epoxy grouts, and other installation materials for the Owner's use in replacement and maintenance.
 - 1) Provide each of the above in 5-gallons containers, water-proofed, and labeled for contents

C. SPARE PARTS

1. Refer to the Equipment Schedule and Equipment Schedules for additional strainer baskets, filter elements, screen filters, and other specified equipment parts specified for attic stock.
2. Provide specified spare parts in individual boxes (with the part name and model number clearly marked on the box) to the owner.

D. SPECIAL TOOLS

1. Provide special tools specified for continued operation and maintenance of the equipment provided under this Section.
2. Deliver tools to the Owner's operating personnel during the startup and testing of the equipment.

PART 2 - PRODUCTS

2.01 BASIC POOL BASIN CONSTRUCTION MATERIALS

A. GENERAL

1. It is the design intent of these technical specifications, Drawings, and Contract Documents for the **Contractor (and selected Installers)** to provide equipment, labor, and materials as required (without exception) for the construction and installation of the pool(s) & related assemblies at this project site.
2. Activities included, but not limited to, by the EME Fountain Contractor shall be layout, forming, waterproofing, piping & valving systems, basin, and deck equipment, finishes, anchoring, filtration systems, pumping systems, chemical systems, air compressors, miscellaneous equipment systems as noted herein and, in the Drawings, Contract Documents, electrical, programming, and other components, equipment, labor, materials, & supervision needed although not specifically listed.
3. Additionally, included also by the EME Fountain Contractor shall be all required components, equipment, labor, materials, & supervision for start-up, commissioning, chemical balancing of basin water, warranty, instruction, maintenance during the initial operating period's operation, programming, and similar products & services.
4. Application, employment, and use of components, equipment, labor, materials, & supervision shall be in accordance with the manufacturer's instructions & recommendations, the requirements of This Engineer, and the Contract Documents.
 - a. In the event of a conflict, notify Contractor and This Engineer in writing requesting a written clarification.

B. SEALANTS

1. General: Sealants shall be RTV Silicone base, manufactured by General Electric, mildew, and chlorine resistant, capable of continuous water submersion, color as selected.
2. Deck sealant (between the deck and pool beam) shall be Deck-O-Seal One Step or Sikaflex 12-SL. Deck-O-Seal: Hampshire, IL (800-542-7665); www.deckoseal.com . The Sika Corporation: Lyndhurst, NJ (210-933-8800); www.usa.sika.com.

C. UNDERWATER SEALANTS

1. Basis of Design for underwater expansion joints for Contractor or pool installer:
 - a. Submerseal by EMSEAL Joint Systems, LTD; 25 Bridle Lane; Westborough, MA 01581-2603; 800-526-8365. www.emseal.com.
 - b. Willseal 250BG by Willseal LLC, 34 Executive Drive, Hudson, NH 03051, 800-274-2813, 800-416-0550 (Fax), www.willseal.com; email: custserv@willseal.com
2. Basis of Design for underwater expansion joints for Manufacturer Certified Joint Installer. The below-mentioned materials are pre-approved ONLY if installed by a manufacturer's Certified Joint Installer.
 - a. Horizontal underwater construction / expansion joints: "Dura-White" Deck-O-Seal #125 by Deck-O-Seal Corporation, Hampshire, IL (800-542-7665); www.deckoseal.com.
 - b. Vertical underwater construction / expansion joints: "Dura-White" Deck-O-Seal Gun Grade by Deck-O-Seal Corporation, Hampshire, IL (800-542-7665); www.deckoseal.com.

D. LINK-SEALS, WATERSTOPS, & WATERPROOF PENETRATIONS

1. Link-Seals assemblies:
 - a. Sleeve features:

- 1) Molded from non-conductive, light-weight, high impact-resistant HDPE available in diameters ranging from 2-inch [25 mm] to 25-inch [635 mm] in any length.
 - 2) Hollow waterstop collar: 2-inch [50 mm] width.
 - 3) Provide specially designed end caps for attaching the sleeves to the concrete forms and assuring sleeve holds the circular configuration during the concrete placement.
 - 4) Provide sleeve with a textured exterior surface to assist in assuring a better mechanical bond to the concrete interfaces.
 - 5) Basis of Design: Century Line thermoplastic wall sleeves by Thunderline/Link-Seal, 6525 Goforth Street, Houston, TX 77021, 713.747.6948, www.linkseal.com or a pre-approved equal.
- b. Link-Seal Modular Seals with the following features:
- 1) Model "S-316L" Link-Seal Modular Seal
 - a) Suitable for use in water, direct ground burial, chemical exposure, and atmospheric pressure
 - b) Shall provide electrical isolation and cathodic protection
 - c) EPDM ("black" in color) with reinforced nylon polymer pressure plates
 - d) Nuts, bolts, and washers shall be ANSI type stainless steel grade 316L, per ASTM F593-95 with a tensile strength of 85,000 psi, minimum
- c. Basis of Design: Link-Seal assemblies (by PSI-Thunderline/Link-Seal), 6525 Goforth Street, Houston, TX 77021, 713.747.6948, www.linkseal.com or a pre-approved equal.

E. ADHESIVES & GROUTS

1. Adhesives for exterior, underwater, and submerged applications
 - a. Rated by the manufacturer as:
 - 1) superior for the exterior, submerged, and underwater applications
 - 2) ultimate adhesion for porcelain and glass tiles
 - b. Basis of Design: Latex Portland Cement Thin Bed Mortar for thin set and slurry bond coats: Weather, frost, and shock resistant, non-flammable, GreenGuard compliant, conform to ISO C2TES1, and meeting the following physical requirements:
 - 1) Shear bond in water immersion: > 300 psi [2.0 MPa]
 - 2) 7 Day cure / 21-day water immersion
Tensile adhesion strength: > 170 psi [1.17 MPa]
 - 3) Total VOC Content < 0.05 mg/m³
 - c. Latex Portland cement Thin Bed Mortar: LATICRETE 254 Platinum by LATICRETE International, Inc. 1 LATICRETE Park North, Bethany, CT 06524-3423 USA. Phone 800-243-4788, www.laticrete.com; www.laticrete.com/green
2. Adhesives for spot bonding method of tile and stone installations
 - a. Rated by the manufacturer as:
 - 1) High strength epoxy adhesive formulated for spot bonding method of tile and stone installation on vertical and overhead surfaces for exterior applications
 - 2) Adhesive for fabricating granite, marble, and stone

- b. Basis of Design: LATAPOXY 310 Stone Adhesive for a fast-permanent bond, non-staining, resistant to shock and vibration, non-sag, conform to ANSI A118.3, ISO 13007, and EN 12004, and meeting the following physical requirements:
 - 1) Shear bond to concrete: 720 to 920 psi [5.0 to 6.3 MPa]
 - 2) Tensile adhesion strength: 1,500 to 2,100 psi [10.3 to 14.5 MPa]
 - 3) 7-day cure shear adhesive strength 2,610 to 4,785 psi [18 to 33 MPa]
 - 4) 7-day cure 21-day water immersion Shear adhesive strength 2,030 to 4,930 psi [14 to 34 MPa]
 - 5) Thermal shock 1,030 to 1,600 psi [7 – 11 MPa]
 - 3. Epoxy Grout
 - a. Only epoxy grouts in tiles or natural stone finishes are permitted
 - b. Basis of Design: Laticrete SpectraLOCK PRO Premium Grout by LATICRETE International, Inc. 1 LATICRETE Park North, Bethany, CT 06524-3423 USA. Phone 800-243-4788, www.laticrete.com; www.laticrete.com/green
 - 1) Compressive Strength: 3,800 psi (@7 days) [26.2 MPa]
 - 2) Tensile Strength: 1,100 psi (@7 days) [7.6 MPa]
- F. PIPING INSULATION AND WATER-PROOFING VAPOR BARRIER
- 1. General:
 - a. All insulation must be closed cell type
 - b. Follow & observe all manufacturers' requirements
 - 2. Direct-Burial and Above-Grade Insulation for heated water piping:
 - a. Basis of Design:
 - 1) Insulation: FOAMGLAS® insulation, ASTM C-552 "Spec. for Cellular Glass Thermal Insulation", by Pittsburgh Corning Corporation, 800 Presque Isle Drive, Pittsburgh, PA 15239 USA, 800.545.5001; www.foamglasinsulation.com , or an approved equal.
 - 2) Jacketing: PITWRAP® CW Plus jacketing (FI-234) by Pittsburgh Corning Corporation, 800 Presque Isle Drive, Pittsburgh, PA 15239 USA, 800.545.5001; www.foamglasinsulation.com , or an approved equal.
 - 3. Direct-Burial and Above-Grade Insulation & Jacketing for chilled water piping:
 - a. Basis of Design: PITTSEAL® 727 (FI-255) sealant by Pittsburgh Corning Corporation (or approved equipment)
- G. NATURAL STONE
- 1. Natural stone to be selected following submittal of samples and review of cascading effect at mock-up. See "SAMPLES" and "MOCK-UP" above. Material to be suitable for permanent submerged environment.
 - a. Stone material to be no less than 3cm in thickness.
 - b. Stone color to be black.
 - c. Stone to have eased edge. Underside of stone to have drip edge reveal.
 - d. Joints between stone segments to be concealed and detailed as curves or irregular pattern, to avoid visible straight lines and to create visual continuity across stone surface.
 - 1) EME Designer to review and approve segmentation approach and joint layout.
 - e. Setting material to be compatible with both stone and metal surfaces.

2.02 STAINLESS STEEL BASINS

A. MATERIAL SPECIFICATION

1. All wetted stainless-steel components that are visible to the public shall be 316L or better. All other stainless-steel components shall be 304L or 316L. Visible stainless steel components shall have a polished finish, No.4, 320 grit. Surface roughness shall be Ra 25 micro-inches or less.
2. Visible elements include:
 - a. Removable stainless steel audio speaker cover screen, 3/16" thickness, to be minimum 60% perforation with a 10 +/- gradient on top and bottom, with matte black acoustically transparent grille cloth on inside surface.
 - 1) Coordinate perforation pattern with EME Designer.
 - b. Stainless steel for fountain stems
 - c. Fountain-stem mounted custom enclosures for cameras and sensors, which include protective glass covers
 - 1) Coordinate enclosure design, with EME Designer, EME Specialized AV Systems Integrator and CDS Designer.
3. Fountain basins shall be assembled with a concealed fastener system. Any exposed fasteners must be approved on a case-by-case basis and shall be tamper-proof.
4. All materials used in basin fabrication must be durable and non-corrosive.

B. TOLERANCES & QUALITY CONTROL

1. The manufacturer shall present a certificate of ISO 9001 registration or the following:
 - a. The manufacturer will employ an independent testing agency chosen by EME Fountain Contractor to perform source quality-control testing and special inspections, and to prepare test reports.
 - 1) Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 - 2) The manufacturer shall allow testing agency access to places where structural/primary components are being fabricated or produced and cooperate with the testing agency and provide samples of materials as may be requested for additional testing and evaluation.
 - b. The manufacturer shall correct deficiencies in or remove and replace primary components that inspections and test reports indicate do not comply with requirements.
 - c. All manufacturing shall be done to millimetric precision with a net result of -0.000 meters +0.001 meters dimensionally
 - d. All recirculation components (i.e., gutter drop-outs, inlets, etc.) shall be designed using static computational fluid dynamics models to ensure proper dispersion of chemicals.

2.03 PIPING & FITTINGS

A. PIPE & FITTINGS MATERIAL TYPES

1. The following types of piping & fittings are identified on the Drawings. Fittings shall be the same type and schedule as piping.
2. Unless noted otherwise, the piping shall be NSF-PW rated. The NSF-PW rating assures that the materials are specifically listed and approved for potable water use.

3. Type 1 and Type 2 pipe may be substituted with UPVC in the same pressure rating.

ADE PIPE & FITTINGS TYPE	MATERIALS	REMARKS
TYPE 1	PVC, SCHEDULE 40	
TYPE 2	PVC, SCHEDULE 80	
TYPE 3	CPVC, SCHEDULE 80	Utilize CPVC TYPE IV
TYPE 4	HDPE - SDR-11, PN-16	
TYPE 5	Stainless Steel, Schedule 10, Grade 304 (or better)	Welded pipe and pipe fittings
TYPE 6	Coated Galvanized Steel, Grade 40	Coated for chemical resistance
TYPE 7	Clear PVC, Schedule 80	
TYPE 8	PVC, Schedule 80, Double-walled Containment Piping	For hard-pipe transport of sodium hypochlorite (bleach) and muriatic acid Primary pipe-carrier 2-inch [50mm] and secondary containment 4-inch [100mm]
TYPE 9	Corrugated HDPE pipe	For Drain, Vent, Waste, & Sleeves, under-roadways (meet Federal Highway loading for H-10).

B. PIPING SCHEDULES / APPLICABILITY / USES

1. Pipe materials shall be as follows. Fittings shall be the same schedule as the piping:

Description:	ADE Type Pipe:	Remarks:
Exposed Pipe & Fittings	2	Above-grade within equipment rooms except as noted herein
Concealed piping & Fittings	2	For sizes 6-inches [150 mm] or less
Concealed piping & fittings	2	For sizes 8-inches [200 mm] or greater
Pipe & fittings beneath basin structures	2	
Piping passing through single structure	2	Single layer of concrete only – all pipe sizes
Piping passing through multiple structures	5	2 or more layers of concrete – all pipe sizes
Piping beneath roadways, traffic areas, or piping exposed to heavy loads	2 (placed within Type 9 oversized sleeve)	Place Type 2 piping within Type 9 piping (being used as an oversized sleeve) sized and installed per the manufacturer's requirements for depth of earth cover. Utilize H-10 load rating.

Heater piping	3	Must be fully supported – refer to heater manufacturer to determine if Type 5 is specifically specified.
Clear piping to observe water flow in designated pipe locations (such as prior to flow meters, waste discharge pipes, etc.)	7	Minimum length of 24-inches [600 mm] or as noted in Drawings
Air Compressor & Regenerative Blower Piping >30 PSI [2 Bars]	5	Entire piping system for compressed air to be St. steel as indicated above (Type 5); include closed-cell insulation for exposed piping
Air Blower Piping (small loads / pressures only) (initial 90 feet [27.4 M])	5	Include closed-cell insulation within the equipment room. Place signage “HOT – DANGER.”
Air Blower Piping (small loads / pressures only) (after initial 90 feet [27.4 M])	3	Include closed-cell insulation for exposed piping; typical for blower-induced air supply for therapy fittings or similar use.
Chemical tubing conduits or chases	1	Long sweep fittings specified to facilitate install of tubing.
Air tubing / hoses within conduits and chases (for applications such as air supply tubing for pneumatic valves)	1	Long sweep fittings specified to facilitate install of tubing. Black color for tubing / flex pipe; air tubing shall be UV outdoor-rated.
Chlorine / Acid transport (Double-Walled Thermoplastic piping containment below grade)	8	Place such piping within Type 6 below-grade sleeves for additional protection
Piping / valve manifolds	5	Includes trunk pipe with numerous valve branches – each connection shall be flanged. Utilize the flange to convert to other types of pipe material

2. Piping General Notes / Requirements

- a. Provide closed-cell insulation (rated for high temperatures up to 240° F [115° C.]) around chilled, heated, & compressed air piping.
 - 1) Compressed air piping shall include closed-cell installation unless located beneath 18-inches [455 mm] of soil.
- b. UV inhibitor coating on piping & fittings: Types (1 through 4 and type 8) Plastic (petrochemical) piping & fittings exposed to sunlight shall be coated with an ultraviolet inhibitor.
- c. The pipe and fittings shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer.

- 1) Pipe shall be stored indoors after production at the manufacturing site until shipped from the factory.
- 2) This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water (PW) applications.
- 3) Standard lengths of pipe size 6" and larger shall be factory beveled each end.
- d. Heavy, corrosion-resistant coatings on metallic piping
 - 1) Type 6 pipe (galvanized steel pipe) shall have a minimum G90 heavy corrosion-resistant coating applied to surfaces.
 - a) Type 5 (stainless steel) may be used instead of coated galvanized steel at Contractor's option.
- e. Piping used for chemical conduits/sleeves/chases
 - 1) Place chemical tubing carrying potassium monopersulfate and bromine within Type 1 conduits/sleeves/chases.
 - a) Use only "sweep" (long ell) fittings to allow future replacement of the flexible chemical hoses
 - b) Air tubing and hoses for tubing supplying air to pneumatic valve shall be placed within Type 1 conduits / sleeves / chases.
3. Type 1 Piping:
 - a. PVC Schedule 40 pipe shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784.
 - b. The pipe and fittings shall be manufactured in compliance with ASTM D1785 and D2665 (where applicable), consistently meeting or exceeding the Quality Assurance test requirements of these standards regarding material, workmanship, burst pressure, flattening, and extrusion quality.
 - c. Basis of Design: Pipe & fittings shall be manufactured by Spears Manufacturing Company, 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com or a pre-approved equal.
4. Type 2 Piping:
 - a. PVC Schedule 80 pipe and fittings shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784.
 - b. The pipe and fittings shall be manufactured in compliance to ASTM D1785, consistently meeting or exceeding the Quality Assurance test requirements of this standard regarding material, workmanship, burst pressure, flattening, and extrusion quality.
 - c. Basis of Design: Pipe shall be manufactured by Spears Manufacturing Company 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com or a pre-approved equal.
5. Type 3 Piping:
 - a. CPVC Schedule 80 pipe and fittings shall be manufactured from a Type IV, Grade I Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D1784.
 - b. The pipe and fittings shall be manufactured in compliance to ASTM F441, consistently meeting the Quality Assurance test requirements of this standard regarding material, workmanship, burst pressure, flattening, and extrusion quality.

- c. Basis of Design: Pipe & fittings shall be manufactured by Spears Manufacturing Company 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com or a pre-approved equal.
- 6. Type 5 Piping:
 - a. Schedule 10S, grade 304 (or better) stainless steel piping.
 - b. The pipe and fittings shall be manufactured in compliance to ASTM A312, consistently meeting or exceeding the Quality Assurance test requirements of this standard regarding material, workmanship, burst pressure, flattening, and extrusion quality.
- 7. Type 7 Piping:
 - a. PVC, Schedule 80, Clear pipe, and fittings shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454 per ASTM D1784.
 - b. The pipe shall be manufactured in compliance to ASTM D1785, consistently meeting or exceeding the applicable Quality Assurance test requirements of this standard regarding material, workmanship, burst pressure, flattening, and extrusion quality.
 - c. The pipe shall be manufactured in the USA by an ISO 9001 certified manufacturer. PVC Schedule 80 CLEAR pipe and fittings shall be packaged immediately after its manufacture to prevent damage and shall be stored indoors at the manufacturing site until shipped from the factory.
 - d. Clear PVC piping and fittings have no UV inhibitors and thus shall not be placed outdoors or in areas exposed to sunlight or UV exposure.
 - e. Basis of Design: Clear pipe & fittings shall be manufactured by Spears Manufacturing Company 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com or a pre-approved equal.

C. FITTINGS

- 1. Unless otherwise specified herein or on the Drawings, fittings shall be as follows:
 - a. Fittings shall be of same pipe schedule and rating as the pipe material specified.
 - b. Pump inlet / outlet piping fittings shall be either:
 - 1) Type 3 to resist possible high-temperature deformation
 - 2) Type 5
 - 3) Type 6 coated for chemical resistance
 - 4) Type 6 pipes and fittings (if used) shall have a minimum G90 heavy corrosion-resistant coating applied to surfaces before startup. Such coating shall be suitable for continuous exposure to mildly chlorinated water typical of pool water.
 - 5) Normal Type 1 or Type 2 piping or fittings may not be used to connect to pumps due to potential high temperatures.

6) When threaded pipe joints and fittings are used, fittings shall be Type 2 minimum. Threaded joints shall have sufficient threads and be assembled with Loctite "No More Leaks" pipe thread sealant (item #80726) per installation instructions of Loctite. No more than three pipe threads shall be exposed after the joint is made up tight – or – the fitting with male threads has become extremely tight and sealed completely. Female plastic pipe threads shall only accept plastic male fittings. In the case of male pipe threads of a metal pipe, a metal female fitting must be used. Female metal pipe threads may accept plastic or metal male pipe threads.

7) Type 1 through Type 4 piping connections shall be socket welded or flange connections except where flanged connections are detailed.

- c. Basis of Design: Fittings shall be manufactured by Spears Manufacturing Company 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com or a pre-approved equal.

D. FLANGES AND FLANGE HARDWARE

1. Pipe flanges shall comply with the requirements specified herein. When flanged pipe, joints are used, flanges shall be of standard ANSI geometry and rated as Class 150.
2. Flanges may be either welded slip-on flanges or "Vanstone" lap joint flanges except where one type is specified herein.
3. Manufacturer-accepted (subject to This Engineer's approval) synthetic non-degradable gaskets shall be used at flange joints. VITON gasket materials shall be considered as a minimum.
4. Bolts, washers, and nuts shall be stainless steel, grade 316L minimum.
 - a. Flange hardware exposed to Seawater shall be rated A286 Stainless Steel 2205 UNS S31803.
 - b. Flange hardware installed within remote locations shall be provided with an appropriate epoxy coating to assist in providing a potentially longer usable life.
5. Threaded fasteners shall have Loctite #271 applied to bolt threads before tightening and torqued to a value sufficient to load the bolt to 40-60% of bolt yield strength.

E. FEATURE MANIFOLDS & ASSEMBLIES

1. Manifolds shall be complete units and be Type 5 and incorporate the Drawing requirements to include:
 - a. specified quantity of inlets and outlets
 - b. specified branch pipe diameters
 - c. overall main trunk diameter
 - d. flanged connections only
 - e. Globe valves only for proportional flow type control (unless otherwise indicated)
2. Supply manifold supports to support the specified weights, maintain the manifolds in position, and minimize any movement or vibration during the operation of the feature.
3. Piping manifolds, fittings, clamping devices, anchor bolts, connections to manifolds, nozzles, light fixture brackets, weir plates, and inlets in features shall be made of Type 5 (Schedule 10S, stainless steel) piping.

F. SPECIAL FITTINGS, JOINTS, AND PIPING ASSEMBLIES

1. Rubber expansion joints: Fabricated, molded rubber units equipped with flanges and as noted below:
 - a. Hypalon rubber to resist mildly chlorinated water
 - b. Flanges with Hypalon enamel painted over the ductile iron portions
 - c. Molded reinforcement and steel rings and rods shall assist in the PSI rating and inches of mercury pressure / force ratings.
 - 1) The target pressure rating shall be 50 psi [344.7 kPa]
 - 2) The target vacuum rating shall be 30-inches [760 mm] of mercury
 - a) Exception: Joint assemblies for pipe sizes greater than 24-inches [610 mm] and can withstand a vacuum of 20-inches [510 mm] minimum.
 - d. Provide control rod assemblies with each flanged rubber expansion joint
 - 1) Control rod assemblies and hardware shall be 316L
 - e. Basis of Design: Model 502H as manufactured by Mercer Rubber Company, 350 Rabro Drive, Hauppauge, NY 11788, 631.582.1524, or a pre-approved equal.
2. Flexible Connectors: Provide fabricated, flexible connector units equipped with flanges as noted below:
 - a. Refer to the Drawings for locations required
 - b. Stainless steel V-Loops technology to address pipe motion
 - 1) Incorporate stainless steel flexible bellows, double-braided piping with flanged end connectors and rated for mounting in building spaces or in direct-burial locations.
 - c. Shall be capable accommodating up to 4-inch [100mm] movement in pipe sizes 1.5-inch [37mm] through 12-inch [300mm] at up to 160 PSIG [1103 Kpa].
 - d. Observe manufacturer requirements.
 - e. Basis of Design: Model: Kinflex V-Loop as manufactured by Kinetics Noise Control, Inc., Dublin, Ohio, 1-877-457-2695; www.kineticsnoise.com

G. PIPING SIZE SCHEDULES

1. Refer to the schedules and sizes within the Drawings.

H. PVC CEMENT & PRIMERS

1. Purple primer on PVC surfaces before applying PVC cement
2. Thermoplastic solvent cement: Heavy Bodied, Medium Setting High-Strength, Industrial Duty for sizes through 12-inch [300 mm]; Extra-Heavy Bodied, Slow Setting Industrial Duty for sizes 14-inch [350 mm] and above.
3. Basis of Design: PVC cement & primers shall be manufactured by Spears Manufacturing Company 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com as noted below:
 - a. Listed for NSF Standard 61 for Potable Water
 - b. Primer for PVC: Spears Primer Cleaner-70 Industrial Grade, Purple
 - 1) Clear primer is acceptable for connections made indoors.
 - c. Primer for CPVC: Spears Primer Cleaner-24 Industrial Grade, Purple
 - 1) Clear primer is acceptable for connections made indoors.
 - d. Cement for PVC: Spears PVC-11 Gray for sizes through 12-inch [300 mm]
 - e. Cement for PVC: Spears PVC-19 White or Gray for sizes 14-inch [350 mm] through 30-inch [750 mm]
 - f. Cement for CPVC or PVC: Spears CPVC-24 Gray or Orange (for sizes)

I. PIPE HANGERS, HARDWARE, AND SUPPORTS

1. Pipe fasteners, hangers, and similar support systems requiring a structural interface or dependency on the Architect's building structure shall be provided as a Complete Build Activity with Delegated Engineering Services submittals.
 - a. Refer to 1.08 SUBMITTALS
 - b. Refer to 1.09 QUALITY CONTROL
 - c. Fasteners, hangers, and supports anchored to the building structure shall be approved by the project's structural engineer of record and shall be sized in accordance with the pipe and hanger manufacturers' requirements related to the specific pipe size, spacing, and associated loads.
2. Basis of Design:
 - a. Elcen Metal Products Co.; 9325 King St., Franklin Park, IL 60131 (312-678-6505)
 - b. Materials shall be stainless steel 304 (or better) for flange and hanger hardware, hangers, supports, bolts, clamps, hardware, nuts, washers, and miscellaneous project hardware
 - c. Exceptions (if SST 304 is unavailable):
 - 1) Coating / Painting of the surface of metallic components such as flanges, hangers, and supports
 - 2) Primer and top coatings to be from the same manufacturer.
 - 3) Pre-approved manufacturers and products include:
 - a) Rust Inhibitive metallic primer
 1. Rust-Oleum: 7780 Clean Metal Primer or 7769 Rusty Metal Primer
 2. MAB Paint Company: Rust-O-Lastic Zinc Chromate Primer
 3. Fuller - O'Brien Paints & Coatings: Blox Rust Alkyd Metal Primer (verify for the type of metal)
 - b) Top Coat:
 1. Rust-Oleum: Match with primer used and the type of metal
 2. MAB Paint Company: Rust-O-Lastic Finish Coating
 3. Fuller - O'Brien Paints & Coatings: Versaflex Heavy Duty Alkyd Gloss Enamel
3. When 3/8-inch [9.5 mm] anchor studs are specified, they shall be Red-Head No. JS-38H (or equal).
 - a. The anchor stud shall have a test pullout capacity of 3550 lbs. [1610 Kg] and a test shear capacity of 4500 lbs. [2041 Kg] when properly installed in the stone aggregate concrete of 3500 psi [24.13 mPa] load capacity.
 - b. Basis of Design for anchor studs is ITW Commercial Construction, 700 High Grove Blvd, Glendale Heights, IL 60139, Phone: 630-825-7900; www.itwredhead.com
4. The materials specified for the pipe support methods indicated in the Drawings are, unless otherwise specified, SST 304 (or better) or must be steel and must be surface-coated (after priming) to assist in avoiding rust and corrosion.
 - a. Pipe hangers' material shall be Stainless Steel Grade 304 (or better), or as an alternate, the hangers and its components may be primed and painted with a rust inhibitor coating.
 - b. Stainless steel materials are not to be painted or coated.

5. Before installation, support steel surfaces must be painted with a rust-inhibitive primer coat and final top coat.
6. Minimum support size shall be 1-inch [25 mm] x 2-inch [50 mm] coated galvanized steel with the appropriate pipe straps for support.

J. PIPE LABELING

1. Compliant to Brady B-946 custom legend, self-sticking markers, and arrows or Engineer-approved equal
2. Basis of Design: Brady Corporation, Phone: 800-643-8766 (www.bradycorp.com) or Graphic Products, Inc., Phone: 888.326.9244 <http://www.duralabel.com/free-gifts/thankyou-pipemarking.php#ixzz2TsmLNeLx>

2.04 FINISHES

A. GENERAL

1. Pools' interior finishes shall be specified by the EME Media Feature Designer with a smooth and easily cleanable surface.
2. The Contractor shall provide all specified finishes

2.05 BASIN & SITE EQUIPMENT

A. GENERAL

1. Hardware (screws, nuts, and other connection devices shall be Stainless Steel (Grade 316L (or better))).
2. Contact This Engineer if there are questions concerning the determination of the basin type and applicability of design standards.
3. The quantities indicated in the Drawings are for the Contractor's early information; however, it is the Contractor's responsibility to verify the actual quantities required.

B. BASIN DRAINS, RELIEFS, SUMPS, & FLOOR EQUIPMENT ASSEMBLIES

1. Floor Drains & Sumps
 - a. All connections to be fabricated SST

2.06 PUMPS

A. GENERAL

1. Refer to pump schedules for pump type ratings, water flows, heads, motor speed, enclosure, efficiency, NPSH-R value, and power requirements. The unit shall be suitable for the conditions shown on the pump schedule.
2. Mount pump on a rigid, single piece baseplate, with grouting hole, connected by flexible coupling with a guard to an induction type motor of IE-3 if metric and NEMA Premium (12.12) if Imperial premium efficiency level, suitable for VFD duty rated, and slow-starting.
 - a. Exception: Vertical type pump motors may be provided with custom supports in lieu of a base-plate.
3. Unless otherwise noted in the "Pump-Type" ratings, pump construction shall be cast iron and be fitted with a long-life, product lubricated, drip-tight EPDM or VITON mechanical seal, with O-ring seat retainer, designed for the specified maximum temperature and pressure and for quiet operation.
4. The housing shall be hydrostatically tested to 150 percent maximum working pressure.

5. The design of pump shall include ease of maintenance with machine fit parts that are easily disassembled.
 - a. A coupling, capable of absorbing torsional vibration and operating in variable speed applications, shall be installed between the pump and motor.
 - b. A spacer coupler shall be fitted to allow for removal of pump's wetted end without disturbing pump volute or movement of the pump's motor and electrical connections.

B. FEATURES SPECIFIED FOR CENTRIFUGAL PUMPS (TYPES A through J):

1. Impeller shaft:
 - a. Impeller shaft shall be a solid 416 stainless steel; heat-treated to 80 KSI yield strength and be supported by two heavy duty ball bearings. The design shall allow back pull-out servicing, enabling the assembly to be removed without disturbing the casing piping connections.
2. Bearing Housing:
 - a. The bearing housing shall supply support for a single row of permanently lubricated heavy-duty ball bearings, with provision for purging or flushing. Grease bearings with polyurea grease, capable of handling both high and low temperatures and resistant to washout and condensation.
 - b. The bearings shall be capable of absorbing both radial and thrust loads and maintaining the rotating element in axial alignment.
 - c. Bearings shall be capable of being inspected and repaired by removal of only a bearing bracket.
3. Mechanical Seals
 - a. The pump's mechanical seal shall be Stainless Steel multi-spring balanced type with silicon carbide faces incorporating EPDM or VITON secondary seals.
 - b. Provide stainless steel gland plate with stainless steel trim.
 - c. Provide factory-installed flush line with manual vent.
 - d. Seals shall be capable of being inspected and easily repaired without disassembling the pump and its piping connections.
4. Impeller:
 - a. Impeller shall be of the enclosed double suction type made of low zinc silicon brass or stainless steel - both hydraulically and dynamically balanced to ISO 1940-1:2003 balance grade G6.3 and keyed to the shaft
5. Volute:
 - a. Pump volute shall be cast iron ASTM A159 (35,000 psi [241.32 mPa]) with an integrally cast pump discharge and pump suction.
 - b. Flanges shall be extra heavy-duty, 250# thickness while capable of being drilled for 125# ANSI flat face use. Volute shall have integrally cast support feet, gauge ports at nozzles, and vent and drain ports.
6. Fusion Bonded Coating:
 - a. Factory coat to protect internal cast iron wetted components with Scotchkote 134, fusion bonded coating by 3M with a Thickness of 8 to 12 mils.
 - 1) Exception: Impellor or similar components
 - b. Primer: Manufacturer's recommended for substrate indicated.
7. Motor:

- a. Motors shall meet scheduled horsepower, rotational speed, phase & voltage, and totally-enclosed-fan-cooled enclosure design (TEFC). Pump and motors shall be factory aligned, to be realigned after installation (prior to operation) by the manufacturer's representative.
 - b. Motors shall be non-overloading at any point on the pump curve and meet NEMA specifications conforming to the standards outlined in EPACT 92.
 - c. Motors shall be Premium Efficient IE-3 if metric and NEMA Premium (12.12) if Imperial, TEFC specifically rated, listed for variable frequency drive / inverter duty, and slow start.
 - d. Motors shall have Class F (or greater) insulation for efficient operations, explicitly identified, with duty-rated for VFD duty, and slow start.
 - e. Provide each motor with terminal blocks / terminal lugs for power connection.
 - f. Each motor (larger than 25 hp [18.64 kW]) shall have a shaft grounding ring system.
 - g. A manufacturer-supplied performance chart with an NPSH-R value is mandatory for each pump.
8. Seismic:
- a. The seismic capability of each pump shall allow them to withstand a horizontal load of 0.5g, excluding piping and fasteners used to anchor the pump to mounting pads, without adversely affecting pump operation.
9. Testing & Paint Color:
- a. Each pump shall be hydrostatically tested, painted with two coats of high-quality factory approved paint, and name-plated before shipment. Color: Red, unless noted otherwise.
10. Accessories:
- a. Internal bronze casing wear rings, galvanized drips pan on the base, and special spacer couplers.

C. PRE-APPROVED PUMPS - SPECIFIC TYPE AND CLASS RATINGS

1. Type: Refer to below listing for requirements of specified pump class':

PUMP TYPE	SPECIFIED ATTRIBUTES / FEATURES	Manufacturers / Series
A	<ul style="list-style-type: none"> • Class: Flooded Suction Centrifugal Pump • Split-Coupled Vertical Inline Pump with Motor Integrated Pump Mounted Controls • Integrated control enclosure shall be NEMA 4X type. • Stainless Steel Type 416 Pump Shaft with Outside Balanced Mechanical Seal. • Couplings shall be split to allow removal from pump and motor shafts, leaving space between the shafts sufficient to replace mechanical seal components without disturbing the pump or motor. • Seal Construction: Silicon Carbide Seat, Resin Bonded Carbon Rotating Face with EPDM, or VITON Elastomers. Seal hardware shall be 316L stainless 	Armstrong 4300

	Steel	
	<ul style="list-style-type: none">• Pump volute shall be coated with an NSF approved low VOC epoxy on the interior and external surfaces.• Motor enclosures shall be TEFC with Terminal Blocks• Motor Efficiency: NEMA Premium (12.12) compliant with NEMA MG-1 Part 31.4.4.2 for inverter-fed poly-phase motors. IE-3 is compliant for metric.• 1,750 RPM or less (Maximum Rotational-Speed)• When the motor is larger than 25 hp, equip with an AEGIS SGR motor shaft grounding system factory installed and tested. Site installation of SGR is not allowed.• Pump shall be compliant with NSF Standard 50-211.	
B	<ul style="list-style-type: none">• Class: Flooded Suction Centrifugal Pump with Vertical In-Line Construction• Stainless Steel Pump Shaft / Sleeve with EPDM or VITON Seals• Epoxy Fused Coating on Wetted Parts• TEFC Motor Enclosure with Terminal Blocks• Premium Efficiency Motor IE-3 for metric and NEMA Premium (12.12) for imperial with Class F Insulation (or better)• Inverter / VFD Duty Rated Motor at 1,750 RPM or less (Maximum Rotational-Speed)• When the motor is larger than 25 hp, equip with a Shaft Ring Mounted Grounding System	Marlow 580
C	<ul style="list-style-type: none">• NSF Standard 50 Listing Compliant• Class: Flooded Suction Centrifugal Pump with Horizontal Construction• Stainless Steel Pump Shaft / Sleeve with EPDM or VITON Seals• Epoxy Fused Coating on Wetted Parts• TEFC Motor Enclosure with Terminal Blocks• Premium Efficiency Motor IE-3 for metric and NEMA Premium (12.12) for imperial with Class F Insulation (or better)• Inverter / VFD Duty Rated Motor at 1,750 RPM (Maximum Rotational-Speed)• When the motor is larger than 25 hp, equip with a Shaft Ring Mounted Grounding System	Marlow 530SC
D	<ul style="list-style-type: none">• NSF Standard 50 Listing Compliant• Class: Self-Priming Centrifugal Pump with Horizontal Construction	Marlow 4SPC

	<ul style="list-style-type: none"> • Flanged Suction and Flanged Discharge • Epoxy Fused Coating on Wetted Parts • TEFC Motor Enclosure with Terminal Blocks • Premium Efficiency Motor IE-3 for metric and NEMA Premium (12.12) for imperial with Class F Insulation • Inverter / VFD Duty Rated Motor at 1,750 RPM or less (Maximum Rotational-Speed) • Steel Pump Shaft with Replaceable Bronze Shaft Sleeve with EPDM or VITON Seals • Bronze Impellor • Integral Suction Strainer with Stainless Steel Strainer Basket • NSF Listing Standard 50 Listing Compliant 	
E	<ul style="list-style-type: none"> • Class: Self-Priming Centrifugal Pump with Horizontal Construction • Flanged Suction and Flanged Discharge • Cast Iron Hydraulic Body with Epoxy Fused Coating on Wetted Parts • TEFC Motor Enclosure with Class F or better Insulation • Premium Efficiency Motor IE-3 for metric and NEMA Premium (12.12) for imperial with Class F or better Insulation • Inverter / VFD Duty Rated Motor at 1,750 RPM or less (Maximum Rotational-Speed) • Stainless Steel Pump Shaft or Stainless-Steel Shaft Sleeve (Close-Coupled) • EPDM or VITON Seals on 3PL and 4PL Only • Cast Iron Impeller • NSF Listing / NSF Standard 50 Listing Compliant 	Marlow 6E1 Marlow 6E2 Marlow 6E4 Marlow 3PL Marlow 4PL
F	<ul style="list-style-type: none"> • Class: Self-Priming Centrifugal Pump with Horizontal Construction • Union-Coupled Suction and Discharge • NORYL, Thermoplastic Housing Hydraulic Body • TEFC Motor Enclosure with Class E Insulation • Inverter / VFD Ready Rated Motor at 3,550 RPM or less (Maximum Rotational-Speed) • Stainless Steel Pump Shaft / Sleeve with VITON Seals • Integral Non-Corrosive Strainer Basket with Transparent Cover Lid • NSF Listing / NSF Standard 50 Listing Compliant 	Hayward HCP Series Pentair Whisperflo- XFK Series
G	<ul style="list-style-type: none"> • Class: Self-Priming Centrifugal Pump • 4" Suction and 3" Discharge Female NPT Pipe 	Marlow 3B

	Connections	
	<ul style="list-style-type: none"> • Cast Iron Hydraulic Body with Epoxy Fused Coating on Wetted Parts • ODP Motor EPACT Efficient EISA Compliant with Class F Insulation • Inverter / VFD Ready Rated Motor at 3,550 RPM or less (Maximum Rotational-Speed) • Steel Pump Shaft with Replaceable Bronze Shaft Sleeve with EPDM Seals • Cast Iron Impellor • Integral Suction Strainer with Stainless Steel Strainer Basket • NSF Listing / NSF Standard 50 Listing Compliant 	
H	<ul style="list-style-type: none"> • Class: Self-Priming Centrifugal Pump with Horizontal Construction • FIP Suction and Discharge Pipe Connections • NORYL, Thermoplastic Housing Hydraulic Body • ODP Motor at 3,450 RPM or less • Integral Non-Corrosive Strainer Basket with See-Through Cover Lid • NSF Listing / NSF Standard 50 Listing Compliant 	Hayward Tri-Star-SP-32x Series Pentair WhisperFlo Challenger Sta-Rite Max-E-Pro Dyna-Pro AMT 3xxx-95 Series
I	<ul style="list-style-type: none"> • Class: Self-Priming Trash Pump • Rated for solid laden liquids, slurries, and sludge • FIP Threaded Connections • Cast Iron Hydraulic with Built-In Buna-N Check Valve • Stainless Steel Impellor (Self-Cleaning) and Stainless-Steel Shaft • TEFC Motor Enclosure at 3,450 RPM or less with Class F Insulation • Stainless Steel Pump Shaft with EPDM or VITON Seals 	
J	<ul style="list-style-type: none"> • Class: Submersible Pump • Rated for solids with diameters up to 3-inch • Flanged Discharge • Cast Iron Hydraulic Body with Epoxy Fused Coating on Wetted Parts • TEFC Motor Enclosure to be Premium Efficiency IE-1 with Class F Insulation • Inverter / VFD Duty Rated Motor at 1,750 RPM or less (Maximum Rotational-Speed) • Stainless Steel Pump Shaft with EPDM or VITON Seals • Equipped with Float Level Controls 	Barnes 3xSE Series 4xSE Series Deming 7365 Series

- K
- **Class: Submersible Vertical Turbine**
 - Inverter/VFD Duty Rated Motor at 3450-3480 RPM
 - Shaft Seal SIC/SICNBR
 - 4" Pump | 6" Motor | Impeller | Integral Check Valve: Constructed of AISI 304 (or better) Stainless Steel
 - 4" FNPT Pump Discharge Connection
 - Liquid Rated: Water Max temperature. 104°F
 - Power: KVA Code J | 460/480V, 3PH, 60Hz
 - Service Factor: 1.15
 - Enclosure Class: (IEC 34-5) IP68
 - Insulation Class (IEC 85) F
 - Thermal Protection: External w/Built-in transmitter
 - Cooling Jacket with Inlet Filter; AISI 304 (or better) Stainless Steel
- Grundfos

2.07 STRAINERS

A. INTEGRAL TYPE

1. Basis of Design: Integral strainers as supplied with
 - a. Pac-Fab Challenger type pumps
 - b. Hayward Commercial pumps).

2.08 FILTERS

A. GENERAL

1. Certifications: The filter(s) shall bear the NSF Seal of Approval per NSF Standard 50.
 - a. The filter area shall be listed in NSF-Standard 50 to provide the specific filter rate. No modification, manipulation or interpretation of these values will be permitted.
2. Metallic tanks shall be equipped with a UL listed grounding lug.
3. Refer to the Drawings for tank connection sizes.
4. A mandatory sight glass / clear pipe segment 2-Feet [600 mm] in length shall be provided on:
 - a. Defender Regenerative Filter - pre-coat pipe
 - b. Hi-Rate Sand filter – backwash pipe
 - c. All Filters – upstream of flowmeter
5. Each outdoor located filtration system must be manufacturer-rated for outdoor use. All tubing shall be metallic and impervious to rain and UV damage

B. PRESSURE CARTRIDGE FILTER SYSTEM:

1. Commercial Pressure Cartridge Filter
 - a. Basis of Design: Hayward Series HCF7030C, Hayward Industries, Inc., Hayward Commercial Pool Products, 10101 Molecular Drive, Suite 200, Rockville, MD 20850; (800) 657-2287; www.hayward-pool.com/shop/en/commercial/com-filters
 - b. Assembly shall consist of the filter tank, multiple cartridge elements, union-type connectors, gauges, air-relief, etc.
 - c. Components and materials shall have been tested and approved using NSF standard 50, latest edition.

- d. Permanently mark each filter cartridge with the manufacturer's name, pore size, and rated filter area.
- e. Filter Area must be a minimum 700 sq. feet [65 m²] of high-performance filter media with an effective particulate removal of between 10 - 20 microns. Media shall consist of eight compact cartridges for fast, manageable cleaning.
- f. Connection: 2.5 inch [63 mm] with thorough 2 inch [50 mm] internal piping.
- g. Manual air relief valve is capable of bleeding air with a 1/4 turn of the lever.
- h. Tank clamp shall be tamper-proof. The clamp shall allow for self-alignment of the tanks top and bottom components.
- i. Maximum working pressure: 50 psi [344.7 kPa].
- j. Integral drain: Minimum of 1.5 inches [40 mm].
- k. Union couplings: 2.5 inches [63 mm] diameter piping.
- l. The design flow shall be a rated maximum of 150 gpm [568 L/min]. The head loss shall be limited to 11.64 feet [3.5 m] at 138 gpm [522 L/min] flowrate.
- m. All materials shall be manufacturer-rated for outdoor use, rain event and UV-resilient and weather-proof without exception, & all tubings & fittings shall be metallic non-corrosive.
- n. Refer to the Equipment Schedule for detailed information.

2.09 TANKS & CABINETS

A. TANKS

1. General

- a. Below-grade chemical tanks shall be rotationally molded high-density cross-linked polyethylene, one-piece seamless construction, cylindrical in cross-section, vertical in axis, intact with piping inlets and outlets, drains, overflows, and restraint systems.
- b. Each tank shall have a self-containment / double wall tank system.
- c. Tanks shall be marked to identify the manufacturer, date of manufacture and serial number.

2. Fiberglass Tank or Mechanical Vault:

- a. Construction: Reinforced fiberglass unless indicated to be concrete on the Drawings.
 - 1) Reinforced Fiberglass Construction: Base construction to be wood or steel reinforcing (as required for support).
 - 2) Reinforcing members shall be located on the outside surfaces of the tank and be glassed over to affirm no reinforcing member surfaces are exposed.
 - 3) Internal ribbing, braces, or gussets may be used to achieve stability at the discretion of the manufacturing fabricator; however, internal gussets or ribbing shall be limited to that which allows at least 95% of the nominal tank volume to be achieved.
 - 4) External gussets may be used to increase stiffness and stability; however, gussets shall not protrude more than 4 inches [100 mm] from the tank surface dimensions and shall not interfere with access to flange or NPT connections.
 - 5) Specified Type 2, Sch. 80 PVC fittings shall be factory installed. No field-installed fittings are permitted.

- 6) Mounting Provisions: Design tank to mount on a concrete ballast pad at its invert elevation. Ballast pad to be certified to provide sufficient resistance to suspected hydrostatic uplift pressures assuming an empty tank and ground water to be within 12 inches [305 mm] of the uppermost surface elevation.
 - a) Place a minimum of one (1) cubic yard of 3,500 psi [24.13 mPa] concrete for each 200 gallons [0.75 m³] of tank capacity around each tank to resist hydrostatic uplift pressures. Reinforced foundation shall extend 3-ft [0.91 m] beyond the exterior vertical walls of the tank.
 - b) Provide structural anchors affixed and integral to the tank capable of fastening the tank to the concrete foundation per the manufacturer's instructions and requirements.
- 7) Lifting Provisions: Provide lifting features to facilitate hoisting. The tank must accommodate lifting without permanent deformation of any part or surface.
- 8) Shipping Requirements: Before shipping, cap or plug tanks. Prepare the tank for shipping with no external pressures that may affect the integrity of the tank or accessories.
- 9) Provide the specific valves indicated on Drawings.
- b. Basis of design:
 - 1) AquaWorx, 10450 66th St N., Pinellas Park, FL 33782, 888.426.8851, www.aquaworxusa.com

2.10 CONTROLS & INSTRUMENTATION – FLOW & PRESSURE

A. GENERAL

1. Gauges shall have a minimum 2 inch [50 mm] diameter dial face and be readable from 12 feet [3.5 m].
2. Wetted materials shall be stainless steel or bronze alloy.
3. Dual purpose gauges are permitted.
4. Gauges shall be remote back-mounted onto the pump gauge panel.
5. Gauges located outdoors shall be weather-proof with stainless steel hardware.

B. FLOWMETERS

1. Each filtration system shall be provided with a remote-reading flowmeter sensor installed on the discharge side of the pump return flow adjusting valve (after the filter and heater).
2. The flowmeter shall be rated for a minimum of 150% the design water flow gpm.

C. PRESSURE GAUGES

1. Provide primary recirculation pumps with a pressure gauge with sensor tubing installed on the discharge side of the pump as shown in the Drawings.
2. Each pressure filter / strainer system shall have two pressure gauges, one mounted on the influent side and one on the effluent side of the filter.
3. The gauge can read a maximum pressure of 50 psi [344.7 kPa].
4. The gauge shall be fitted with a 0.25 inch [6 mm] NPT stem back connection and be suited for direct back-mounting on the gauge panel.

D. VACUUM GAUGES

1. Provide primary recirculation pumps with a vacuum gauge with sensor tubing installed on the suction side of the pump as shown in the Drawings.
2. A vacuum gauge can read a maximum vacuum of 15 inches [380 mm] Hg.

- a. Vacuum gauge shall be fitted with a 0.25 inch [6 mm] NPT stem back connection and be suited for direct mounting on the pump inlet pipe.

E. WATER HAMMER ARRESTORS

1. Provide in strict conformance with the manufacturer's recommendations.
2. Basis of Design: Watts Model "1 LF15M2-FS Unit Size F" by Watts Water Technologies Company; Lawrence, MA 01842; 617.688.1811. Note: The Model number will vary depending on the size.

F. WATER LEVEL CONTROLS AND FILL SYSTEM

1. Provide a 4-level-mode water-level sensors system and related water level control panel into each Water Feature as indicated on the Drawings. Pre-approved equals may be accepted.
 - a. Each device shall provide sensing signals to activate a relay and solenoid valve located in the mechanical equipment room.
 - b. The sensor units operate at 12-24VDC < 2 Amps.
 - c. The same manufacturer shall fabricate the level sensor, level fill controls, and fill valving manifold.
2. The Water Level Control Panel shall be those specified in Equipment Schedule.
3. NEMA 12 enclosure made from galvanized steel with gray powder coat finish, knockouts shall be provided for conduits.
 - a. Line Voltage: 120VAC / 60Hz or 220/240VAC / 50Hz, 3A
 - b. Sensor 12-24VDC.
 - c. Solenoid 12-24VDC / 60/50 Hz, inrush 0.4A / holding 0.2A.
 - d. Conduits containing chlorinated pool water may not connect to NEMA 12 enclosures.
4. Normally-closed fill valves shall be acceptable to the specified manufacturer.
5. The water level control panel shall govern the following minimum 4 functions:
 - a. Quick Fill Operation: 12-24VDC solenoid actuated water supply valve to maintain water levels when Water Feature is not running (static mode).
 - b. Operating Running Sensor: Able to command the operation of the Water Feature, when the Water Feature is operational (dynamic mode).
 - c. Fill-ON: When the water level reaches this set point, the auto fill system is activated to be ON (to add water). The fill pipe will be de-activated when the water level reaches one of the above-listed set points (Static or Operating Running).
 - d. Safe-Off Operation: Shuts down in-Water Feature electrical functions such as feature lighting and pumps during low or unsafe water level situations.
 - e. Refer to the Drawings for additional level set points required.

2.11 CHEMICAL

A. GENERAL

1. Chemical controllers, feeders, and pumps shall meet the requirements and carry the product certifications for NSF Standard 50.

B. CHEMICAL CONTROLLERS

1. General
 - a. The integrated equipment room control system shall provide continuous monitoring and command of sanitizers, pH,

- b. Basis of Design: MR-2. Manufacturer Representative: CES, 2 Jupiter Park Lane, Suite 1, Jupiter, FL 33458, USA; 800.940.1557; WWW.CESWaterQuality.com
- c. Flow Monitoring
 - 1) Paddlewheel flow sensor
 - 2) Flow rate, gpm
 - 3) Flow volume totalizer
- d. Heater Control
 - 1) Temperature control, heater on/ off
 - 2) Energy saving mode, on/ off set time and secondary temperature setpoint
- 2. Sensors
 - a. The controller shall have four (4) standard sensors and seven (7) additional sensors. Although some sensors are listed as "additional" by the manufacturer, they are specified for this project and shall be provided by the installer.
 - b. Standard Sensors:
 - 1) The standard pH and ORP sensors shall come with a Ryton body and inorganic electrolyte gel.
 - 2) The standard temperature sensor will be a 2 wire, Zener diode temperature probe.
 - 3) The pressure sensor shall consist of a compound pressure/ vacuum gauge manufactured in stainless steel, 2.5 inches [63 mm] diameter, liquid filled with an operating pressure range of 0 to 60 psi [0 to 413.7 kPa] and vacuum of 0 to 30 inch/ Hg. [0 to 760 mm/Hg.]
- 3. Flowcell:
 - a. Fiberglass body, clear acrylic sensor mounting plate, and clear acrylic viewing tube.
 - b. Provide accurate sample flow rate and water velocity regulation past the probes while providing hydro-mechanical cleaning of the free chlorine sensor.
 - c. Provided with PVC 0.5 inch [13 mm] isolation ball valves, PVC ¼-in wet-test valve and reed flow switch.
- C. PERISTALTIC CHEMICAL METERING PUMP FOR BROMINE BASED SANITIZER
 - 1. Provide a self-priming, positive displacement, metering pump capable of suction lifts to 25 feet [7.62 m] for sodium hypochlorite (liquid chlorine) in the pool(s) per the Drawings.
 - 2. The pump shall have a 3-head roller that presses against a peristaltic tube capable of feeding chemicals against a 25 psi [172.4 kPa] upstream fluid.
 - a. The peristaltic tubing shall be capable of easy replacement. The dis-assembly of the 3-head roller shall be removable without tools.
 - 3. The pump housing shall be constructed of GE Lexan polycarbonate to allow viewing of the 3-head roller against the peristaltic tubing.
 - 4. The rate of rotation shall be capable of varying, adjustable output flows from 5% to 100% (with 2.5% increments) of its rated gpm output.
 - 5. The motor drive can operate in temperatures up to 125° F [51° C] with a maximum draw of 1.7 amps and rated for a continuous duty cycle.
 - 6. The pump can wall-mount and shall be equipped with 6 feet [1.83 m] long 120 vac electrical cord and appropriate electrical plug.
 - 7. The following accessory spare parts kit shall be provided with each metering pump:

- a. 3 - connecting nuts (1/4 inch [6 mm] or 3/8 inch [9.5 mm])
 - b. 3 - ferrules w/1/4 inch [6 mm] OR 2 ferrules w/3/8 inch [9.5 mm]
 - c. 1 - injection check valve (100 psi [689.5 kPa]) OR (1) injection fitting (25 psi [172.4 kPa])
 - d. 1 - weighted suction line strainer
 - e. 1 - 20 inch [25 – 508 mm] roll of suction/discharge tubing 1/4 inch [6 mm] or 3/8 inch [9.5 mm] in UV-resistant white or black.
 - f. Tubing in white only
 - g. 1 - spare pump tube
 - h. 1 - mounting bracket
 - i. 1 - manual
8. Basis of Design (models as listed in the Equipment Schedule): Stenner Pump Company, 3174 DeSalvo Road, Jacksonville, FL 32246, 904.641.1666; Manufacturer Representative: CES, 2 Jupiter Park Lane, Suite 1, Jupiter, FL 33458, USA; 800.940.1557; WWW.CESWaterQuality.com
9. Chemical supply: Contractor shall provide the bromine tablets and water to fill the tank for the commissioning and initial service period. Upon substantial completion, Contractor shall refill the dissolved bromine tank to capacity.

D. PERISTALTIC CHEMICAL METERING PUMP FOR OXIDIZER FEED

1. Provide one peristaltic feeder system as specified in the Drawings.
2. The Potassium Monopersulfate addition system for each pool shall include the following:
 - a. Stenner peristaltic feeder (as specified in the Drawings Equipment Schedule).
 - b. Chemical crock with a sealed lid with MSDS and content labels (see the Equipment Schedule) – include a containment tank with each chemical crock.
 - c. Connections to the pool piping system(s).
 - d. Spare parts as noted above in “CHEMICAL METERING PUMP FOR BROMINE BASED SANITIZER.”
 - e. Mixing equipment.
3. Basis of Design (models as listed in the Equipment Schedule): Stenner Pump Company, 3174 DeSalvo Road, Jacksonville, FL 32246, 904.641.1666; Manufacturer Representative: CES, 2 Jupiter Park Lane, Suite 1, Jupiter, FL 33458, USA; 800.940.1557; WWW.CESWaterQuality.com

2.12 ELECTRICAL - CONTROLS, ENCLOSURES, & GROUNDING

A. GENERAL

1. Refer to Section 26 05 00 and related Sections for Project standards and requirements.
2. Refer to the requirements below for all electrical components, controls, enclosures, grounding, bonding, & earthing.
3. Electrical equipment and installations, including the grounding of a metal material, are to meet or exceed the National Electrical Code (NEC) and conform to the National Fire Protection Association (NFPA) 70.
 - a. Provide enclosures to include a conductive back panel for component mounting and heat dissipation
4. NEMA-3R rated enclosures shall be provided
 - a. Exceptions:

- 1) Electrical enclosures located within a conditioned space (not subject to rain, sleet, snow, a corrosive atmosphere, or falling / splashing water droplets) may be NEMA-12 unless noted otherwise within the Drawings.
- 2) Electrical enclosures subject to or exposed to corrosive / corrosion-causing fumes or within 1 mile of an ocean or saltwater body of water shall be NEMA 4X or better and made of stainless steel, plastic, or fiberglass.
5. Electrical components shall be UL Listed or ETL Listed, or by an equivalent certifying agency, and NEC compliant.
6. Maintain a minimum, unobstructed clearance of 48 in [1.22 m] in front of panel boards, motor starters, LED power supplies, lighting control panels, transformers, control panels, and MCC's.
7. The cabling, conductors, and wiring located in under-deck, underground, & underwater conduits shall comply with wet-rated requirements of NEC Article 300.50 (Underground & Underwater Installations) and NEC 310.10 (Wet Locations).
 - a. Note: Under-Deck cabling, conductors, conduits, & wiring shall be manufacturer-rated for Underground, Underwater, and Wet locations
8. If equipment componentry is installed with non-compliant metallic parts, the item will be considered defective and shall be replaced with specified components and hardware at no additional costs for the Owner.

B. COMPLETE BUILD SCENARIO

1. Electrical power systems
 - a. Such power systems shall include but not be limited to:
 - 1) Panels, control panels, lighting control panels, circuit breakers, magnetic motor starters, relays, overload heaters, related transformers, safety cut-off switches, deck receptacles, bonding, earthing, grounding, underwater-rated cabling, and other similar systems, as required for system functionality, beyond the demarcations indicated on the related Construction Documents.
2. Electrical control systems
 - a. Such control systems shall include but not be limited to:
 - 1) Control system, HMI, control wiring circuitry, relays, timing switches and sequencers, timing systems including hours of day/month for operation, lighting control panel system, power supplies, related transformers, safety cut-off switches, autofill, wind sensor systems, deck receptacles, bonding, earthing, grounding, underwater-rated cabling, and other similar systems.
 - a) The Contractor is responsible for providing the entire control panel system(s) in their entirety.
 - b) Although the Drawings may graphically indicate a control panel system, the manufacturer and fabricator of the control panel shall determine the final quantity of actual enclosures required to accommodate the control. All the individual control panels shall comprise and equal the control panel system.
 1. Filter pump(s) electrical controls, interlocks, and safety systems on UV sterilizers, and chemical addition systems. The sub-systems must not be operable unless the filter system is running and delivering filtered water to the Pool or water feature.

- c) Low pool water shutdown interlock to shut down and deactivate the system in the event of an emergency low water condition.
- 2) Such electrical interlocks and similar safety systems as may be required by NEC, local building codes, governmental regulations, and these Contract Documents (Drawings & Technical Specifications).
- 3. Grounding and Bonding of components are inclusive and shall be provided within the Complete Build Scenario.

C. BONDING, EARTHING, & GROUNDING

- 1. Each nozzle and specialty metallic component shall be equipped with grounding lugs or capable of being grounded (fabricated from the same material as the body to which it is attached), bonded, earthed, and grounded in accordance with these Specifications, the Drawings, and the requirements of the manufacturer. A UL / ETL Listing / NEC (or an equivalency) certification is required.
- 2. If the grounding lugs are not provided by the manufacturer, then Contractor shall have the ultimate responsibility for providing the necessary grounding lugs.
 - a. The grounding lug shall accommodate a #8 bare, solid, copper conductor.

D. CONDUIT

- 1. Provide non-metallic, rigid, Type 1 for the interior, exterior, under-deck, underground, and underwater locations.
 - a. Wiring inside the pool equipment area mechanical space or enclosure shall be encased in rigid Type 1 conduits.
 - b. Underwater light conduits shall be 1 inch [25 mm] diameter rigid Type 1 from the low-voltage power supplies / transformer to each light niche and be watertight / waterproof without exception.
- 2. Conduit sizes shall adhere and follow the NEC, Chapter 9, Table #B for concentric stranded "THWN" copper conductors in schedule 40 PVC (rigid non-metallic conduits), minimum allowable sizes for either:
 - a. 4-wire, 3-phase bundle, or
 - b. 2-wire + ground, 1-phase bundle

E. DATA CABLING AND CAT6 TYPE

- 1. Underwater, under-deck, and underground electrical cable, data cables, and conductors shall be encased in waterproof, sealed PVC conduits and shall also be rated for continuous operation in underwater, marine, and underground wet environments without exception.

F. ELECTRICAL ENCLOSURES

- 1. Seams are to be continuously welded and ground smooth.
- 2. Include the following: Seamless foam-in-place gasket.
- 3. Internal 3-point latch
- 4. PowerGlide handle.
- 5. Door shall be capable of being removed by pulling continuous hinge pin.
- 6. Collar studs for mounting back panel
- 7. Bonding provision on the door with an UL-Listed grounding lug on the body.
- 8. Provide window kits for panel enclosures housing meters and chemical controllers.
 - a. Glazing: 0.25" thick clear polycarbonate.
- 9. Hardware:

- a. Material: stainless steel (nuts, bolts, washers).
 - b. Verify metallic components exposed to or submerged in chlorinated water shall use only stainless-steel Grade 316 hardware (nuts, bolts, washers, and misc. items).
 - c. Cast-Iron castings or steel components exposed to or submerged in chlorinated water or coastal salt-laden air shall be epoxy fused coated.
10. Unistrut:
- a. enclosure assemblies shall be installed with Unistrut- mounting hardware.
 - 1) Unistrut Finish: Stainless Steel
 - 2) Hardware Material: Stainless Steel

G. ELECTRICAL RECEPTACLES

1. General:
- a. Bonding provision with an UL-Listed grounding lug on the body.
 - b. Refer to the Drawings for the locations and quantities of the receptacles specified.
 - c. Each receptacle shall be a Class A GFCI-protected device.

H. EMERGENCY CUT-OFF SWITCH

- 1. E-Stop Pushbutton
- 2. 22-mm size with RED color
- 3. Maintained Push-Pull
- 4. One Normally Closed (N.C.) contact rated at 10 Amps at 600 VAC
- 5. Mounted in a NEMA 4X enclosure / housing
- 6. Screw clamp terminals
- 7. Bonding provision with an UL-Listed grounding lug on the body.
- 8. Provide the relays, operator button, weatherproof enclosure, and signage for this device.
- 9. Provide Model XB5AT42 or an approved equivalent by Schneider.

I. ENCLOSURE AND PANEL IDENTIFICATION LABELS & ID'S

- 1. Install custom engraved phenolic labels on controls and electrical panels / enclosures.
 - a. Equipment Spaces are required to use phenolic labels to comply with OSHA safety regulations, ISO guidelines.
 - b. Provide phenolic labels in locations where a durable label is a necessity and in the following typical locations: Cutout switch labels, electrical panels, identification panels, name plates and door plates
- 2. Unless specified otherwise by codes, utilize the colors noted herein.
- 3. Approved Label / Tag manufacturer: Carolina Design Company, PO Box 812, Clover, SC 29710 tammie@phenoliclabels.com
 - a. Alternate manufacturers may be considered; however, their quality must comply with those from Carolina Design Company (above).

J. MAGNETIC MOTOR STARTERS

- 1. Provide magnetic motor starters, and solid-state overload relays for each 3-phase pump motor in the various mechanical room and areas.
- 2. Unless there is a VFD serving the pump motor, a soft start feature is mandatory.
- 3. Motor starters shall meet the following Specifications unless otherwise specified.

- a. Magnetic starters shall be of the "100% -voltage, non-reversing type" and rated at the voltage available at this project site.
- b. 60 hertz/3-pole polyphase is assumed to be the minimum design point.
- c. To confirm compliance, verify the actual operating voltage prior to ordering any equipment.
- d. Bonding provision with an UL-Listed grounding lug on the body.
4. Coil voltage: 120VAC, 60 hertz unless otherwise noted on the Drawings.
5. The coil shall be used to electrically interconnect 120 VAC type components that will operate only when the starter is energized.
6. Include 1 N.O. auxiliary contact set.
7. Basis of Design: Square-D "Class 8536" Series as supplied by Square-D.

K. MOTOR DISCONNECT SWITCH

1. Verify and confirm power rating for each disconnect switch.
2. Early-break auxiliary contacts (1 N.O. and 1 N.C.)
3. Bonding provision with an UL-Listed grounding lug on the body.
4. Basis of Design: Nonmetallic HDI Series or an approved equivalent by Mennekes Electronics, www.mennekes.com.

L. UNDERGROUND / UNDERWATER ELECTRICAL CABLES / CONDUCTORS

1. Conductors shall be copper with insulation suitable for the location.
2. Wires / conductors for grounding, earthing, and bonding shall be:
 - a. #8 AWG bare, solid copper cable with no insulation
 - b. Conduit encasement for bonding, earthing, or ground wires are prohibited.
3. Rated under-deck, underwater, and underground electrical cable and conductors shall be encased in waterproof, sealed PVC conduits and be rated for continuous operation in marine, underwater, and underground wet environments.
4. Under-deck, underwater, and underground cables, conductors, cords shall be rated for wet conditions and locations and be supplied, encased in a waterproof conduit, with the appropriate cord length intact with the following:
 - a. Moisture-impervious metal-sheathed
 - b. Allowable conductor types THWN
 - 1) Alternate wiring types (only with specific approval from This Engineer) may be MTW, RHW, RHW-2, TW, THW, THW-2, THHW, THWN-2, XHHW, XHHW-2, or ZW
 - 2) Except for bonding, earthing, or grounding wires.
 - c. Size in accordance with NEC Table 310-16, rated at 75 Degrees C., operating at a maximum ambient temperature of 122 Deg. F. [50 Deg. C.]
 - d. Be of a type listed for use in wet locations
 - 1) CAT 6 wet-rated cables shall be: Mohawk, "VersaLAN CMR/CMX" - or equal
 - 2) Encase all insulated conductors in a waterproof conduit.
5. The interior of conduits, enclosures, or raceways installed under-deck, underwater, and underground shall be considered a wet location.
 - a. Insulated conductors and cables installed in these conduits, enclosures, or raceways in under-deck, underwater, and underground installations shall be listed for use in wet locations and shall comply with NEC 310.10.
 - b. Connections or splices in an under-deck, underwater, and underground installation shall be approved for wet locations.

2.13 VALVES, CHECK VALVES, & OPERATORS

A. GENERAL REQUIREMENTS

1. Valves shall be compatible and suitable with mildly chlorinated water typical for pools and water features as well as saline type water (less than 7,000 ppm) in respects.
 - a. Internal parts shall be removable for inspection and complete replacement without applying heat or breaking pipe connections.
 - b. Valve shafts shall be Grade 316L stainless steel unless otherwise noted.
 - c. Valve hardware (bolts, nuts, washers, and misc. metallic components shall be stainless steel, Grade 316L).
 - d. The shaft seals shall be of the V-type and shall be replaceable without removal of the valve from the line or the shaft from the valve.
 - e. Valve shall have spherical disc design for increased CV, high cycle life, and ultimate sealing.
 - f. Valve body shall have integrally molded body stops and seat relief area to prevent over-tightening of the mating flanges. Valves shall accept flat faced flanges in accordance with ANSI B16.5 bolt pattern for 150 lb. flanges.
 - 1) Exception:
 - a) If a liner is utilized, the liner shall be 100% seat design fully molded around the body whereas only the Disc and Seat are wetted parts and feature raised convex rings on the face and be utilized as the mating flange gaskets.
 - g. Valve joints shall be prepared using flanged connections to accept either wafer style or lugged butterfly valves.
 - h. Valves placed in "difficult-to-reach" locations or more than 7 feet [2.13 m] above the floor elevation shall have chain operators or extended valve operators as pre-approved by This Engineer.
 - 1) Valve handles and valve operators shall be of the same material as the valve body.
2. Pressure and Temperature Minimum Ratings:
 - a. Valves shall be rated for 150 psig [1135 kPa] pressure ratings at 120° F [48° C]
 - b. 1/2 inch [12 mm] through 24 inches [600 mm] flanged valves shall be pressure rated to 150 psig [1135 kPa].
3. Valves shall be open when turned counter-clockwise.
4. Valves shall be certified by NSF International for use in potable water service.
 - a. Valves shall be rated as complying with NSF-50 or NSF-61 (drinking water) standards.
 - b. Metallic valves (and their handles or operators) shall be stainless steel or epoxy-fused coated (NSF-61 compliant).
5. The maximum water velocity allowed through thermoplastic-type valves shall be 5.0 fps [1.524 mps]. Valves located in positions with water velocities that exceed 5.0 fps [1.524 mps] shall be metallic and manufacturer rated for those flow velocities.
 - a. Exception: This Engineer may consider higher water velocities if those higher water velocities are specifically certified as permissible by the valve manufacturer.
6. Valves (and check valves) placed into compressed air systems shall specifically be rated for use with compressed air by the manufacturer.

7. Cast Iron valves 3" and larger shall have an epoxy coated body on interior and exterior surfaces, ductile iron-nylon II coated disc, one piece 416 stainless steel shaft with Buna-N, EPDM, or VITON seat minimum, 150 PSI rating Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 (or better) L stainless steel shaft.
8. Cast Aluminum valves 2" and larger shall have an ASTM S12A body, coated with Rilsan on the interior and exterior surfaces, or an ASTM B26 Class B body without coating if the valve body is not wetted. Internal components include Buna-N or EPDM resilient lining and seat. Internal components include EPDM or BUNA-N resilient lining, a disc made of Rilsan coated ductile iron or uncoated stainless steel, and T304L stainless steel shaft.
9. Thermoplastic valves 3" and larger shall be constructed from PVC Type 1 Cell Classification 12454 or CPVC type 4 cell classification 23447. Thermoplastic valves shall include PVC disc with solid type 316L stainless steel shaft with Buna-N, EPDM, or VITON seat pressure rated to 150 psi @ 73 degrees Fahrenheit.

B. APPROVED MATERIALS

1. U-PVC – Conforming to ASTM D1784 Cell Classification 12454 A
2. Polypropylene – Conforming to ASTM D4101 Cell Classification PP0210B67272
3. PVDF – Conforming to ASTM D3222-91A Cell Classification Type II
4. UV Inhibitors: Mandatory for plastic valves and components if located exposed to sunlight
5. FKM – VITON® Fluorocarbon Rubber (also referred to as VITON)
6. EPDM – Ethylene Propylene Diene Terpolymer Rubber
7. Nitrile – Nitrile Butadiene Rubber
8. Ball valve O-rings shall be EPDM or VITON®.
9. Lugs, Operating Nuts, Stem Extensions, Shafts, and Valve Hardware:
 - a. Stainless steel, in accordance with ASTM-A276, in Grade 316L.
 - b. Butterfly Valve Disc Assembly: Offset design with fully isolated Type 316L stainless steel stem and Type 316L stainless steel hardware.
10. Cast Aluminum housing with Rilsan (nylon) coating
11. Stainless Steel, grade 316L or better (unless otherwise noted in the Drawings)
12. Operator component requirements:
 - a. Unless noted otherwise, actual lever handles, gear handles, chain components (wheel, chain, etc.) shall be one of the following:
 - 1) Epoxy fused coated
 - 2) Stainless steel, Type 316L or better
 - 3) High impact polypropylene handle / handwheel

C. PRE-APPROVED VALVE AND MANUFACTURERS

1. Basis of Design for Plastic-type valves (for less than 5 FPS [1.524 MPS] water velocity applications):
 - a. ASAHI America
 - 1) Type-57 Butterfly valves shall be PVC, PP or PVDF body with either PP, PVC, or PVDF disc and EPDM, Nitrile, or FKM seat & seals.
 - 2) Classifications approved:
 - a) Ball Valves: up to 3 inches [80 mm]
 - b) Butterfly Valves: 1.5 inches [40 mm] and larger

- c) Globe Valves: up to 4 inches [100 mm]
 - b. Spears
 - 1) PVC & CPVC 2000 Industrial True Union Ball Valve
 - a) Ball check valves shall be CPVC (ADE Type 3)
 - 2) Classifications approved:
 - a) Ball Valves: up to 3 inches [80 mm]
 - b) Butterfly Valves: 1.5 inches [40 mm] and larger
 - c) Globe Valves: up to 6 inches [150 mm]
 - 2. Basis of Design for Metallic valves:
 - a. Dominion Valves by Neptune Benson
 - 1) Valves 3 inches to 12 inches [80 - 305 mm] shall be constructed with cast aluminum ASTM S12A housing and fully coated with Rilsan on the interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T316 stainless steel shaft
 - 2) Valves 14 inches [355 mm] and larger shall be constructed with cast iron housing epoxy coated and with Rilsan coated ductile iron disc.
 - 3) Valves shall be Dominion butterfly valves and shall be provided for strainer isolation, filter bypass, backwash throttling, filtered water return and balance tank connections.
 - 4) Classifications approved:
 - a) Butterfly Valves: 2 inches [50 mm] and larger
 - b. Val-Matic Series 2000 valves
 - 1) Provide valves manufactured and tested in accordance with American Water Works Association Standard ANSI/AWWA C504 and certified to ANSI/NSF 61 Drinking Water System Components - Health Effects.
 - 2) The manufacturer shall have a quality management system that is certified to ISO 9001:2000 by an accredited, certifying body.
 - 3) Classifications approved:
 - a) Butterfly: 2 inches [50 mm] and larger
 - c. Bray Series 20 and 21 valves
 - 1) Aluminum body
 - 2) Uncoated Stainless-Steel disc
 - 3) EPDM or BUNA-N seat material
 - 3. Flanges and Hardware:
 - a. Plastic piping shall have plastic flanges (with equivalent pressure ratings);
 - b. Stainless steel piping shall have stainless steel flanges.
- D. OPERATORS
- 1. General requirements:
 - a. Metallic components for operators shall be stainless steel unless approved by Contractor and This Engineer.
 - b. Valve hardware (nuts, bolts, washers, etc.) shall be 316L stainless steel.
 - 2. Lever Type Operator:
 - a. Only for standard sizes 1.5 – 6 inches [40 – 150 mm]. Lever operators may not be used on sizes larger than 6 inches [150 mm].
 - b. Shall have built-in lockout capability.
 - 3. Gear Type Operator:

- a. Mandatory for standard sizes 8 inches [200 mm] and larger
 - b. Gear operators are acceptable for sizes smaller than 8 inches [200 mm] as well
 - c. Shall be equipped with position indicator.
- 4. Chain Type Operator:
 - a. Mandatory for valves located 7 feet [2.13 m] or greater above the floor elevation.
 - b. Chain operators may be installed on Gear-operated butterfly valves. The chain must be weldless loop style chain.
- E. ISOLATION AND THROTTLING VALVES (2-INCH AND LESS)
 - 1. Isolation and throttling valves of 2 inch [50 mm] and less in size shall be true-union ball valves.
 - a. Refer to the Drawings for specific types specified.
 - 2. Materials of construction shall be Type 2. The "true-union" design shall allow valve removal and replacement without spreading the pipelines adjacent to the valves.
 - 3. Valves shall be 100% -port and have replaceable Teflon seats. Valves shall have a blowout-proof bottom entry stem and ABS handle that can be easily removed.
 - 4. Valves shall have a Safe-T-Shear® stem with double O-ring stem seals. Valve handles shall be polypropylene with built-in lockout mechanism. Valve union nuts shall have Buttress threads. Seal carriers shall be Safe-T-Blocked®.
- F. ISOLATION AND THROTTLING VALVES (2.5-INCH AND GREATER)
 - 1. Isolation and throttling valves of 2.5 inch [65 mm] and greater in size shall be of the butterfly type.
 - a. Refer to the Drawings for specific types specified.
 - 2. Materials of construction shall be Type 2. The valve body shall be Type 2. The valve disc shall be polypropylene or better. The valve shaft shall be stainless steel. Seat materials and other elastomers shall be rated for continuous chlorinated water and saline content water service and shall be EPDM or better.
 - 3. The valves shall be rated for "bubble-tight" service unless otherwise specified. Valves between 2.5 inch [65 mm] and 6 inches [150 mm] shall have lever-style operators unless indicated otherwise.
 - 4. Valves 8 inches [200 mm] AND greater in size shall have gear-type operators.
 - 5. The valves shall be wafer-style and shall fit between standard ANSI flange constructions.
- G. PRECISION THROTTLING GLOBE VALVES (UP TO 6-INCHES)
 - 1. Precision throttling valves 6 inches [150 mm] and smaller in size shall be of the globe type.
 - 2. All thermoplastic Globe valves shall be constructed from PVC (Type 2), or CPVC (Type 2), or U-PVC – Conforming to ASTM D1784 Cell Classification 12454 A, as specified in the Drawings.
 - 3. Seals shall be FKM – VITON® Fluorocarbon Rubber or EPDM – Ethylene Propylene Diene Terpolymer Rubber
 - 4. The valve shaft shall be stainless steel
 - 5. There shall be no metal to media contact. Valves shall have excellent flow regulating characteristics throughout the entire lift of the disc.
 - 6. Valves shall have a high impact polypropylene handwheel.

7. PVC and CPVC -1/2 inch [12 mm] through 4 inches [100 mm] globe valves shall be pressure rated to a minimum 80 psi [551 kPa] or greater for water at 73°F [22.8°C]. Sizes shall be rated for full vacuum service 29.9"/Hg.
8. Basis of Design:
 - a. Spears Y-pattern True-Union PVC Globe Valve, www.spearsmfg.com, 800.327.6390
 - b. Acceptable Alternatives:
 - 1) Asahi America, www.asahi-america.com, 800-343-3618
 - 2) Bray Commercial, Model: DG Flanged Globe Valves with St Steel fitted; www.braycommercialdivision.com; 888.412.2729
- H. CHECK VALVES (1.5-INCHES AND LESS)
 1. Thermoplastic check valves 1.5 inches [37mm] and less shall be True Union 2000 Industrial Ball Check type manufactured to ASTM F-1970 and materials of construction from Type 3 (CPVC Type IV), ASTM D-1784 Cell Classification 23447.
 - a. The check valve design shall allow installation in either horizontal or vertical position.
 - b. CPVC 1/2" through 1.5" ball check valves shall be pressure rated to 235 psi at 73°F.
 - c. Note thermoplastic water velocity limitation as indicated above
 2. Suitable for pressure and vacuum service
 3. The valve ball shall be the only moving part and shall unseat to permit flow in one direction, but seal against its seat to prevent backflow. Minimum 100% shutoff pressure shall not exceed 0.7 psi [4.82 kPa].
 4. The valves shall have one of the following end-connections: socket-weld with true-unions on both ends
 - a. CPVC (Type 3) Flange connectors are required as the Drawings specify.
 5. Materials:
 - a. O-rings and seals shall be EPDM or VITON. Seal materials and other elastomers shall be rated for continuous chlorinated water and saline content water service.
 - b. Valve union nuts shall have Buttruss threads.
 - c. Valve seats shall be a standard O-ring type.
 - d. Seal carriers shall be Safe-T-Blocked®.
 - e. Valve components shall be replaceable.
 - f. Components shall be assembled with Silicone-Free, Water Soluble Lubricants
 - g. NSF shall list EPDM valves® for use in potable water service.
 - h. The valve body, ball, and other main parts shall be Type 3.
 6. Basis of Design:
 - a. Model True Union 2000 Industrial Ball Check Valves as manufactured by Spears Manufacturing Company, 15853 Olden St., Sylmar, CA 91342 (PO Box 9203, Sylmar, CA 91392); (818) 364-1611; www.spearsmfg.com
- I. CHECK VALVES (2-INCH AND GREATER)
 1. Check valves 2 inches [50 mm] and greater in size shall either be a "swing check" type or the "wafer-style," torsion spring design.
 2. Materials of construction shall be Stainless Steel, including body, disc, arm, stem, shaft, spring, bushing, and seat ring.
 3. The disk shall seat tightly and secure positive closure to prevent backflow.

4. The valve seat and any other wetted part shall be of a material rated for continuous chlorinated-water service.
5. Any wetted elastomer shall be EPDM or VITON.
6. The valve design shall allow for replacement or removal without disassembly of the adjacent flanges.
7. Basis of Design (pre-approved equals):
 - a. "Ritepro" by Bray, Model 210, ASME 150, with stainless steel body and seat
 - b. "Dual-Disc type" by Val-Matic in stainless steel Grade 316.
 - 1) Pre-Approved Alternate: "Dual-Disc type" by Val-Matic in Ductile iron ASTM A536, Grade 65-45-12 with BUNA-N Resilient Seat Molded to Body with mandatory Fusion Bonded Epoxy (FBE) Coating

J. POTABLE WATER ISOLATION VALVES

1. Isolation valves for potable water service at street pressures less than 150 psi [1.03 mPa] shall be of bronze construction and of either "ball" or "gate" design.
2. Valves shall have glass-reinforced Durafill valve seats rated for potable water service.
3. The valve ball or disc shall be hard chrome plated brass. The valve shall be bottom-loaded with a pressure-retaining stem.
4. The valve shall be rated "bubble-tight" service in continuous isolation service at 400 psi [2.76 mPa] WOG (non-shock).
5. Valves shall comply with all applicable requirements and conform to federal specification WW-V-35B, Type II, Style 3, Class A.
6. The maximum water velocity allowed through plastic-type valves shall be 5.0 fps [1.524 mps]. Valves located in positions with water velocities that exceed 5.0 fps [1.524 mps] shall be metallic and manufacturer rated for those flow velocities.
7. Basis of Design:
 - a. Series B-6000 or equivalent by Watts Regulator Company; Lawrence, MA 01842 (617-688-1811).

K. MOTORIZED CONTROL VALVES – NOT USED

L. ELECTRIC SOLENOID VALVES - NOT USED

M. OTHER SPECIFIED VALVES

1. Unless otherwise specified, the valves shall satisfy the applicable general requirements of the Specifications for the specified duty.
2. Other chemical valves are specified in "Chemical Equipment."
3. Specified valves are "manual" unless electric, motorized, or pneumatic valves are explicitly specified within the Drawings.
4. Valves specified for chemical duties shall be rated appropriately for peak chemical concentrations expected after the injection point.
5. Metallic-type valves shall be equipped as follows:
 - a. Factory primed then Fusion Epoxy Coating or approved equal
 - b. EPDM or VITON Seals
 - c. Stainless steel stems and shafts
 - d. Stainless steel fitted

2.14 MAINTENANCE, SERVICE, TESTING, & RELATED EQUIPMENT

A. GENERAL

1. Provide commercial-rated equipment.

2. Observe and follow manufacturer's instructions & recommendations
3. Refer to the Drawings' Equipment Schedules for exact models specified.

B. MAINTENANCE & SERVICE EQUIPMENT

1. Maintenance handles & poles:
 - a. 1-piece 1.25-inch O.D. [32 mm] fiberglass handles with quick-change adapters to connect cleaning equipment
2. Vacuum hose:
 - a. Heavy-duty rated with integrally molded cuffs
 - b. 2 inches [50 mm] diameter x 50 feet [15.24 m]
 - c. Materials contain UV inhibitors
 - d. Color: White/Black
 - e. Warranty: 4 years
3. Wall brush:
 - a. Heavy-duty stiff, non-metallic bristles
 - b. Curved, 24 inches [610 mm] long
 - c. Include quick connector for easy adaption to pole
4. Cleaner bags
 - a. Filter bag options shall include the following micron choices:
 - 1) 105, 250, or 1,000
5. Ease of maintenance
 - a. Pump shall be accessed, repaired, and maintained on the pool deck without tools.

C. CHEMICAL TESTING

1. Provide testing lab kit for:
 - a. Free Available Chlorine: 1- 10 ppm
 - b. Total Available Chlorine: 0 – 3 ppm
 - c. pH – 6.8 – 8.4 ppm
 - d. Acid & base demand
 - e. Calcium Hardness (CAH)
 - f. Total Hardness
 - g. Cyanuric Acid (CYA)
 - h. Copper and Iron
 - i. Potassium Monopersulfate (KMPS, MPS)
 - j. Reagents for 24 months of testing
2. Note: The chlorine test equipment also detects dissolved Bromine.
3. Basis of Design: Taylor Professional Complete Chlorine Testing Lab; model #56-300 by Recreonics; www.recreonics.com

2.15 MISCELLANEOUS EQUIPMENT

A. EMERGENCY EYEWASH STATION

1. Provide one (1) emergency eyewash station and drench shower (in each chemical equipment room)
2. Basis of Design: Bradley Plumbing Fixtures; 414-251-6000. Refer to the Drawings for the specified model number.

B. WATER FILL SYSTEM - AUTOMATED

1. Each pool shall be fitted with an automatic water level control system.

2. The water level control and fill system shall include a manual fill valve (as sized on the Drawings) arranged in parallel with the automatic fill valve (sized on the Drawings). Install an additional isolation valve on the potable water inlet line for safety.
3. Valves exposed to governmental water pressure shall be rated for potable water pressures up to 125 psi [861.8 kPa]. Maintain a minimum 4 inch [100 mm] air gap from the city water supply pipe terminus to the maximum water level of each water feature and pool
 - a. The alternate connection shall be via a listed backflow preventer system as noted herein.
4. Potable water fill system shall comply with local and state codes and requirements.
5. Provide a water hammer arrestor as specified.
6. Provide a pressure limiting device if the pressure of the supply pipe is greater than 60 psi.
7. Pre-approved automated water-fill systems include:
 - a. The feature and pool water level control system for Aquaworx fabricated fiberglass tanks shall be from the ATLEV family (sizes vary) by Aquaworx Inc. 10450 66th St N #3, Pinellas Park, FL 33782 (1-888-426-8511).

PART 3 - EXECUTION

3.01 BASIC POOL BASIN CONSTRUCTION & INSTALLATION

A. GENERAL

- a. Equipment and materials shall be installed in accordance with referenced standards, the manufacturer's instructions & recommendations, and the Contract Documents.
 - b. In the event of a conflict, notify the Architect, the Contractor, the EME Team and This Engineer in writing requesting a written clarification.
2. Install equipment, materials, infinity edges, and weirs true and precisely level.
3. Provide the SST basin unit(s) with all equipment pre-installed prior to placement. Coordination between the Contractor and pool installer is mandatory.
4. Protect equipment from damage during installation and through substantial completion. At the Contractor's expense, he shall replace damaged parts, components, and equipment.

B. SEALANTS

1. Follow manufacturer instructions & recommendations without exception.
2. Specific installation care is required for (but not limited to):
 - a. Surface preparations
 - 1) Observe minimum and maximum thicknesses as well as the ratio of the width of sealant in a crack or joint vs. the depth of the sealant.
 - 2) Ensure that the correct primer for the sealant is installed per the manufacturer's requirements.
 - 3) Observe manufacturers' requirements for bond breaker tape or backer rod
 - b. Mixing of the products: Refer to the manufacturer's cut sheets for direction.
 - c. Application & finish of the products
 - d. Curing of the products

C. UNDERWATER SEALANTS

1. General:
 - a. Follow manufacturer instructions & recommendations without exception.
 - b. Specific installation care is required for (but not limited to):
 - 1) Surface preparations
 - a) Observe minimum and maximum thicknesses
 - 2) Mixing of the products
 - 3) Application & finish of the products
 - 4) Curing of the products
2. Pre-manufactured Underwater Expansion Joint
 - a. Contractor shall provide properly formed and prepared expansion joint openings constructed to the exact dimensions and elevations shown on manufacturer's standard system drawings or as indicated on the contract drawings. Deviations from these dimensions will not be allowed without the written consent of This Engineer.
 - b. The contractor shall clean the joint opening of all contaminants immediately prior to installation of expansion joint system.
 - c. Repair spalled, irregular or unsound joint surfaces using manufacturers' standards for repair of the substrates in question.
 - d. Remove protruding roughness to ensure joint sides are smooth. Ensure that there is sufficient depth to receive the full depth of the size of the Submerseal being installed. Refer to Manufacturers Installation Guide for detailed systematic instructions.
 - 1) Exception: Without exception, this Engineer shall have the final right of acceptance or approval.
 - e. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.
 - f. A system to be installed by qualified installers only per detailed published installation procedures and by job-specific installation instructions of manufacturer's field technician.
 - g. Clean and Protect
 - 1) Protect the system and its components during construction. Subsequent damage to the expansion joint system will be repaired at the contractor's expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.
3. Experience and Qualifications:
 - a. An authorized Contractor or pool installer (with the on-site oversight of a manufacturer's representative) shall provide Submerseal by Emseal [or Willseal] for underwater expansion joints:
 - 1) Submerseal by EMSEAL Joint Systems, LTD; 25 Bridle Lane; Westborough, MA 01581-2603; 800-526-8365. www.emseal.com.
 - 2) Willseal 250BG by Willseal LLC, 34 Executive Drive, Hudson, NH 03051, 800-274-2813, 800-416-0550 (Fax), www.willseal.com; email: custserv@willseal.com
 - b. Deck-O-Seal type underwater expansion joints require a written certification of qualification for the selected, manufacturer-certified installer.

1) Critical:

- a) Deck-O-Seal type joints may only be utilized when installed by a manufacturer's Certified Joint Installer. This experience and certification requirement is applicable to:
 - 1. Horizontal underwater construction / expansion joints: "Dura-White" Deck-O-Seal #125 by Deck-O-Seal Corporation, Hampshire, IL (800-542-7665); www.deckoseal.com.
 - 2. Vertical underwater construction / expansion joints: "Dura-White" Deck-O-Seal Gun Grade by Deck-O-Seal Corporation, Hampshire, IL (800-542-7665); www.deckoseal.com.

D. JOINTS

- 1. Refer to the TCNA (Tile Council of North America), ACI (American Concrete Institute), applicable codes and standards, manufacturers, and the Contract Documents for minimum standards for joint placement and separations.
- 2. Provide cut joints, expansion joints, and movement joints per the Contract Documents and shall include, but not be limited to the following locations:
 - a. Tiles & natural stone on beams, floors, and walls
 - b. Coping, natural stone fields, and interior finishes
- 3. Provide isolation joints as per the Documents without exception
- 4. Follow & observe the manufacturer's recommendations & requirements without exception.
 - a. Provide 2 rows of 1-inch x 1-inch [25 mm x 25 mm] of non-slip tiles (in white color) on each side of the underwater, submerged, expansion joint materials (joint trench) continuous on beam, floors, & walls.
 - b. Use of manufacturer-required primers are mandatory
- 5. Natural stone joints:
 - a. Test a small area with the joint sealant to ensure success (allow 24-hours) to observe potential fluid migration and to verify results.
 - b. Finish joints with a "jointing tool" when complete for a professional finish. Proper tooling of the sealant assures contact with the joint flanks.
- 6. Use closed cell backer rods or bond breaker tape to control the depth of joint sealants or materials.
- 7. Observe all required curing times and temperature limitations when installing joint materials.

E. ADHESIVES & GROUTS

- 1. Install only epoxy type grout into finishes.
- 2. Observe the installation & recommendations by adhesive and grout manufacturers.
- 3. All surfaces must be clean, sound, free of oil, waxes, frost curing agents, form release agents or other bond inhibiting contaminants.
- 4. Prepare, and water blast surfaces
- 5. Follow ANSI specification A108.01-3.7 "Requirements for Movement Joints: Preparations by Trades" or TCNA detail EJ-171 "Movement Joints – Vertical and Horizontal."
- 6. Exterior stone installations require the use of "LATASIL" at all joints.

F. EQUIPMENT INSTALLATION

1. Equipment shall be installed in accordance with the manufacturer's instructions & recommendations and the Contract Documents.
 - a. In the event of a conflict, notify The Architect and This Engineer in writing requesting a written clarification.
2. Equipment shall be new and in pristine condition.

3.02 STAINLESS STEEL BASINS EXECUTION

A. STAINLESS-STEEL BASIN WATERTIGHT

1. Continuous sanitary welds shall be provided.
2. Refer to the Stainless-Steel shop drawings.

B. 300-SERIES STAINLESS STEEL

1. Any stainless steel intended to be in contact with the or welded water must be 300 series stainless

C. WELDED PROCESS

1. Welding processes, whether in the shop or in the field, must comply with AWS D1.6
2. Any fitting penetrating the stainless-steel basin shall be made watertight by:
 - a. Continuous welding of stainless steel
 - b. A flange and a gasket with stainless screws
 - c. Solvent welding the fitting to the vinyl liner
3. Weld and filler rod selection shall be carefully chosen to have the same alloy content as the stainless steel flat stock.
4. Welding procedures must be carried out by certified welders with a minimum 5 years of experience in welding showcase stainless steel surfaces.
5. Adjoining stainless-steel components shall be properly clamped prior to welding, to minimize stress on the welded assembly and therefore avoid future cracking.
6. Proper treatment of all weld areas, including solidified welding metal, heat-affected zones, and base stainless steel surface, must be performed.
 - a. Stainless steel surfaces shall be finished after welding to remove all marks that occurred due to heating during welding procedures.
 - b. Welds must be properly cleaned immediately after completion. All rusting associated with welding must be eliminated. Any discoloration associated with welding and any free iron should be removed by mechanical or chemical means.
 - c. Any coarse or rough surfaces should be smoothed, and mechanical marks or scratches shall be removed, and all foreign matter shall be removed, including paint, slag and spatter, to optimize corrosion resistance.
 - d. All welds shall be mitered and ground smooth. Weld show-through must be prevented on all exposed surfaces.
 - e. Grind butt welds flush; grind and fill exposed fillet welds to a smooth profile.
7. Avoid allowing stainless steels to come in contact with ordinary iron or steel, such as work tables, lifting tools, storage racks. Iron and steel dust, such as may be created by grinding, cutting, blast cleaning and the like, shall be kept away from areas where stainless steel is being fabricated
8. Field splicing is not permitted.

D. INSPECTION OF COMPONENTS

1. Mandatory inspections:

- a. The stainless-steel basin components shall be thoroughly inspected for compliance with all shop drawings prior to acceptance by the EME Team and OAR
- b. Special attention must be paid to the straightness of components that must be plumb or level when installed, for instance any overflow gutter edge, as well as the integrity of all plumbing, conduit, and electrical points of connection, and an overall smooth appearance free of dents or other blemishes.

E. PREPARATION

1. Site Conditions:
 - a. Basin installer shall confirm in writing suitability of project site to proceed with the basins' forms and material installation.
2. Field Measurements:
 - a. Construction of the pool foundation and floor shall be coordinated and confirmed upon completion. A final survey will be conducted by basin installer before proceeding.
 - b. A drawing and/or report of their findings shall be submitted for review in any of the areas listed below shall be identified along with other applicable information.
 - c. The basin installer along with the manufacturer shall note in writing any possible recommendations for correction of deficient conditions and advise of possible delays and additional costs that may result as soon as possible, explicitly considering the following:
 - 1) Relative placement of pool foundations
 - 2) Horizontal line
 - 3) Elevation
 - 4) Concrete finish

F. FINAL CHECKS

1. After and during assembly, the plumbness and levelness of the structure must be checked and maintained.
2. All pipe connections and conduit connections must be tested for water tightness as described in section 3.06

3.03 PIPING & ASSOCIATED COMPONENTS EXECUTION

A. PIPING AND VALVING SYSTEMS

1. Install pool piping as shown on the Drawings per the size schedules in the Drawings.
2. Refer to "PIPING SUPPORT METHODS," for general requirements for piping supports, anchoring, and movement compensation.
3. Install Type 2 or Type 5 piping under and through the pool basin unless otherwise specified.
4. The torque applied to the bolts per manufacturers' standards and requirements. Install accessories in accordance with the manufacturers' instructions & requirements, and facility requirements.
5. Double-Walled Piping Containment Systems shall be installed in accordance with Spears® Double Containment Design & Installation Guide.

B. PIPING LAYOUT & EXECUTION

1. Examine piping layouts, locations, and dimensions shown on the Drawings. Verify piping locations do not interfere with other equipment or construction before installation.
2. Piping shall be installed as shown on Drawings and specified to make a comprehensive system.
3. Pipes shall be installed parallel or perpendicular to the walls or other exposed construction unless a different layout is shown. Cut piping accurately from established dimensions verified at the project site. Coordinate piping locations, routing, and minimum clearances from other devices.
4. Install Clear Pipe, Sch. 80 (Type 7) in the following locations:
 - a. Flow meters' piping placements:
 - 1) Place a minimum 2 feet [600 mm] length at each flow meter.
 - 2) Center the flow meter at the mid-point of the length of the clear pipe.
 - 3) Couplings / fittings connecting the specified pipe length shall be Clear PVC, Sch 80.
 - 4) Comply with flow meter manufacturers' installation instructions for minimum upstream and downstream straight-run conditions as well as all manufacturer's instructions & recommendations.
 - a) Exception: Type 7 Clear Piping shall not be placed outdoors or where it would be exposed to UV rays.
 - b. Backwash / Waste:
 - 1) Place a minimum 2 feet [600 mm] length on each backwash pipe.
 - 2) Couplings / fittings connecting the specified pipe length shall be Clear PVC, Sch 80 (Type 7).
 - a) Exception: Type 7 Clear Piping shall not be placed outdoors or where it would be exposed to UV rays.

C. PIPE SIZING

1. The pipe sizes indicated are required to meet the hydraulic requirements as set forth by The Architect and This Engineer.
2. Do not deviate from the pipe sizes shown unless prior written approval is obtained from This Engineer.
 - a. When a size is not indicated, request judgment from This Engineer.
3. If interference with other equipment or the Architect requires relocation of pipes or a layout different from that shown, notify This Engineer for further written instructions.

D. GENERAL EXECUTION

1. Preparation:
 - a. Before installation, examine piping and fittings for damage or defects. Discard unacceptable units.
 - b. Clean interior of pipe of foreign matter and keep clean during installation. Pipe shall not be placed in standing water, or when the trench or weather conditions are unsuitable for the work.
2. Installation Execution:
 - a. The following practices and quality control are required for the piping installation:
 - 1) Comply with manufacturer's requirements
 - 2) Cut pipe "square."
 - 3) Remove pipe burrs (inside and out)

- 4) Clean pipe ends with a clean rag to remove dirt and moisture
 - 5) Verify that a "dry-fit" is possible and manageable
 - 6) Apply primer and cleaner per the manufacturer's requirements
 - 7) Flow solvent weld cement on pipe and fitting with the appropriately sized applicator
 - 8) Work steadily when applying solvent weld cement
 - 9) Do not "puddle" the cement within the fitting or allow the solvent weld cement to "run-down" the interior of the pipe
 - a) Allow 10-seconds open time to lapse before inserting pipe end into fittings. Refer to the manufacturer's requirements.
 - 10) Assemble immediately by "bottoming" the pipe within the socket and twisting $\frac{1}{4}$ turn while solvent weld cement is still wet
 - 11) Hold & secure the solvent weld cemented joint for a minimum of 60-seconds to prevent "pushout."
 - 12) Additional manpower is required with large pipe and fittings. Use mechanical equipment if needed (follow the manufacturer's requirements)
 - 13) Wipe off / remove excess solvent weld cement but do not disturb the joint for a minimum of 10-minutes – no exceptions.
 - 14) Comply with specified set times scheduled below
 - 15) Properly support the piping to prevent damage
 - 16) Curing period will be dependent upon:
 - a) Air temperature and humidity
 - b) Type of and size of pipe
 - c) Type of solvent cement
 - d) Dry joint tightness
 - 17) Bring pipe to its scheduled operating temperature prior to water pressure testing
 - 18) PVC heat welding / bending is prohibited.
 - a) If custom angles on fittings are required, the Contractor shall be responsible for providing those as may be needed.
- b. Initial Pipe Solvent Weld Cementing Set Times:
- 1) Comply with the following time periods after cementing pipe fittings.
 - a) Double times in damp or humid weather.
 - b) Field conditions may lengthen these initial set times.
 - c) For drying times at temperatures that differ from this, consult This Engineer:

PIPE SIZE	AVERAGE INITIAL SETTING TIME	AVERAGE INITIAL SETTING TIME
	Air Temperature: 60° to 100° F [15° to 37° C]	Air Temperature: 40° to 59° F [4° to 15° C]
0.5 – 2 inches [13 – 50 mm]	5 minutes	10 minutes

2.5 – 8 inches [63 – 200 mm]	30 minutes	2 hours
10 – 14 inches [255 – 355 mm]	2 hours	8 hours
16 inches [400 mm] & higher	4 hours	16 hours

c. Water pressure testing:

1) Water pressure testing requires that a minimum curing / drying time be completed to allow the PVC solvent weld cement to cure and take a permanent set. The following table sets forth the minimum drying period before the required water pressure tests.

a) This chart applies only to weather temperatures ranging from 40° F. to 100° F. Double the noted times when in damp or humid weather. For drying times at temperatures that differ from this, consult This Engineer:

PIPE SIZE	AVERAGE CURING TIME	AVERAGE CURING TIME
	Air Temperature: 60° to 100° F [15° to 37° C]	Air Temperature: 40° to 59° F [4° to 15° C]
0.5 – 2 inches [13 – 50 mm]	12 hours	24 hours
2.5 – 8 inches [65 – 200 mm]	24 hours	48 hours
10 – 14 inches [255 – 355 mm]	48 hours	96 hours
16 inches [400 mm] & higher	72 hours	6 days

d. Conduct hydrostatic water pressure tests on the vacuum, gravity flow, pressure piping, and underwater light conduits as specified in Field Quality Control.

1) Conduct water pressure testing at:

a) For PVC materials (Type 1, 2, 3, 4, and 7) 60 PSI [413.7 kPa] or at 150% of the maximum operating pressure (whichever is greater) with no loss of water.

- b) Exception: Main drain assemblies and related gravity flow / open channel flow piping systems shall be water pressure tested for a continuous 24 hours at a minimum 30 PSI [206.8 kPa] water pressure test with no loss of water.
- c) Caution: Pressure testing via the use of compressed air is prohibited.
- e. Equipment room located pipe sizes of 3 inch [80 mm] and greater shall have flanged connections unless otherwise specified.
- f. Pipe sizes less than 3 inches [80 mm] may have NPT threaded connections unless flanged connections are necessary to adapt to other devices (valves, etc.).

E. PIPING INSTALLATION REQUIREMENTS

1. The piping diagrams, placements, and layouts are shown on the drawings shall be followed without exception unless written authorization from This Engineer.
 - a. Exception: Piping indicated to be shown in a diagrammatic view only. This allows installation with discretion to meet the site conditions.
2. Place pool perimeter piping as close to the pool beam as possible.
 - a. Above-grade piping and piping within building structures shall be supported and suspended as detailed and specified herein.
3. Piping located beneath and passing through the basin structures shall be Type 2 or better, and piping and fittings within the mechanical equipment space shall be Type 2 or better.
4. Piping passing through more than one adjacent layer of concrete shall be Type 5.
5. Piping in parallel or crossing shall have 4 inches [100 mm] minimum clearances to other piping.
6. Provide piping, fittings, reducers, braces, hangers, supports, isolation joints, and expansion equipment specified for the complete, functional installation.
7. Pipe slopes:
 - a. General:
 - 1) At no point, shall the piping change slopes allowing an air pocket, trap, or dip to occur.
 - b. Piping shall be placed on an appropriate grade around the basin, so it will drain completely by gravity. In instances where gravity drainage is not provided, the Contractor shall provide drain valves and sump assemblies so that piping can be drained completely.
 - 1) Provide specialized blow-out plugs, niches, drainable junction boxes, drainable conduits, nozzles, and such drain pipes with valves into the gravity sump (equipped with a sump pump for automatic draining).
- c. Pipe Slopes' Table:

Pipe Description	Source / Destination	Continuous, Minimum Pipe Slope (maybe more)	Remarks
Gutter	Basin to Surge (or Collector) Tank	2%	Gravity / open channel flow
Basin Floor	Basin to Surge (or	2%	Gravity / open

Drain Therapy Air Supply	Collector) Tank Air vent to therapy nozzles	2%	channel flow Insect screen w/ 65% open area required Per fill system manufacturer's requirements
Static (for auto-fill sensor)	Basin to equipment area	2%	

- d. Remove air from the piping system especially when filling the piping for water pressure tests.
 - 1) Remove air via valves; corporation stops at the high points of the line or other means.
 - 2) Caution: entrapped air may create unacceptable surge pressures (water hammer) in the piping system causing a piping failure.
8. Only Type 5 piping may be installed into air plenums.
 - a. Ground and bond metallic piping at 20 feet [6.10 m] intervals on center. Utilize only UL-listed ground lugs.
 - b. Insulate plenum-located metallic piping and related system components with a closed-cell pipe insulation.
9. Install a 1 inch [25 mm] Type 1 pipe or better, cold water supply pipe from the handicap anchor deck box to the potable water supply at the equipment room.
10. Bolt flanges together in accordance with recognized standard practice.
11. Valve and check valve Installations
 - a. Locate check valves a minimum of 10 pipe diameters downstream of any pump or another source of turbulence.
 - b. The maximum water velocity allowed through plastic-type valves (or check valves) shall be 5.0 fps [1.524 mps]. Valves located in locations or positions with water velocities that exceed 5.0 fps [1.524 mps] shall be metallic and manufacturer rated for those flow velocities.
 - c. Check valves must be installed with the valves' flow arrow pointing in the direction of the water flow.
 - d. Check valves shall not be placed in a downward water flow condition.
12. Pipe material transitions:
 - a. Material transitions shall be above-grade, flange to flange connections and include ribbed EPDM type rubber gaskets.
 - b. Dielectric unions shall be used when joining dissimilar metallic pipe materials.
 - c. Install dielectric fittings at ferrous and non-ferrous metallic piping.
 - d. Below-grade materials transitions are prohibited.
13. Place pipe couplings, with the welded-water stop plate, into position before placing concrete around such water stop couplings.
 - a. Install water stops, waterproofing, flashing flange, or sleeves as detailed, at each floor or wall penetration.
 - b. Coordinate water stop couplings installed at the cast-in-place penetration of the pool basin and each penetration of concrete equipment room walls and floors.
14. Do not install low-mounted suspended / hung piping less than 7 feet [2.13 m] above the FFE, without This Engineer's written approval.

15. Install Type 3 or Type 5 piping within 6 in [150 mm] of self-priming pumps.
16. Use only flanged joints, unions, or roll grooved couplings where disassembly is at temperatures above 110°F.
 - a. Do not use PVC for threaded connections at temperatures above 110°F

Temperature (degrees F.)	De-Rating Factor
73	1.00
80	0.88
90	0.75
100	0.62
110	0.51
120	0.40
130	0.31
140	0.22

F. WELDED PIPE CONNECTIONS

1. Weld symbols shown shall be interpreted in accordance with ANSI/AWS A2.4.
When no weld symbols are specified, welds shall be of 100% depth and fulfilled with properly prepared pipe ends in the standard fashion.
2. Refer to the applicable Specifications for PVC pipe welding. At a minimum, perform PVC pipe welding via hot-gas welding method using a 600° F [315° C] tip temperature providing a temperature of approximately 500° F [260° C].
3. Weld Cold-Fog system stainless steel piping/tubing per manufacturer's instructions & recommendations, complying with the latest ASTM requirements for stainless steel welding.

G. NON-WELDED PIPE CONNECTIONS

1. Equipment room-located pipe sizes 3 inches [80 mm] and greater shall have flanged connections unless otherwise specified.
 - a. PVC piping under basins and other concrete slabs may use solvent-welded connections regardless of size unless otherwise indicated.
2. Pipe sizes less than 3 inches [80 mm] may have NPT threaded connections unless flanged connections are necessary to adapt to other devices.

H. FLANGED PIPE JOINTS

1. Bolt flanges together in accordance with recognized standard practice.
2. Provide manufacturer's authorized synthetic non-degradable gaskets at flange joints.

I. THREADED PIPE / FITTING JOINTS

1. When threaded pipe joints and fittings are used, fittings shall be minimum Type 2.
2. Assemble threaded joints with Loctite "PST" pipe thread sealant per Loctite instructions. No more than three pipe threads are to be exposed after the joint is made up tight.
3. Do not thread Sch 40 PVC pipe. Thread only PVC Sch 80 or heavier.
 - a. Threading requires a 50 percent reduction in pressure rating stated for plain end pipe @73°F.
4. Female plastic pipe threads shall only accept plastic male fittings. In the case of male pipe threads in a metal pipe, a metal female fitting must be used. Female metal pipe threads may accept plastic or metal male pipe threads.

J. PIPING ISOLATION FROM CONCRETE FLOORS AND WALLS

1. Install vibration isolators on the suction and discharge piping systems at each pump.
2. Install required Link-Seals with the corresponding Century-Link sleeves at each pipe penetrating equipment room walls, floors, basin concrete for a water-proof seal. Refer to the Drawings for additional details.
3. When Link-Seals are described in detail in the drawings, there shall be no substitutions allowed.

K. FIELD QUALITY CONTROL & WATER PRESSURE TESTING

1. Perform the following piping system hydrostatic water pressure testing:
 - a. Provide pumps, pressure plugs, caps, gauges, and other instruments and devices necessary to perform the hydrostatic (water) pressure tests specified.
 - 1) Maintain the constant water pressure test on the piping system throughout the backfill, compaction, deck placement, and during any construction activities around the piping.
 - 2) Comply with pipe / fitting manufacturers' requirements when preparing to water pressure test a piping system.
 - a) Air must be removed from pipes & fittings prior to water testing.
 - b) Caution: Do not use compressed air pressure on PVC piping or fittings.
 - b. Hydrostatically water-test each total piping system to a minimum pressure of 150 percent of the system working pressure except as noted below.
 - 1) Typically, water pressure test at 60 psi [413.7 kPa] with the following exceptions.
 - a) Exception: Perimeter overflow (gutter) piping, drain outlet gravity piping, and other gravity drain piping: 30 psi [206.8 kPa].
 - b) Underwater electrical conduits: Water pressure tested to be leak-proof at 20 psi [137.9 kPa].
 - 2) The Contractor shall provide certified, photo & written documentation upon the completion of these water pressure test.
 - a) The written certification shall include words stating that "no water was added" to the piping systems during these water pressure tests.
 - c. Initial water pressure test duration: Minimum 24 hours of constant water pressure without additional pumping or addition of water.
 - 1) Prior to the water pressure test being considered successful, the water pressure testing shall include a visual check of 100% of EACH joint by the Contractor and The Architect and This Engineer to assist in verifying that there exists no water leaks / water loss.

- 2) All piping shall be maintained in a pressurized condition until all work near the piping is completed. Once the decking is in place over, near, and around the piping systems, a final verified observation of the intact water pressure testing shall be confirmed and recorded, only then may the water pressure testing may be removed from the piping systems.

- 1 Only after the decking is placed shall the water pressure test assemblies be removed from the mechanical vault.
- 2 At that time, the manufactured-provided valves and related equipment shall be installed inside mechanical vault

L. PIPING SUPPORT, EXPANSION, PROTECTION

1. Install bracing, fasteners, bracing, hangers, supports, and thrust blocks.
 - a. Piping and major components to be adequately supported to avoid placing excessive strain on either piping, building structures, or major system components (piping manifolds, pumps, and valves).
 - b. Piping shall be adequately supported, isolated, and installed to allow for expansion, vibration, and noise reduction.
 - c. Piping shall be supported to prevent sagging. Without exception, the piping shall slope as noted herein.
2. No excessive movement by the piping is allowed.
3. After installation, metallic parts shall be coated / painted with a primer and an exterior metal coating
4. The piping support details shown on the Drawings are diagrammatic and indicate the general arrangement and methods for providing proper support for piping systems.
5. Due to the small scale of these Drawings, it is not possible to show elbows, and flexible connections specified to allow for expansion and pipe movement; however, the Contractor shall verify that adequate expansion and flex capability is achieved while maintaining sufficient supports to avoid placing excessive strain on the piping, building structures, or system components.
6. Install expansion joint assembly units on the suction and discharge of each pump rated at 5 hp [3.72 kW] and larger
 - a. Refer to the Drawings for quantities and sizes
 - b. Install pipe supports and bracing for piping manifolds.
 - c. Install compression sleeves and extension rods
 - d. Pipes located within equipment mechanical spaces or within structures (with no soils support) will require pre-approved support units.
 - e. Comply with local codes and manufacturer's requirements for maximum spacing of hangers and support; however, in no event shall the spacing in the table above be exceeded.
 - f. Individually support valves and heavy fittings to avoid stress on adjacent piping or fittings.
 - g. Do not support any equipment from the adjacent piping systems.
 - h. Do not over tighten pipe in supports, preventing the anticipated movement. Install clamps, supports, and straps that hold pipe away from the adjacent framing as part of the base bid.

7. Drawings do not indicate exact-required support details; however, complete piping support is a performance responsibility assigned to the Installer. Piping and equipment support shall be provided as required for the forces and loads and as determined and directed by This Engineer.
 - a. The Architect and This Engineer shall recommend additional supports to be installed once the equipment is placed into operation. Such additional strapping, supports and other such bracing identified by the Engineer shall be provided by the installer / contractor at no additional costs to the owner.
 - b. It shall be the Contractor's responsibility to properly support piping at valves, pumps, equipment, overhead areas, and changes in direction.
 - c. Pipe larger than 12" diameter require floor supports using stainless steel (or alternative approved materials) support bracing columns.
8. Ring, clevis, roller and J-hook type hangers are prohibited.
9. Install additional pipe supports and expansion compensation devices as This Engineer may deem necessary.

M. HORIZONTAL PIPE SUPPORTS (CEILING-MOUNTED)

1. Install horizontal ceiling mounted pipe supports, on center, to the following spacing:

PIPE SIZE Inch [mm]	STATIC LOAD lbs. [Kg]	MAX. SPACING feet [m]
2 [50 mm]	25.3 [11.5 Kg]	6.0 [1.8 m]
2.5 [63 mm]	41.2 [18.7 Kg]	7.0 [2.1 m]
3 [80 mm]	55.7 [25.3 Kg]	7.0 [2.1 m]
4 [100 mm]	88.4 [40 Kg]	7.5 [2.2 m]
6 [150 mm]	184.3 [83.5 Kg]	8.0 [2.4 m]
8 [200 mm]	333.1 [151 Kg]	9.0 [2.7 m]
10 [250 mm]	500.4 [227 Kg]	9.0 [2.7 m]
12 [305 mm]	687.8 [312 Kg]	9.0 [2.7 m]
14 [350 mm]	818.1 [371 Kg]	9.0 [2.7 m]
16 [400 mm]	1033.5 [468.7 Kg]	9.0 [2.7 m]

2. The threaded rod sizes shown in the Drawings are selected to match the size clevis hanger. At the Contractor's option, a smaller rod size may be used with extra-heavy flat washers at the clevis hanger. In this event, the rated capacity of the smaller size rods shall be at least double the static load for the pipe size as shown in the table.

N. HORIZONTAL PIPE SUPPORTS (WALL-MOUNTED)

1. Refer to the Drawings and these Specifications for the recommended method of support for horizontally run piping when supported from wall-mounted hangers.

2. Install horizontal wall mounted pipe supports, on center, to the spacing scheduled herein.
3. Install pipe supports at gutter piping around the pool to prevent sagging or dropping of the piping. Refer to the applicable drawing details.
 - a. Exception: If the gutter piping is encapsulated within the structural beam, pipe supports are not necessary.

O. VERTICAL PIPE SUPPORTS

1. Refer to Drawings for vertical pipe support details.
2. Supports for vertical pipe runs shall be independent. Place supports uniformly spaced at 150 percent of the minimum spacing for the corresponding size of horizontal piping.
3. Install a minimum of 2 supports at each vertical pipe run. Install vertical pipe runs prior to connecting to the horizontal runs.

P. FLOOR MOUNTED PIPE SUPPORTS

1. Refer to the Drawing details for the floor supports for horizontal pipe runs.
2. For static load support, utilize a pipe saddle (Elcen-Figure 48) and embed the pipe stand in at least three inches of concrete. For load support plus anchoring, use a U-bolt support saddle (Elcen-Figure 49) and embed the pipe stand in at least six inches of concrete.
3. For floor construction, other than concrete, a base plate shall be installed and fastened to the floor with sufficient fasteners and spacing appropriate for the floor construction.

Q. PIPE RUN ANCHORING FOR DYNAMIC LOADS

1. Install a minimum of one thrust block anchor on each equipment room or vault horizontal run as close as possible to the downstream elbow.

R. NOISE REDUCTION

1. Special noise reduction procedures:
 - a. Isolate piping penetrations from the structure via the use of Link-Seal Penetrations
 - b. Clearances around each pipe at concrete floor juncture.
 - 1) Utilize a No-Leak Flange (Type 2 piping)
 - c. Install expansion joints / couplings before and after each pump greater than 5-hp or as indicated on the Drawings.
 - d. Install neoprene equipment mounts (for pumps larger than 5 hp [3.73 kW]) except when their use is contrary to the pump manufacturer's installation requirements.

3.04 PUMPING SYSTEMS EXECUTION

A. GENERAL

1. Comply with manufacturer's installation, commissioning, and start-up instructions as well as those with the Drawings and these Specifications.
2. Install the specified hair/lint strainer upstream of each pump unless specifically noted in the Drawings.
 - a. Not required for vacuum D.E. filter pumps.
3. All hardware shall be 316L.

4. Self-priming tubing: Install a 0.25-inch [6.4 mm] diameter stainless steel tubing from the suction side of each pump to the water discharge side of each Marlow self-priming pump with a check valve located immediately after the pump or to any self-priming pump with a motor larger than 3 hp. [1.49 kW].
5. Install pumps to meet the following:
 - a. Mount perfectly level.
 - b. Provide for major equipment, housekeeping bases / pads, 6-inches thick minimum; unless noted otherwise on Drawings, extended 6-inches beyond machinery bedplates.
 - c. Provide templates, anchor bolts, vibration isolators, and accessories required for mounting and anchoring equipment.
 - d. Anchorage system shall be in accordance with the equipment manufacturer's specifications and local code requirements. Consult with equipment manufacturer for length and installation of anchor bolts.
 - 1) Grout equipment into place in accordance with the manufacturer's requirements unless required otherwise.
 - e. After the placement of a 90-deg. elbow or another directional change fitting, a minimum of 5 pipe diameters of piping shall be provided on the suction (upstream) side of the pump unless an upstream strainer rated as a flow straightener is provided. Refer to the Equipment Schedule on the Drawings for the specified minimum requirements
 - f. The supply piping shall be arranged / installed / mounted so that no air locks can occur
 - g. Install eccentric reducers with the "flat" side up
 - h. Deviations to the above may void manufacturer's warranty.
6. Install rubber expansion joints on the upstream and downstream piping at each pump 5 hp or greater [3.73 kW].
 - a. Comply with manufacturers' requirements.
 - b. Align pumps with the attached piping prior to installing expansion joints.
7. A designated manufacturer's representative shall examine and validate the installation of Marlow, Armstrong, and similar large pumps.
 - a. The certification shall specifically address chemical feeder placement, proper pump alignment, the anchored supply piping, pump / motor lubrication, piping on the upstream side of the pump (with eccentric reducers), and VFD-rated electrical motor.
 - 1) Contact This Engineer for clarifications if needed.
 - 2) Refer to the Contractor's certification section herein.

B. EQUIPMENT INSTALLATION

1. Install piping and equipment within the equipment room as shown on the Drawings and as specified herein. All equipment shall be in new and pristine condition.
2. Position and install equipment per the Details indicated within the Drawings.
3. Equipment shall be installed per Manufacturer's instructions & recommendations as well as the Contract Documents (to include the Drawings & Specifications).
4. Confirm dimensions, based on actual equipment dimensions, before the start of installation.

5. Unless noted otherwise by the flow meter manufacturer, position the flow meter (and sensor probes) to be in accordance with the manufacturer's requirements and as indicated below:
 - a. located in the upper quadrant of a horizontal-located pipe
 - b. Installed with a minimum 10 pipe diameters of clear, straight-pipe distance on the upstream side (no fittings, valves, or check valves shall interfere with the required, stated clearances).
 - c. Installed with a minimum of 5 pipe diameters of clear, straight-pipe distance on the downstream side of the flow meter.
 - d. Installed with the Type 7 minimum piping.
 - e. Sized to accommodate 150% of the design flow rate.
6. Install NEMA 3R panel enclosures in equipment rooms unless otherwise noted within the Drawings.
7. Label / I.D. equipment components as specified herein.

3.05 STRAINER ASSEMBLIES EXECUTION

A. CLEARANCES

1. Provide a minimum 2 pipe diameters of largest adjacent piping size within 3 feet [0.9 M] of each strainer. Maintain this adjacent pipe clearance both upstream and downstream of each strainer.
2. Demonstrate that a full rotation of the adjacent valves closest to the strainer is possible and causes no hindrance to the routine disassembly of the strainer, cleaning of strainer basket or screen, and the viewing of the interior portions of the strainer.

3.06 FILTER SYSTEMS EXECUTION

A. GENERAL

1. Only a single pump shall provide the specified filtration flow into a single filter system.
2. Install the filters in accordance with the manufacturer's installation and operating manual.
3. Filter air compressor piping shall be stainless steel piping, tubing, & fittings and shall be securely affixed to adjacent surfaces.
 - a. Provide dielectric unions to prevent dissimilar metals from contact.
 - b. Secure the air compressor to Contractor-provided housekeeping pad
4. Ground / bond components & units including the brass / stainless piping for air compressor

B. TYPE 7 CLEAR PIPE PLACEMENTS

1. Provide a minimum length of 2 feet [0.6 M] (or 3 pipe diameters – whichever is greater) of clear Type 7 pipe on the downstream side of the filter in the following locations:
 - a. Filter pre-coat pipe
 - b. Filter waste pipe
 - c. Downstream of the flow meter (within 3 pipe diameters of the meter).

3.07 TANK & CABINET EXECUTION

A. GENERAL

1. Unless noted otherwise, each tank shall have signage indicating its contents and purpose.
2. No field penetrations are allowed.
3. Install tanks in accordance with the manufacturer's instructions.
4. Locate and position all tanks strictly as indicated within the drawings unless EME Media Feature Contractor and This Engineer expressly provides written authorization to relocate.
5. No heavy equipment shall be operated near below-grade tanks.
6. Observe the manufacturer's requirements during the installation.

B. CHEMICAL STORAGE TANK EQUIPMENT

1. Installation
 - a. Place the MSDS and a content label on each chemical storage tank. Encase the label within a waterproof, clear container for protection.
 - b. Vent each chemical tank to the atmosphere in accordance with the manufacturer's requirements. Extend vents to a location that will not expose chemical fumes to persons, materials, and equipment. The vent pipe shall be 1-inch larger than the largest pipe penetration.
 - c. Tanks may be placed inside specific chemical cabinets or inaccessible areas as certified by the manufacturer.
 - d. Secure buried chemical tanks against hydrostatic uplift pressures.
2. Field Testing
 - a. After installation, the tank shall be water tested. Fill the entire tank with water, monitor the tank and fitting connections for a minimum of 72 hours with no loss of water recorded.

3.08 CONTROLS & INSTRUMENTATION – FLOW & PRESSURE EXECUTION

A. GENERAL

1. Install gauges, sensors, & switches per manufacturer's instructions to the drawings for specified gauge, sensor, & switch types.
2. Install unions and flanges as detailed to facilitate removal.

B. GAUGES & SENSORS

1. Refer these specifications for the required identification tags for gauges.
2. Gauges, Meters, and Sensors:
 - a. Connect thermometer and flow meter electrical contactors to equipment mechanical space / chemical controller control panel.
 - b. Install the electronic sensors, digital instrumentation, and gauge mounts as detailed on the drawings.

C. INDUSTRIAL LIQUID FLOW SWITCH

1. Observe the minimum and maximum flows as determined by the manufacturer.
2. Observe the upstream and downstream minimum clear pipe space requirements as set forth by the manufacturer
3. Coordinate with the electrical installer to verify that the switch has a minimum 2-minute safety operating period prior to activating the flow switch.

3.09 CHEMICAL SYSTEMS EXECUTION

A. GENERAL

1. Equipment shall be installed per Manufacturer's instructions.
2. Label / I.D. chemical components, tubings, and hoses as specified herein.
3. Encase tubing transporting chemicals in a UV resistant, flexible chase or Type 1 piping with 90-degree sweeps.
4. Coordinate additional chemical wiring and electrical work with Electrical Documents. Install electrical interlock per manufacturer's instructions and details.
5. Install and position chemical equipment, CO2 feeders, chemical controllers and sensing devices including tubing, piping, and fittings in the pool equipment packages or rooms as indicated by the manufacturer(s), as on the Drawings, and as specified herein.
 - a. In the event of a difference in the installation requirements from the specific manufacturer and The Engineer, contact The Engineer for written clarification.
 - b. Provide with required GFCI receptacles, junction boxes, probes, sensors, saddle connectors, electrical connectors and control relays, control logic, conduits / pipe sleeves, conductors, check-valves, and rate-of-flow indicators.
 - c. The following "chemical" sanitizers and controls do not emit corrosive fumes and may be placed in the main mechanical room or space.
 - 1) Ultraviolet (UV) sanitizers equipment
6. Accurately cut / trim the connecting hoses for each chemical feeder system so that no confusion or incorrect hose attachment to improper chemical equipment would occur in the future.
 - a. Provide a minimum of 2 labels on each length of chemical tubing. Labels shall state "BROMINE" or "KMPS," or similar type wording.
7. Chemical feeder connections shall be Type 1 or braided, polyethylene tubing encased in Type 1 piping conduits / non-metallic pipe sleeves.
8. Provide chemical solution crocks marked to indicate contents. Locate and arrange as shown on Drawings
 - a. MSDS (within clear water-tight protector covers) shall be affixed to each chemical container / crock.
9. Provide chemical dilution and solution crocks with lids.
 - a. Do not puncture any chlorine / acid / or alkaline chemical crock lid.
10. Locate / position the chemical equipment that emits corrosive fumes into a separate, designated room. Air from the chemical room shall be mixed or blended with any other room.
11. Provide the total ventilation / exhausting of air from within the chemical room to be a minimum of 20x/hour or as certified by the Project's Prime MEP / HVAC consultant
12. Chemical injections are to be directly into pressure piping via the use of pipe saddles that is located after (downstream) of the main equipment locations. The water flow shall be toward the basin or reservoir tank as indicated on the Drawings.
 - a. Note: Drilling and tapping of chemical tubes directly to piping materials are disallowed. Only connections via pipe saddles are allowed.

3.10 ELECTRICAL POWER & ELECTRICAL CONTROLS EXECUTION

A. GENERAL

1. Refer to Specification Section 26 05 00 and related Sections in addition to the following.

2. Maintain a 48-inch [1.22 m] minimum, unobstructed clearance in front of each panel, motor starter, control panel, underwater lighting, automation panel, power supply, transformers, and other NEC & IEC required disconnects and switch boxes.
3. Install electrical / control wiring, including components, equipment, and materials for completely operational systems in full coordination with the selected fountain / water feature / timing controls' manufacturers and distributors to ensure complete compatibility with the logic and peculiarities for such components, electrical interlocks, automated operations, and suitable programmability.
 - a. The electrical interlock shall be provided to deactivate chemical feed systems when there is no flow in the recirculation system.
4. Install grounding and bonding for each metallic component as required by the NEC with products and materials certified for such purpose and in accordance with the requirements of the manufacturer(s). The successful grounding and bonding shall be the responsibility of the Contactor as a complete build scenario.

B. BONDING, EARTHING, AND GROUNDING INSTALLATION

1. Refer to Specification Section 26 05 00 and related Sections in addition to the following.
2. Install the bonding and grounding of electrical components located within the basins prior to any concrete work. Include equipotential bonding per the requirements of NEC 680.26 to provide compliance and these requirements.
3. Electrically bond, earth, and ground each metallic device within and around the pool basin's perimeter with a #8 solid, bare copper ground wire in accordance with the NEC requirements and local codes).
 - a. Apply 3M Scotch-cast #2135 potting kit at each grounding lug, connections to the main grounding electrode system, equipment attachment, and rebar juncture. Each ground wires' connections shall be UL listed -type or exothermic weld in compliance with NEC.
 - b. Secure required conductor under the perimeter surface 4 to 6-inches [100 mm to 150 mm] below the subgrade.
 - 1) At least one minimum 8 AWG bare solid copper conductor shall be installed.
 - c. Grounding Loop: Install one #8 solid, bare copper ground wire continuously around the pool basin and associated structures between 18 – 24-inches [455 – 610 mm] beyond the perimeter of the pool and building slab edge, buried 4 – 6-inches [100 – 150 mm] below grade. Include bonding, earthing, and grounding connectors with the central grid, verify total continuity.
 - 1) The conductors and ground loop shall follow the contour of the pool basin's perimeter surface, the contour of the building (or slab-on-grade).
 - d. Attach bonding to pool's structural reinforcing steel a minimum of four (4) points uniformly spaced around the perimeter of the pool.
 - 1) For stainless steel basins, install grounding / bonding jumpers each 6.5 feet [1.98 m] around the basin's perimeter.
 - e. Install grounding / bonding jumpers (or lugs) to lights, and other similar metallic components within the basins. Extend ground / bonding loop connection to adjacent building's main grounding electrode system.

- f. Extend ground / bonding loop connection to the pump, filter, metallic components / piping within the mechanical room and chemical equipment at each basin. Verify grounding / bonding wire conductors are securely fastened to the adjacent piping, structure, and equipment.
4. Once perimeter metallic equipment is installed, perform grounding continuity verifications via the use of audible sounding / bell ringing devices.
 - a. Achieve a successful "sounding" continuity verification between each metallic equipment item at the basin's deck edge perimeter
 - b. Achieve a successful "audible-sounding" continuity verification between each metallic equipment (at the basin's deck edge perimeter) and the metallic equipment located in the mechanical room.

C. ELECTRICAL INSTALLATION

1. CMAR shall provide the load center and main power supply. Confirm the available voltage and electrical supply with electrical engineer prior to connecting equipment.
2. Install control panel (with related componentry) in accordance with the NEC. Refer to the Specialty Designated Electrical Engineer for Drawings, schedules, and inquiries.
3. Refer to the Electrical Engineer for conduit requirements.
4. Coordinate the following with Specialty Designated Electrical Engineer:
 - a. Conduit size providing power to the various sub-panels
 - b. Conductors' quantity and sizes
 - c. Maximum / rated circuit breaker panel loads
 - d. Connectivity and full operations from all control panels.
5. Unless noted otherwise or required by the equipment manufacturer, bonding / earthing / ground wires are not to be placed within conduits
6. Refer to these specifications and the Specialty Designated Electrical Engineer for mounting material requirements and further installation procedures.

D. MOTOR STARTERS AND VFD's

1. Comply with motor starter's and VFD manufacturers' installation requirements.

E. CIRCUIT BREAKER PANELBOARDS

1. Refer to the wiring schematics for associated circuitry with Circuit Breaker Panelboards (CBP) and branch circuits shown in each panelboard schedule.
2. Identify the voltage / phase and is 60-Hz [50 Hz] on the front surface of each panel.
3. Size phase, neutral, and ground wires for the 100% amperage shown. Size conduits for the complete wire bundle consisting of 3 conductors. When multiple conductors or wire bundles are placed within the same conduit, increase the size to comply with minimum allowable space requirements per NEC, Chapter 9, and Table 3C.
4. Amperage ratings indicated on the Circuit Breaker Panel (CBP) schedule are for each circuit breaker. Size conductors for 100% of the amp rating for the overcurrent circuit breaker unless other secondary protection is specified.
5. The CBP schedule indicates the 100% -Load Amperage (FLA) rating on each circuit. Wiring and conduits shall be sized for the 100% circuit breaker rating for each branch circuit.
6. The CBP schedule identifies the (FLA) on each leg of a 3-phase circuit. On 1-phase circuits, the branch circuit shall be connected to the phase leg shown to balance the Phase loading within 10 percent.

3.11 VALVING SYSTEMS EXECUTION

A. VALVES

1. Install valves per manufacturer's instructions to the drawings for specified valve types. Install unions and flanges as detailed to facilitate removal.
2. Refer to these Specifications for the required identification tags for valves.
3. Install butterfly valves on each side of each pump and as detailed on the Drawings.
4. Check Valves:
 - a. Check valves shall be installed in accordance with the manufacturer's instructions & recommendations.
 - 1) Check valves may be installed in horizontal lines with the disk hinge pin in the vertical position or in vertical lines with the flow "up."
 - 2) Do not install check valves on vertical pipes with a downward water flow.
 - b. Install 5 pipe diameters of clear pipe space upstream and downstream of each check valve. Flow straighteners may be fitted in lieu of clear pipe space. The designation of "flow straightener" shall be determined and identified by the manufacturer of that component.

3.12 MAINTENANCE & PRE-COMMISSIONING EXECUTION

A. GENERAL IDENTIFICATION REQUIREMENTS

1. Each major item of equipment shall be identified by stenciled marking, which shall read the same as the identification shown in Mechanical or Electrical Drawings.
2. Stencil letters shall be upper-case (capital), not less than 1-inch [25 mm] high and painted with white or contrasting color Effecto Enamel.
3. Label chemical containers and crocks with minimum 2-inch [50 mm] large letters indicating the stored chemicals for each tank. Use "Black text on Orange" colors. Additionally, place warning labels (minimum 1-inch [25 mm] high lettering) instructing the proper chemical dilution methods authorized for these systems.
4. I.D. tags and labels: Use the following colors guide for labels and tags except for chemical / corrosive piping and valves:

Basin Name (use actual name of basin)	Valve Tag & Label Color Assignment
1	White text on Green tags / labels
2	Black text on White tags / labels
3	White text on Gray tags / labels
4	White text on Black tags / labels
5	Medium Blue

B. PIPING AND VALVE IDENTIFICATION

1. Main color bands in the form of pressure sensitive tape shall be placed on each pipeline-type.
 - a. Main color bands shall be 3-inches [80 mm] wide, placed at 10 feet [3.05 m] intervals along pipe runs, immediately preceding the passage of the line through a wall, ceiling, and floor, and at each equipment connection or line valve. The following piping ID colors shall be utilized:

Piping Name / Purpose	Identification Color Assignment
Suction / Gravity drain	Green
Filtered water	Light Blue
Waste / backwash	Brown
Heated	Yellow
Chilled	Medium Blue
Chemical / Corrosive Liquids	Orange

- b. Adjacent to each color band, an abbreviation of the name / purpose (as listed immediately above) of the pipe / valve function shall be placed.

- 1) Letters shall be 0.5-inch [13 mm] high upper-case, applied with pressure sensitive tape.
2. I.D. Tags specified on valves (to match the Valve ID chart).
3. Upon completion of the Work, provide one (1) copy of each laminated valve chart 18" x 24" [455mm x 610mm] sealed to the rigid backboard, placed under glass, and framed, and shall be hung by the in a conspicuous location in the equipment room.

C. PRE-COMMISSIONING

1. Prior to the commissioning events, provide, test, and confirm that control wiring connections are in communication with each other.
 - a. Includes but not limited to:
 - 1) filtration system controls
 - 2) pump controls & emergency safety cut-off system with relays
 - 3) UV sterilizer unit and controls operations
 - 4) chemical controller operations
 - 5) flow metering, level sensing / controls, wand pressure operations
2. Provide the following for the equipment mechanical spaces:
 - a. Mount valve identification charts, guides, and equipment operating instructions in laminated protective sleeves set in a stainless steel or PVC frame.
 - b. Completed installation of ID labels, placards, ID bands on each component (i.e.: valves, check valves, pumps, filters, strainers, and chemical components).
3. Chemical system operations to be completed

D. ROUTINE CARE AND CLEANING

1. Routinely wipe down the surface finishes of each major component within the equipment room.
2. Maintain surfaces finishes being pristine, easily maintainable, free of dirt, dust, and other miscellaneous debris.
3. Care of Stainless Steel:
 - a. Weekly lightly polish the exposed stainless-steel surfaces with a mild coating of clear Mineral Oil (or similar product) to maintain these finishes and surfaces in a pristine condition.
 - b. To remove light scratches from the stainless steel, hand-buff the stainless with flour to lightly scour the surfaces. Eliminate the flour with a damp cloth and then a dry cloth. Finally, then apply the oil mentioned above.

- c. Basis of design: Johnson's Baby Oil, high-grade olive oil, or similar equivalent products.

3.13 MISCELLANEOUS EXECUTION ACTIVITIES

A. WATER LEVEL CONTROL SYSTEMS

1. Provide water level control systems as specified in 2.16, Manufacturer's Instructions, and as follows.
 - a. Install potable water service to the Mechanical Equipment Room or Area as specified. Fit with isolation valve and backflow preventer.
 - b. Install potable water supply manifold to each static line location.
 - 1) Provide valving for a manual and automated fill operations as detailed.
 - c. Adjust water level control device only after water flow adjustments to subsystems have been completed.
 - d. Label / I.D. water-fill components as specified herein.

B. EQUIPMENT SPARE PARTS

1. Obtain a signed receipt from the Owner and copy This Engineer for spare parts and attic stock deliveries turned over to the Owner.
2. Mount / hang or store the spare parts within the equipment room, or plastic shelving or wall-mounted on a pegboard covered wall space.
 - a. Small spare parts shall be placed in a clear, sealable bag or container with a printed description of its contents.

3.14 TESTING, STARTING, & COMMISSIONING OF SYSTEMS

A. PIPING TEST

1. Refer to these Specifications for hydrostatic test (water pressure testing) requirements for the water piping systems.
2. Refer to these Specifications for test (air pressure testing) requirements for only compressed air piping systems.
 - a. Critical: NO air pressure testing is allowed on water piping systems.

B. ADJUSTMENTS

1. Continue to adjust and regulate the system under actual operating conditions until specified water quality levels are achieved and can be maintained.
2. Adjust as required to assure water flow rates are attained.

C. CONCEALMENT

1. No piping work, fixtures, or equipment shall be concealed or covered by any means before they have been successfully water pressure tested, flow tested, and inspected by the local governmental authority having the authority and observed by one of the following:
 - a. Architect
 - b. Engineer
2. Work shall be installed and tested as required by These Specifications and the code requirements and shall be leak tight before a governmental inspection of the work stage requested.
 - a. If leaks are discovered, make repairs and re-test.

D. BASIN & PIPE FILLING

1. Do not fill basins until structural curing times and 28-day strengths of the basins and the below list have been achieved. This is applicable to:
 - a. Basin structural basin
 - b. Stone adhesive and grouting products
 - c. Contraction and expansion joint materials and fillers
 - d. Similar products
2. The filling, start-up, and water chemistry implementation of the pool shall be in accordance with the written procedures within the book, "POOL SURFACES - PROBLEMS AND SOLUTIONS," 7th Edition, by Techlines, Inc. and Randy Dukes.

E. COMMISSIONING & OPERATION OF EQUIPMENT

1. Coordinate the initial startup and operational period, installation, electrical, commissioning, and chemical completion activities.
 - a. Oversee, perform, adjust, and supervise the operation of the equipment and be responsible for the proper functioning thereof.
 - b. Make such changes, adjustments, or replacements of equipment as required for compliance with the Contract Documents.
 - c. Replace equipment, materials, & parts found to be defective.

F. CHEMICAL ADDITION / WATER TREATMENT

1. Maintain water within the newly filled basin with a pH of 7.2 for a minimum of 3 days (with regular brushing at least twice daily of the entire pool surface) prior to adding pre-diluted bromine.
2. Provide daily service (including specified chemicals and filter media) for the basin until the governing regulatory agency has issued a temporary operating permit or Owner's acceptance, whichever comes first.
3. Notify the Architect and This Engineer of System Startup forty-eight (48) hours in advance. Before startup, corroborate sub-systems and safety features (including electrical circuit protection) have been tested and operate within parameters of the Contract Documents.
4. Chemical Operational Parameters: Attain and maintain the following chemical operational parameters at the time of startup, thru the 90-day maintenance period, and Substantial Completion.

	DISINFECTANT LEVELS	MIN.	IDEAL	MAX.
a.	Pool Free Bromine, ppm [mg/L]	2.0	3.0	4.0
b.	Combined Avail. Bromine, ppm [mg/L]	0.0	0.0	0.4
c.	Total Available Bromine, ppm [mg/L]	2.0	3.0	4.4
d.	pH	7.4	7.5	7.6
e.	Total Alkalinity, ppm [mg/L]	80	100-120	130
f.	Total Dissolved Solids, ppm [mg/L]	0	0	1200
g.	Calcium Hardness, ppm [mg/L]	200	250	300
h.	Copper, Silver, Iron ppm [mg/L]	0	0	0.1
i.	Cyanuric Acid (Stabilizer), ppm [mg/L]	0	0	0
j.	Potassium Monopersulfate (Purolyte), ppm [mg/L]	0	0	12

5. Provide a balanced water quality via the implementation of the "Langelier Saturation Index" (LSI). The LSI shall be maintained between 0.0 and +0.3.
6. UV Equipment Commissioning:
 - a. Commissioning by a qualified factory trained technician is a prerequisite to a warranty-issuance for the Ultraviolet Chamber and Control Panel.
 - b. Supervise installation of the electrical and control cabling connections.
 - c. Provide training for the daily operation and maintenance during the commissioning process. Video training session. Submit the recording per Division 01.
 - d. Demonstrate the operation of the UV sanitizer including controls to de-activate the filtration pump(s).

G. OPERATIONS & MAINTENANCE INSTRUCTION

1. Provide experienced pool operator-instruction by a certified pool operator.
2. Instructions shall be provided for each operating pool shift. Each shift's instructions shall be for a period of not less than three (3) days (two (2) full day's operations and start-up, and one (1) full day shut-down assistance) after the pool has been filled and initially placed into operation.
 - a. During these periods, the Owner's designated representative(s) for operating shifts shall be thoroughly instructed in phases of the pool's operation, including start-up, emptying, and winterizing procedures.
 - b. Prior to this instructor leaving the site, the instructor shall obtain written certification from the Owner's designated representative acknowledging that the instruction periods have been completed and necessary operating information was provided.
3. Provide a DVD documenting training and operational requirements, including start-up, filtration operations, chemical handling operations, emptying, and winterizing procedures.

H. CLEAN-UP AND PROTECTION

1. After work of Section 13 12100 has been completed, clean-up work areas and remove equipment, excess materials, and debris. Protect pool(s) from damage until substantial completion. Remove and replace equipment, finishes, and materials that are chipped, cracked, abraded, improperly adhered, otherwise damaged, or deemed unacceptable by This Engineer.

I. MANUFACTURER CERTIFICATES OF INSTALLATION

1. Obtain written manufacturer's installation certificates stating the manufactured equipment is installed in accordance and compliance with the manufacturers' instructions & recommendations and Contract Documents.
2. The following minimum listing of equipment shall have manufacturer's certifications:
 - a. Strainers
 - b. Pumps
 - c. Chemical feeders
 - d. Chemical controllers
3. The Contractor shall certify the following minimum listing of materials:
 - a. Field-installed non-slip surfaces (for certified slip-resistance)

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C PHASE 1 (WS113)

EME - FOUNTAINS
SECTION 13 12 00

END OF SECTION 13 12 00

SECTION 13 46 00 - TRANSPARENT BULLET RESISTANT 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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Transparent Bullet Resistant System.

1.3 REFERENCE STANDARDS

- A. Underwriters Laboratories: UL 752 – Standard for Bullet Resisting Equipment.
- B. NIJ Standard 0108.01 – (National Institute of Justice) Standard for Ballistic Resistant Protective Materials.
- C. STM A 666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Strip, Plate and Flat Bar.
- D. ASTM B 209/B 209M – Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

1.4 SUBMITTALS

- A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.
- B. Shop drawings: Submit for fabrication and installation of Barrier System. Include details, elevations and installation requirement of finish hardware and cleaning.
- C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each component of the Bullet Resistant Assembly through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver Bullet Resistant Assembly crated to provide protection during transit and job storage.

- B. Inspect Bullet Resistant Assembly upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
- C. Store Bullet Resistant Assembly at building site under cover in dry location.

1.7 PROJECT CONDITIONS

- A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.8 WARRANTY

- A. All material and workmanship shall be warranted against defects for a period of one (1) year from the date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design: Subject to compliance with requirements, provide products manufactured by C.R. Laurence Co., Inc. (CRL) or comparable approved product meeting all requirements including sustainability requirements.
 - 1. Refer to Sections 01 2500 "Substitution Procedures" and 01 6000 "Product Requirements" for comparable product requirements.

2.2 MATERIALS

- A. Aluminum
 - 1. All aluminum used to manufacture frames, channel, anchors, and accessories shall meet the following requirements:
 - a. Aluminum: ASTM B221, alloy 6105-T5 and 6063-T5 for extrusions.
 - b. All exposed aluminum shall have clean cut edges with no burrs, exposed corners shall be rounded and sanded.
 - 2. Finish: Clear Anodized
- B. Stainless Steel
 - 1. All stainless steel used to manufacture deal trays, countertops, anchors, clamps and accessories shall meet the following requirement:
 - a. ASTM A 666 – Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Strip, Plate and Flat Bar.
- C. Bullet Resistant Glazing
 - 1. UL Standard 752, Level 3 all glass unit consisting of multiple layers of glass and polyvinyl butyral (PVB).
 - 2. Transparent (One Way) Mirror Glass.
 - 3. Glazing shall have all edges sanded and polished to a clear finish.

2.3 GLAZING CHANNEL AND CLAMPS

13 46 00 - 2

- A. Glazing shall be secured partition walls with U-channel.
- B. All anchorage shall meet the Federal, State and Local ordinances and local codes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to verify that locations to receive anchors have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. System shall be installed plumb, level, rigid and in true alignment.
- B. Installation shall follow strictly in accordance with manufacturers recommendations and drawings. Any deviation may void warranties and product ratings. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.
- C. System shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance. System shall be adjusted to maintain perimeter clearances as specified in drawings. Shimming shall be performed by the installer as needed to assure the proper clearances are achieved.

3.3 CLEANING

- A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.4 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that the Transparent Bullet Resistant Barrier System does not incur any damage or deterioration at the time of acceptance.

END OF SECTION 13 46 00

SECTION 13 47 13 - CATHODIC PROTECTION SYSTEM

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 including sustainability requirements, apply to this Section.

1.2 SUMMARY

- A. This Section covers the requirements for designing, furnishing, installing, and testing a complete cathodic protection system for underground fuel system piping.
- B. It is the intent of these Technical Specifications that the Contractor engages the services of a Cathodic Protection Specialist to prepare the design and direct the installation of the cathodic protection system.

1.3 SCOPE

- A. The Contractor shall furnish all labor, equipment and materials to design and provide a sacrificial anode cathodic protection system to protect all underground fuel piping installed under this Contract from corrosion. This shall include, but not necessarily be limited to, furnishing and installing all anodes, anode test stations, reference electrodes, wire and incidental items, and performing check out testing and providing written reports. The Contractor shall submit signed and sealed engineering drawings and detailed engineering specifications for the proposed system prepared by a Florida PE.
- B. The Contractor shall engage the services of a corrosion specialist, certified by NACE International, subject to approval by the Owner's Authorized Representative, to supervise the installation and testing of the specified cathodic protection system in connection with the jet fuel piping system installed under this Contract and as specified and shown on the Plans.
- C. The Contractor shall be responsible for the design, installation, performance testing and certification of all the cathodic protection work performed under this Contract.
- D. Cathodic protection shall be provided by means of a sufficient number and size of connected sacrificial magnesium anodes to provide a not less than 30 year protection period before external corrosion may begin to occur.

1.4 APPLICABLE CODES AND STANDARDS

- A. The work shall be performed in accordance with the latest requirements of laws and codes governing this work, including but not limited to:

1. National, State and Local Laws, Regulations and Codes.
2. National Electrical Code (NEC).
3. U.S. Department of Transportation Regulations for the transportation of liquids by pipeline: Parts 180 and 195, Title 49 of the Code of Federal Regulations (DOT).
4. NACE International - NACE Standard RP0169-96, Recommended Practice - Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
5. National Electric Safety Code.

1.5 CATHODIC PROTECTION SYSTEM SPECIALIST QUALIFICATIONS

- A. The Cathodic Protection System Specialist shall be a firm regularly involved in corrosion control work on aircraft fueling systems on a full-time basis for a period of at least five (5) years, and shall submit to the Owner's Authorized Representative, before commencement of the work, the names and addresses of at least ten (10) clients for whom he has satisfactorily performed cathodic protection services of a nature similar to the work proposed to be performed under this Contract.
- B. That portion of the work, which involves the installation of the cathodic protection system and the testing thereof, shall be performed under the direct supervision of the certified corrosion specialist.
- C. An approved Cathodic Protection Specialist for this project is: Craig Meier, Corrosion Control Incorporated, 494 Fairplay Street, Rutledge, Georgia 30663, Phone 706-557-9624.

1.6 ACTION SUBMITTALS

- A. Installer's Qualifications: Verification of the cathodic protection installer's work experience and certification of the corrosion specialist shall be submitted in writing to the Owner's Authorized Representative for approval prior to commencement of the work.
- B. The Contractor shall submit ten (10) copies each of shop drawings and catalog cuts covering the following material:
 1. Chemical composition of anodes and lead wire material,
 2. Anode weight and total weight of anode package including backfill material.
 3. Reference electrode and lead wire material.
 4. Welding, coating and priming materials.
 5. Test station, shunt size and lead wire material.
 6. Electrical Isolation materials.

- C. After the installation is completed, the cathodic protection system shall be inspected and tested by the certified corrosion specialist provided by and at the expense of the Contractor. Tests shall be performed by taking pipe-to-soil potentials and anode current outputs at representative locations. Any deficiencies in the performance of the system revealed by the testing shall be corrected and retested until the system is performing as required herein. At the completion of the testing, the Contractor shall provide certification(s) issued by the corrosion specialist certifying that the system is capable of performing to the full extent meeting the requirements of these Specifications. The Contractor shall submit to the Owner's Authorized Representative six (6) certified copies of the final report, including all data and analysis provided by the corrosion specialist, and "As-built" drawings of the installation. Such submittal shall show the accurate location of each test station and anode, pipe-to-soil potentials and anode output currents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall be the latest design, in new condition and the first quality standard product of manufacturers regularly engaged in the production of such materials. All materials shall be compatible and, where possible, be the product of one manufacturer.

2.2 ANODES

- A. Anodes shall be prepackaged magnesium high current output type, Maxmag or approved equal, each containing 40 pounds of galvanic (sacrificial) anode and having the following chemical composition:

Aluminum	0.003% Maximum
Manganese	0.8% Maximum
Zinc	0.002% Maximum
Silicon	0.002% Maximum
Copper	0.001 Maximum
Nickel	0.001% Maximum
Iron	0.025% Maximum
Other Impurities	0.005% Maximum
Magnesium	Remainder

- B. All galvanic anodes shall measure 3" x 3" x 60" (nominal size) and shall be cast with a perforated galvanized steel core. The weight of the core shall not exceed 0.10 pound per foot. One end of the anode shall be recessed so that one end of the strap

is accessible for lead wire connection.

- C. The anode lead wire shall be fifteen (15) feet minimum in length and shall be No. 10 AWG 19 strand copper wire with Type THWN insulation, red in color. The lead wire shall be connected to the core with silver solder. The connection shall be mechanically secured before soldering, and shall have at least one and one-half turns of wire at the connection. The entire connection shall be insulated to a 600 volt rating by filling the anode recess with an electrical sealing compound.
- D. The galvanic anodes shall be packaged in a permeable cloth bag 6 inches diameter by 64 inches long, with inert backfill material, containing not less than a 65-pound mixture of:

Ground Hydrated Gypsum	75%
Powdered Wyoming Bentonite	20%
Anhydrous Sodium Sulphate	5%

- E. Backfill shall have a grain size such that 100% is capable of passing through 20 mesh screen and 50% through a 100 mesh screen. The mixture shall be firmly packaged around the magnesium anode within the cloth bag by means of adequate vibration so that the magnesium anode is completely surrounded with a minimum ½ inch of backfill material. The combined weight of the anode including backfill and sacrificial galvanic anode materials shall be not less than 105 pounds.

2.3 ANODE TEST STATIONS AND REFERENCE ELECTRODES

- A. Anode test stations shall have a cast iron head capable of withstanding a minimum average load of 250 P.S.I., 8 inches in diameter, stamped yellow with "CP-Test" with a 6 inch O.D. by 24 inches long, non-metallic conduit, Model 668 with locking lid, as manufactured by C.P. Test Services, Inc. or approved equal. All anode test stations shall provide 7 terminals with nickel-plated brass hardware.
- B. A shunting bar shall be furnished for each test station.
- C. Each anode test station shall be provided with a 1 inch wide by 2-inch long 316 stainless steel tag. This tag shall have the test station number and associated structure stamped into the metal. Attach tag to anode lead wire inside test station.
- D. Copper to copper sulfate reference electrodes shall be of the permanent type designed for a 30 year life and an accuracy of ± 5 MV, and shall be Model UL-CUG-SW as manufactured by Electrochemical Devices, Inc., or approved equal. It shall be packaged in a cloth bag containing special low resistivity backfill.
- E. The lead wire shall be 50 foot long; No. 14 AWG stranded copper wire with

HMWPE (High Molecular Weight Polyethylene) insulation, black in color.

- F. All lead wire connections to the anode test station terminal block shall be made using appropriately sized, tinned solid copper, ring tongue, solder less crimp-type connectors, Burndy "HYLUG" type YAV, or approved equal.
- G. Lead wire connections from the anode test station terminal block to the pipelines shall be No. 10 AWG 19 strand copper wire with RHW-USE insulation, black in color.

2.4 MONOLITHIC ISOLATING JOINTS

- A. Monolithic isolating joints shall be used to electrically separate the existing piping system from the new double-walled piping installed under this project. The monolithic isolating joint shall be manufactured of API 5 L grade B or X grade steel to match the adjacent piping diameter and wall thickness. The monolithic joint shall consist of two pipe pups and a forged or pipe steel body that is assembled and welded under a compression load. Isolation shall be accomplished by means of two G-10 or G-11 rings. A double pressure-sealing system consisting of nitrile rubber or silicone rubber forming a positive pressure seal shall be incorporated within the body of the isolating joint. A dielectric filler material shall be used between the isolating rings and in the external gap between the body and pipe pup of the joint. All monolithic isolating joints shall be pressure tested to 150% of the operating pressure and dielectrically tested at the factory.

PART 3 - EXECUTION

3.1 ANODES

- A. Anodes shall be installed as and where shown on the Plans.
- B. The cathodic protection system shall be installed prior to placing any fuel through the pipeline and the protective coating shall be repaired prior to testing the pipe as specified in SECTION 33 52 46.
- C. The Contractor shall install the anodes in a vertical position as shown on the Plans. The anode shall, unless otherwise shown on the Plans, be located below the pipe at a distance between the top of the anode and the bottom of the pipe of not less than 3 feet.
- D. Excavate hole to minimum 2 inches larger than the packaged anode diameter, to the depth indicated.
- E. Anode lead wire shall be installed in a trench; the lead wire shall be installed at a depth of not less than 24 inches. The trench bottom shall be smooth. Excavation and backfilling shall be as specified elsewhere in the Technical Specifications.
- F. The Contractor shall not lift or support the anode by the lead wire. Exercise care to

prevent damage to cloth bag or lead wire insulation.

- G. Center the packaged anode in the hole and backfill with clean native natural sand soil materials in layers not exceeding 6 inches deep. Carefully tamp each layer to properly compact the backfill. When the backfill is level with the top of the anode, pour not less than five (5) gallons of water into the hole. The backfill material shall be completely saturated. Add additional backfilling material as necessary to compensate for soil shrinkage.
- H. The Contractor shall connect the anode's lead wire to the pipe on the topside after the pipe has been cleaned to bare metal by scraping, filing or other approved means. Connection of lead wires to underground pipe shall be made using a thermite brazing method applied in strict accordance with the manufacturer's published instructions and recommended procedures, and as shown on the Plans. Thermite brazing shall be accomplished using Cadweld CA-15 cartridges, or approved equal. The connection area shall be primed with Royston No. 747 primer and covered with a Royston "Handy Cap", installed in accordance with the manufacturer's written instructions, and as shown on the Plans. Any damaged pipe coating, including its outer wrapping, shall be repaired as specified in SECTION 33 52 46.
- I. Place a 3-inch layer of select bedding material around lead wire in the trench. This select bedding material shall be clean native natural sand soil material obtained from the trench excavation in the immediate area only and shall be 100% passing No. 16 ASTM sieve. Carefully center lead wire in trench. Backfill over the wire, using select backfill material, shall be placed in layers not exceeding six inches deep and each layer thoroughly compacted. Tree roots, wood scrap, organic matter and refuse shall not be allowed in the backfill. Exercise care to avoid damaging the lead wire or its connections.
- J. The anodes may only be installed horizontally if such installation is specifically shown on the Plans or directed by the Owner's Authorized Representative in writing.

3.2 ANODE TEST STATIONS AND REFERENCE ELECTRODES

- A. Anode test stations shall be installed as and where shown on the Plans, complete with prepackaged copper-to-copper sulfate permanent reference electrode and anode.
- B. All permanent reference electrodes shall be installed horizontally in native soil, 6 inches below the bottom of the pipe and a minimum of 20 feet to the closest anode. The reference electrodes shall be backfilled with clean native natural sand soil material in layers not exceeding 6 inches deep. Backfill material shall be obtained from the trench excavation in the immediate area only and shall be 100% passing No. 16 ASTM sieve. Carefully tamp each layer to properly compact the backfill. When the backfill is level with the top of the reference electrode, pour not less than five gallons of water into the hole. The backfill material shall be completely saturated. Add additional backfill material as necessary to compensate for soil shrinkage.
- C. The Contractor shall install anode test stations in pavement or in concrete pads, as

shown on the Plans.

- D. Lead wire connections from the anode test station terminal block to the pipelines shall be as described under paragraph 3.1H above.
- E. Lead wire connections from the pipelines to the anode test station terminal block shall be shown on the Plans.
- F. Lead wire connectors as described under paragraph 2.3F above, shall be installed using the proper crimping tools and in strict accordance with the manufacturer's instructions.

3.3 ENERGIZING AND TESTING

- A. The Contractor shall notify the Owner's Authorized Representative at least one week in advance of the test to permit arrangements for the presence of the Owner's Authorized Representative and/or airline representatives to witness such tests.
- B. After installation of the cathodic protection system the entire system shall be tested by the corrosion specialist, in accordance with the recommended procedures of NACE International, to assure its proper operation.
- C. Testing shall include a determination of proper operation of anodes at all test stations and adequacy of test stations and insulating joints. Testing shall also include measurement of galvanic anode current output, measurement of pipe-to-soil potential and all tests deemed necessary to verify proper operation of the cathodic protection system.
- D. Upon completion of the tests, the corrosion specialist shall submit six (6) copies of the detailed report to the Owner's Authorized Representative recording and describing test results and deficiencies detected. Any and all deficiencies shall be corrected by and at the expense of the Contractor and retested prior to final acceptance.
- E. When directed by the Owner's Authorized Representative, interference tests shall be conducted by the Contractor's corrosion specialist, on structures and utilities not connected to the cathodic protection system and located within 25 feet of the fuel piping system.

3.4 TESTING OF INSULATED FLANGES AND JOINTS

- A. Each insulating flange and joint assembly shall be tested with an approved ohmmeter.
- B. Ohmmeter used shall have at least 20 megohms, full-scale deflection when using the meter's highest direct current (DC) resistance multiplier setting.
- C. Ohmmeter tests shall be made when flange assembly is dry using the highest multiplier setting and shall indicate infinity measured between each stud and both flanges.
- D. Each insulating flange assembly shall be field tested after installation and shall be tested not higher than the manufacturer's recommended voltage.

3.5 ISOLATION OF CONDUITS AND OTHER POTENTIAL LOCATIONS FOR SHORTS

- A. Provide isolation of conduits and other metallic components to remove any possible path of shorting the cathodic protection system to ground.

END OF SECTION 13 47 13

**SPECIFICATION FOR
ELEVATOR, ESCALATOR MAINTENANCE AND REPAIR**

Table of Contents

PART ONE – GENERAL

- 1.1 Scope of Work
- 1.2 Definitions and Referenced Documents
- 1.3 Regulations
- 1.4 Work Hours
- 1.5 Contractor's Personnel
- 1.6 Identification and Access Requirement
- 1.7 Emergency Response
- 1.8 Items Provided by the Authority
- 1.9 Tools and Equipment
- 1.10 Communication and Equipment Monitoring
- 1.11 Warranty

PART TWO – PRODUCTS

- 2.1 Parts-Inventory – Supplies
- 2.2 Lubricants – Oil Analysis
- 2.3 New and/or Refurbished Equipment, or Equipment Removed from Service

PART THREE – EXECUTION

- 3.1 Performance Requirements
- 3.2 Equipment Monitoring Requirements Lift-Net and Talk-A-Phone
- 3.3 System Maintenance Requirements
- 3.4 Maintenance Schedules
- 3.5 Additional Work
- 3.6 Records Management and Reporting Requirements
- 3.7 Use of Premises
- 3.8 Safety and Protection

SPECIFICATION

PART 1 - GENERAL

1.1. SCOPE OF WORK:

- 1.1.1. The Contractor shall provide all labor, supervision, materials, repair parts, supplies, tools, diagnostic equipment, manuals/schematics and any and all other items and services necessary or proper for, or incidental to, performing twenty-four (24) hours per day, seven (7) days per week, on-site maintenance and repair for elevators and escalators located at the Orlando International Airport South Terminal C, Phase 1 (STC-P1) including Parking Garage C-Phase 2, Ground Transportation Facility, Airside Concourse and Landside Terminal, (Reference Construction Documents for those Projects) and other South Airport Complex units as may be amended from time to time. The Contractor shall provide and maintain an on-site inventory of spare parts (Attachment C, to be approved by the Authority as a condition of Substantial Completion of the initial construction subcontract before the Effective Date of this Contract), and as necessary complete the testing/witnessing in accordance with the testing schedule (Attachment D, to be approved by the Authority as a condition of Substantial Completion of the initial construction subcontract, before the Effective Date of this Contract) and shall maintain the elevator/escalator monitoring system (LiftNet) at the Orlando International Airport ("OIA") STC-P1 in accordance with the Specification.
- 1.1.2. The Contractor's work obligations ("Work") with respect to the equipment identified herein, and all replacements and additions thereto (the "Equipment"), shall include at no additional cost to the Authority (except when such repair or parts replacement is required due to Vandalism or Third-Party **damage**), the following items and services:
 - 1.1.2.1. Scheduled and preventative maintenance, including inspecting, testing, adjusting, lubricating, repairing, cleaning, cosmetic touch-up, and the replacement of expendable/consumable parts in accordance with the schedule for this Work,
 - 1.1.2.2. Unscheduled repairs and/or parts replacement as required to identify and remedy failures/malfunctions,
 - 1.1.2.3. Scheduled overhaul/refurbishment of equipment and components,
 - 1.1.2.4. Safety and code compliance testing, including repairs and adjustments necessary for code compliance as identified by the Authority's elevator safety code inspection service/contractor, including providing all necessary test equipment (i.e. test weights, pressure gauges, skirt indexing tools, ladders, etc.) as necessary to complete the testing/witnessing, in accordance with the testing schedule (Attachment D) (),
 - 1.1.2.5. Replenishing/maintaining of spare parts, materials, and supply inventories,
 - 1.1.2.6. Providing and updating maintenance reports, daily logs, status reports, and safety/code testing schedules including state re-inspection reports,
 - 1.1.2.7. Updating and maintaining Equipment Operating and Maintenance (O&M) manuals,
 - 1.1.2.8. Tracking of manufacturer software/control/logic updates, and installing those software or controls/logic updates when recommended or required by the equipment

manufacturer to increase or improve safety or to remedy problems/bugs.

- 1.1.2.9. Repairing and replacing parts resulting from vandalism or Third-party damage, (for additional compensation when approved by the AAR) in accordance with the Additional Work provisions described in sub-part 3.5,
- 1.1.2.10. Housekeeping in Work and Storage areas to include but not limited to cleaning of machine rooms, pit areas, drip pans, hoist ways and car tops.
- 1.1.2.11. Machine room, elevator/escalator pit, and elevator cab, light bulb replacement,
- 1.1.2.12. Maintenance, repair and replacement of sump pumps wherever located (excluding plumbing and electrical outside of the pit),
- 1.1.2.13. Maintenance and repair of the LIFTNET monitoring system and those related control components directly connected from the monitored unit to the applicable LIFTNET controller interface device and computer server.
- 1.1.2.14. The repair and replacement of all elevator emergency communication devices (i.e. Talk-A-Phone).
- 1.1.2.15. Assisting/escorting the Elevator Safety Inspector/Contractor as necessary to perform the A17 safety inspections of the equipment per the schedule shown in Attachment to be developed,
- 1.1.2.16. Maintenance and repair of all elevator cab air conditioning units,
- 1.1.2.17. Any and all other repairs and maintenance, except as described in Section 1.1.3 below, necessary to keep equipment in good operating condition.
- 1.1.3. Exclusions - The Authority will not hold the Contractor responsible for the maintenance or repair of the following items:
 - 1.1.3.1. Electrical wiring feeders, switches and fuses or breakers to the equipment controller(s),
 - 1.1.3.2. The buried portion of hydraulic cylinders, casing, piping, and conduit,
 - 1.1.3.3. Machine room and elevator/escalator pit lighting fixtures or ballast,
 - 1.1.3.4. Smoke detectors and heat sensors,
 - 1.1.3.5. Cleaning of the elevator car interior and exposed sills,
 - 1.1.3.6. Cleaning of escalator balustrades, decking, steps, or handrails,
 - 1.1.3.7. Emergency power plant and associated switchgear,
 - 1.1.3.8. Elevator Pit sump pumps and related plumbing and wiring (except those sump pumps installed in tunnel level escalator and moving walk pits).
 - 1.1.3.9. The Authority's network portion of the LIFTNET monitoring system located between the airport's server communication rooms and the applicable network interface device in the machine room, escalator, or moving walk pit. Contractor is responsible for the cabling, connections, and LiftNet-to-Equipment interface cards located in the machine rooms and/or equipment controller cabinets.
- 1.1.4. The obligations of the Contractor to perform the Work are absolute and shall not be limited by a lack of knowledge on the part of the Contractor or the Authority that work is needed with respect to any equipment.

1.2. DEFINITIONS AND REFERENCED DOCUMENTS

Definitions:

- 1.2.1. Entrapment: a reported stoppage of an elevator, due to malfunction of the elevator equipment, while a passenger(s) is on-board. The malfunction is also considered an Entrapment even if a passenger(s) is not present when the elevator technician arrives, provided that an entrapment (i.e. elevator phone) is reported and the elevator is found to be malfunctioning.
- 1.2.2. Equipment or Unit: may be used interchangeably and refers to the Elevators, Escalators, and/or the Wheelchair Lift covered under by this Contract.
- 1.2.3. Maintenance: The normal "scheduled" preventative action taken to ensure the continuous, trouble-free, efficient, and safe operation of the Equipment. This includes inspection, testing, lubrication, and cleaning, adjusting, and the periodic replacement of parts as recommended by the original Equipment manufacturer.
- 1.2.4. Repair: The corrective action taken, through the replacement of parts and/or components, for the purpose of restoring, or reestablishing the level of safety, operation, design, and/or performance characteristics, as determined by the original Equipment manufacturer, applicable code requirement, or the Authority.
- 1.2.5. ROA: reported entrapments where the unit is running when the mechanic arrives and there is no indication that an entrapment has occurred and no apparent Equipment malfunction (i.e. false alarm).
- 1.2.6. Third-Party damage: Damage caused by severe weather (**e.g.** lightning, flooding, hurricanes), electrical feed malfunctions or interruptions, communication interruptions, damages caused by other contractors (i.e. construction projects, custodial, etc.) and/or other system/building failures that directly or indirectly effect the operation of the Equipment, and which are beyond the control of the Elevator Contractor. Electrical malfunctions (surges, spikes, etc.) will not be considered Third Party damage if there are no visible indications or residual markings (i.e. burn marks) on the damaged component or other independent means to verify that the cause of the damage was electrical. The AAR shall make the determination if a cause is not readily apparent.
- 1.2.7. Vandalism: The intentional or willful destruction or damage of property or Equipment. This shall be evident by the parties' inspection and/or reasonable conclusion. This term also includes misuse and abuse which is described as the damage due to the unintentional misapplication, or improper use of Equipment as determined by the original Equipment manufacturer's design and application intent, and which is not caused by the Contractor's acts or omissions. The AAR shall make the determination if a cause is not readily apparent.
- 1.2.8. LIFTNET: A non-proprietary interactive monitoring system developed by Integrated Display Systems (IDS) to monitor and manage the airport's elevators, escalators and moving walkway equipment.
- 1.2.9. Elevator Mechanic or Elevator Constructor Mechanic ("Mechanic"): also known as a Certified Elevator Technician, is a natural person registered with and authorized by the Florida Department of Professional Regulation, under the license category "Elevator Safety" to construct, install, maintain, or repair any vertical conveyance, after

having been issued an elevator certificate of competency by the division. Each certified elevator technician must annually register with the division and be covered by general liability insurance coverage in the minimum amounts set by the division.

- 1.2.10. Elevator Helper or Elevator Constructor Helper ("Helper"): A natural person performing work under the direct supervision of an elevator certificate of competency holder to construct, install, maintain, or repair any vertical conveyance.
- 1.2.11. Elevator Constructor Apprentice: A natural person performing work under the direct supervision of an elevator certificate of competency holder to construct, install, maintain, or repair any vertical conveyance. An Elevator Apprentice may be designated/classified as an Apprentice First-Year, Second-Year, Third-Year or Fourth-Year Apprentice but under no circumstances will be a Probationary Apprentice be considered an Elevator Apprentice to be compliant with the terms of this contract.
- 1.2.12. Foreman, Supervisor, Mechanic-In-Charge: these terms are used interchangeably to refer to the senior Elevator Mechanic who is responsible for coordinating the work efforts of the Elevator Mechanics and Helpers. This person assigns work schedules/tasks, ensures the parts inventory is maintained, provides quality control/oversight of completed work, and provides technical assistance to the Elevator Mechanics and Helpers.
- 1.2.13. Prorata: Prorata amount is when a new elevator, escalator, or moving walk is installed in the middle of the month. The Authority will pay Contractor ½ of the maintenance amount for that type of equipment as described on the Bid Form. Additional language in the Specification Section 2.3.2 states if existing equipment is removed from service at Authority's discretion (i.e. construction in area prevents escalator use) the maintenance of the unit will continue to be paid if the total time the equipment is out of service is less than 30 days.
- 1.2.14. References
 - American Standard Safety Code for Elevators and Escalators
 - Americans with Disabilities Act (ADA)
 - ASME A17.1, A17.2, A17.5 Safety Code for Elevators and Escalators
 - ASME Standards and Inspector's Manual
 - Florida Elevator Code: (Chapter 61C-5)
 - Florida Statutes (Section 212.08 – Sales Tax)
 - Greater Orlando Aviation Authority Comprehensive Security Plan
 - Greater Orlando Aviation Authority Emergency Procedures
 - National Elevator Industry Field Employees' Safety Handbook
 - Southern Building Code, Section 506
 - State of Florida, Department of Insurance, Division of State Fire Marshal, Chapter 4A47 Uniform Fire Safety Standards for Elevators

1.3. REGULATIONS:

- 1.3.1. The Contractor shall comply with all applicable Federal, State and local laws, ordinances, rules and regulations pertaining to the performance of the work specified herein.
- 1.3.2. The Contractor shall obtain all permits, licenses and certificates, or any such approvals

of plans or specifications as may be required by Federal, State and local laws, ordinances, rules and regulations, for the proper execution of the work specified herein.

- 1.3.3. Contractor shall comply with Federal and State right-to-know laws if hazardous materials are used. The MSDS (Materials and Safety Data Sheets) shall be made available to all workers and Authority's representatives. Contractor shall report immediately to the AAR any spillage or dumping of hazardous materials on Authority property. The Contractor shall also be responsible for the cleanup and any costs incurred for all such incidents.
- 1.3.4. During the performance of this Contract, Contractor shall keep current and, if requested by the Authority, provide copies of any and all licenses, registrations or permits required by applicable governing agencies. Contractor shall keep a copy of any and all licenses, registrations and permits on the job site while performing the Contract work.

1.4. WORK HOURS:

- 1.4.1. On all passenger elevators and escalators, preventative maintenance and repairs are to be performed during the second or third shifts (1500 -2330 or 2300 – 0700 hours respectively) so as not to interfere with, or delay the operations of the Authority or tenants. Attachment "A" to be developed by the AAR and Contractor will list the specific units and the work shifts for the preventative maintenance and repairs. The AAR may approve or require when repairs are to be conducted.

1.5. CONTRACTOR'S PERSONNEL:

- 1.5.1. Contractor will abide by all State and Federal regulations on wages and hours of an employee dealing with the employment relationship between Contractor and its subsidiaries or related parties and its employees, including but not limited to the Florida Human Relations Act, the Federal National Labor Relations Act, the Federal Fair Labor Standards Act, the Federal Civil Rights Act of 1964, as amended, and the Americans with Disabilities Act.
- 1.5.2. Contractor shall require all prospective employees to show proof of citizenship, or proof from the United States Immigration and Naturalization Service of valid entry permits and/or work permits, and that they are legal aliens eligible to be employed in the United States.
- 1.5.3. Should the Contractor engage employees who are illiterate in English, it will be the Contractor's responsibility and obligation to train such employees to be able to identify and understand all signs and notices in and/or around the areas that relate to them or the services being performed by them pursuant to this Contract. In addition, the Contractor will have someone in attendance at all times who can communicate instructions to said employee.
- 1.5.4. Contractor shall maintain a drug-free workplace within the meaning of the Florida Drug-free Workplace Act. No employee shall be hired by a Contractor for work on Authority's premises prior to such employee having tested negative for drugs. In addition, existing employees of the Contractor must be subject to drug testing by the Contractor upon reasonable suspicion of drug use. Results of all such drug tests are to be retained by the Contractor. Copies shall be provided to the Authority, if requested.

- 1.5.5. Contractor shall transfer promptly from the airport any employee or employees that the Authority advises are not satisfactory, and replace such personnel with employees satisfactory to the Authority; but in no event shall Authority be responsible for monitoring or assessing the suitability of any employee or agent of Contractor.
- 1.5.6. The Contractor's employees shall be instructed that no gratuities shall be solicited or accepted for any reason whatsoever from the tenants, customers or other persons at Orlando International Airport. The Contractor shall be responsible for ensuring that all articles found by its employees on Authority's premises are turned over to the Authority, or the Authority's designated agent in charge of such articles.
- 1.5.7. A valid Florida driver license (Commercial Driver License, if applicable) will be required of all personnel operating motor vehicles or motorized equipment on roadways in or around Orlando International Airport. Each of the Contractor's motor vehicles brought onto the Authority's premises shall have the Contractor's business name and/or logo prominently displayed on both front doors of such vehicle.
- 1.5.8. While working on airport property all Contractor's employees shall wear neat-appearing uniforms with the company name and/or logo and footwear of a style that complies with all legal and safety requirements, including and without limitation, the requirements of OSHA.
- 1.5.9. A Mechanic shall be present on each shift.
- 1.5.10. The Foreman/Supervisor/Mechanic-In-Charge, and all Mechanics identified on the Contractor's Staffing Plan shall possess a current Certification of Competency (CC card) for elevator constructors issued by the State of Florida.
- 1.5.11. Staffing Levels
 - 1.5.11.1. Minimum staffing levels: The Contractor shall continuously provide at least one (1) Mechanic or Helper for every twenty (20) units maintained by the Contractor. Units removed from service (i.e. unavailable for public use due to construction or removed at the discretion of the Authority) for more than 90 days shall not be counted as being maintained by the contractor for the purpose of calculating staffing requirements.
 - 1.5.11.2. The Contract Manager and Foreman/Supervisor or Mechanic-in-Charge shall not be counted as a mechanic or helper for compliance with this requirement.
 - 1.5.11.3. In the event that the total number of **Mechanics and Helpers** required, as determined by dividing the total number of units maintained by twenty (20), contains a fractional component, then the total staffing number required shall be rounded up to the next whole number.
 - 1.5.11.4. For example: if the total number of units maintained is 204, then the required number of mechanic/helpers would be 11; i.e. $204/20 = 10.2$, rounded up to eleven.
- 1.5.12. Contractor shall submit a proposed Staffing Plan with its sealed bid and obtain written approval of the final Staffing Plan by the AAR before the Effective Date of this Contract. The plan may be updated as necessary for employee and/or rotational changes. The proposed Staffing Plan must include job titles and work shifts (i.e., Mechanic 1, Mechanic 2, etc). The final Staffing Plan must indicate all employees' names, assigned work shifts, and job classifications and include resumes of all staff. At a minimum, Contractor shall divide the mechanics and helpers into three shifts and provide sufficient staffing on each shift to ensure the work can be accomplished on the

third shift.. The Owner may cancel the award if no agreement is reached on the Staffing Plan.

1.5.13. Personnel Qualifications: The following personnel are considered key and critical to the maintenance and repair of the Equipment covered by this contract.

1.5.13.1. Contractor shall employ at the Airport site at least one (1) employee on staff with a minimum of five (5) years' experience maintaining, diagnosing, and repairing the elevator controller that is included in the construction bid.

1.5.13.2. Contractor shall employ at the Airport site at least one (1) employee with a minimum of five (5) years' experience maintaining, diagnosing, and repairing the escalator model that is included in the construction bid.

1.5.13.3. Contractor shall employ at the Airport site at least one (1) employee with a minimum of two (2) years' experience maintaining, diagnosing, and repairing the LiftNet elevator/escalator monitoring system.

1.5.13.4. The Contractor shall employ at the Airport site an experienced Operation and Maintenance (O&M) Manager (with at least 5-years' experience managing an elevator maintenance and repair contract) , be LEED certified and be authorized to represent and act for the Contractor in matters pertaining to its operations and activities at the Airport. Contractor shall keep the Authority informed in writing of the identity of such Manager. The O&M Manager shall be in charge of and have overall responsibility for the work to be performed by the Contractor under the Contract. Such Manager shall devote his time exclusively to those responsibilities related directly to the contract and any related construction activities at the Airport. Contractors' O&M Manager shall not be involved with any projects/work (construction related or other maintenance contracts) not related to the Airport unless such activity is approved by the Authority in writing in advance. The Authority shall have the right, in its sole discretion, to approve or reject any Manager selected by the Contractor, and the Authority's written approval shall be required prior to involvement of any Manager in the work provided by this Contract. The Contractor's Manager shall make himself available to the AAR for purposes including weekly or semimonthly meetings, and periodic tours and/or inspections of the premises.

1.5.13.5. In the event a Contractor's key personnel position becomes vacant, Contractor has 30 days to fill the position. The Authority has the right to review the qualifications of, and reject, any replacement key personnel. In the event Contractor does not fill vacant positions with approved personnel in 30 days, the Authority shall deduct at the hourly rate specified in the bid form for Additional Work, for each vacant position, 8-hours per day until the position is filled.

1.5.14. Exclusive Service

1.5.14.1. All Supervisors, Mechanics, and Helpers identified on the Staffing Plan shall provide exclusive service to the South Airport Facilities that are within the scope of this Contract for maintenance and repair duties as described in the Contract Documents. **NONE OF THE INDIVIDUALS STAFFED FOR THIS CONTRACT ARE PERMITTED TO PERFORM OTHER WORK ON AUTHORITY PROPERTY, unless under extraordinary circumstances when written authorization of the Authority's Chief Operating Officer is obtained (such as an emergency). The staffing plan for this**

Contract must be exclusive to this Contract, for 24 hours a day, seven days a week (typically 21 shifts), even if the Contractor disagrees with the need to fully staff the scope of this work.

1.6. IDENTIFICATION AND ACCESS REQUIREMENT:

- 1.6.1. Contractor is required to conduct an employee background check, or require its subcontractors to perform an employee background check, in accordance with the requirements herein on each person proposed for employment at the Orlando International Airport in connection with this Contract, if such person is an employee of Contractor or an employee of a subcontractor for whom Contractor is required under Section ~~1.6.5G~~ below to sign the Authority's badge application ("Contractor Responsible Employees"). Such background check must be successfully completed prior to such person applying for an access control identification badge with the Authority. Each background check shall be performed to the following minimum requirements:
 - 1.6.1.1. Each employee must provide a ten (10) year work history.
 - 1.6.1.2. Contractor must confirm the last five (5) years of each employee's work history. Any gaps in employment of thirty (30) days or more during such five year period must be explained in writing by the employee and must be confirmed by Contractor through W-2s, student transcripts, medical records, or written references of stay-at-home situations from credible local persons such as pastors or priests (which reference must indicate personal knowledge of employee's general work history during the gap period).
 - 1.6.1.3. Contractor must check each employee's criminal history for the immediately preceding five years, with such check to be conducted in each county where the employee has lived or worked in such five year period.
- 1.6.2. Contractor shall not present any Contractor Responsible Employee to the Authority's Access Control Office for badging if such person has any unexplained gaps in their work history, has a criminal record that would disqualify them from receiving an access control badge or has an unacceptable termination record.
- 1.6.3. The Authority will issue, for a fee, as stated below in paragraphs ~~1.6.3.1 below~~~~2.2-D below~~ and ~~1.6.3.2 below~~~~E-below~~, to all Contractor Responsible Employees an identification badge that will display their picture, name, and other applicable information; and any key(s) required in the performance of the Contract, provided that such person meets the minimum criteria established to receive a badge. At all times while on airport property, the Contractor Responsible Employees are required to display such badges prominently on their uniforms in accordance with Authority's guidelines. Every new employee requiring unescorted access to a secure area of the airport must be electronically processed by the Authority's Access Control Office for a Criminal History Records Check and Security Threat Assessment before an identification badge is issued. In addition to this records check, the employee will be required to attend security training class (approximately 1 hour), and in the case of operating a vehicle on the Airport Operating Area (AOA) the employee will also be required to attend a driving safety class (approximately 1 hour); both training classes are provided by the Authority. The Contractor shall maintain, and shall require its subcontractors to maintain, a permanent record in its files of the background information, including drug screening tests, on all current and former employees who

are utilized in the performance of this Contract and, when requested, shall provide such information to Authority, TSA, or such other entity as deemed appropriate by the Authority. The Contractor further agrees to perform, or require its subcontractors to perform, such additional employee background checks, fingerprinting, or other identification measures as may be required by any future security rules or applicable federal regulations.

1.6.3.1. Fees Associated with Identification Badges:

Security Background Check	\$11.00
New Issue	\$25.00
Renewal/Defaced	\$25.00
Name Change	\$25.00 (paid at time of issuance)
Addition	\$25.00 (i.e. adding company name, driver, etc.)
Deletion	\$25.00
Lost	\$50.00
Stolen	No Charge with proper documentation
Fingerprinting	\$27.00 (every two years)
AOA Vehicle Decal	\$25.00 per vehicle

1.6.3.2. Fees Associated with Keys:

New Hard Key	\$10.00
Lost Hard Key	\$50.00

Note: No personal checks or credit card payments are accepted. Companies will be assessed a \$100.00 fee for each non-returned identification badge and key.

1.6.4. Contractor must maintain all information described above for a period of four (4) years following expiration of this Contract. Such information is subject to audit by the Authority and must be sufficient in scope and detail to permit verification of compliance by Authority audit. Actual damages to the Authority resulting from a breach by Contractor of its obligations hereunder will be difficult or impossible to determine. As a result, Authority shall be entitled to recover liquidated damages of Two Hundred-Fifty Dollars (\$250.00) for every Contractor Responsible Employee presented to the Authority for access control badging (a) for whom the above background check has not been completely and accurately performed, or (b) who should not have been presented per the above guidelines. The Contractor remains responsible for any/all regulator deductions associated with the Contractor's failure to properly conduct/complete the required background check. The amount payable hereunder by Contractor is not a deduction, is in addition to any access control badging application fee paid by the employee and is payable whether or not such employee is issued an access control badge by the Authority.

1.6.5. Contractor must co-sign with the subcontractor all badge applications for any employee of a temporary employment agency engaged as a subcontractor to provide personnel to Contractor on this Contract. All employees provided by temporary

employment agencies for this Contract shall be Contractor Responsible Employees. Before submitting a badge application for an employee provided on this Contract by a temporary employment agency, Contractor or the temporary employment agency must submit to the Authority's AAR for prior approval of such employee, a contract between the temporary employment agency and such employee reflecting an intended assignment of such employee to the Contract for the remaining duration of the Contract or the duration of the Contractor's need for such position.

1.7. U.S. CUSTOMS AND BORDER PROTECTION ACCESS REQUIREMENTS

1.7.1. The U.S. Customs and Border Protection (CBP) required badge for the purposes of performing duties under the Contract is a hologram badge. The Contractor shall comply with all CBP requirements in order to obtain and maintain a hologram to be affixed on the Authority badge. Currently a bond must be posted with CBP before any holograms are issued. Contractor should verify bond cost with U.S. Customs and Border Protection. The bond amount could change if the Contractor commits CBP violations or if the CBP changes its rules or procedures.

1.7.2. Contractor shall post a continuous CF 301 Bond (Type 1 or 2) or an Airport Security Bond. The bond is obtained from an authorized surety company as referenced in 19CFR113.37. The face value of the bond depends upon how many employees will require access to the Customs security areas.

Less than 15	\$ 25,000.00
Between 15 and 25	\$ 50,000.00
More than 25	\$100,000.00

1.7.3. The CF 301 Bond can be designated as an import/broker bond, warehouse bond, international carrier bond, or a non-specific Airport Security Bond.

1.7.4. The Contractor must have a sufficient number of BHS Agents, line management staff as well as maintenance technicians, (as permitted by local CBP officials) badged with Federal Inspection Station (FIS) credentials, to ensure adequate staff on all shifts are capable of responding to FIS calls without escort.

1.8. EMERGENCY RESPONSE

1.8.1. Emergency Response - The Contractor shall provide all personnel and services requested by the Authority for emergency coverage/response. The Contractor shall familiarize its employees and subcontractors with the procedures and responsibilities specified in the Authority's Emergency Procedures document pertaining to Elevators, Escalators, and Wheelchair Lift. Copies of all applicable procedures will be furnished to the Contractor at Contract commencement.

1.8.2. In the event that the Authority declares that an emergency condition exists, the Contractor may be asked to perform additional functions or duties beyond the normal equipment maintenance and repair functions described herein. These additional Contractor functions and duties during an emergency condition shall be considered a part of the normal Work services provided to the Authority. If the Contractor's employees are required by the Authority to work beyond their scheduled (i.e. 8 hour) shift, the Authority will reimburse the Contractor for any overtime expenses. The

Authority will not reimburse the Contractor for expenses related to food, lodging, or any other incidental costs arising from this requirement.

- 1.8.3. In the event an emergency condition is declared by the Authority's Executive Director, Deputy-Executive Director, Director of Operations or their respective designees, the Contractor will perform work during such hours as specified by the Authority.

1.9. ITEMS PROVIDED BY THE AUTHORITY:

- 1.9.1. The Authority will provide reasonable job-related office space, workshop space, and storage space for parts, supplies, tools, and equipment at no cost to the Contractor.
- 1.9.2. The Authority will furnish the Contractor's employees, for a fee paid by Contractor, an identification badge (subject to the conditions set forth in **Paragraph 1.6** that will display their picture, name, and other critical information required by the Authority.
- 1.9.3. The Authority will provide job-related company-vehicle parking permits in the Authority's remote parking site, for a fee, to the Contractor. The Authority will provide Contractor one Management Parking permit for parking in the Authority's parking Garage at no cost to Contractor.
- 1.9.4. The Authority will pay the cost of utilities (electric, water, and sewage) used in the maintenance and repair of the Equipment covered under the Contract.
- 1.9.5. The Authority will provide for pick-up of non-hazardous solid wastes, generated in the maintenance and repair of the Equipment covered under the Contract. Contractor shall place all waste materials in the Authority's dumpster or other such common trash pickup point as approved by the AAR.
- 1.9.6. The Authority will pay the cost for each "Certificate of Operation (C/O)" as required by the State of Florida for the Elevators and Escalators.
- 1.9.7. The Authority shall provide a third-party inspection service for the safety inspections of elevators, escalator, and wheelchair lift as required by Section 399.061, Florida Statutes, as amended May 24, 2000.
- 1.9.8. All Authority-created procedures/documents (i.e. Emergency Procedures, Radio specifications, Entrapment procedures, etc.) referenced by this Contract will be provided to the Contractor prior to Contract commencement. These Specifications govern in the event of a conflict between the Specifications and the other Authority-created procedures. Referenced non-Authority documents (i.e. ASME A17 Codes, Southern Building Codes, ADA requirements, etc.) will not be provided and shall be obtained by the Contractor.
- 1.9.9. Two-way radios per Section 1.10.

1.10. TOOLS AND EQUIPMENT

- 1.10.1. The Contractor shall provide, at no additional cost to the Authority, all tools and equipment necessary to perform the Work required under the Contract. The Contractor shall provide evidence of its ability to execute efficient and timely repairs of the Equipment. Part of this evidence shall be an inventory list of special tools used in the maintenance and repair of Equipment covered under the Contract to be submitted within thirty (30) days after Contract Effective Date.
- 1.10.2. The Authority shall have the right at all times, but not the obligation, to examine all equipment, tools, materials and supplies used by the Contractor, or by its officers,

employees, subcontractors or agents in the performance of the Contractor's obligations under the Contract. If any of the above is found to be unsafe or not in good working condition, the Authority has the right to direct the Contractor to remove it from service, and to repair or replace it promptly.

- 1.10.3. Each of the Contractor's motor vehicles brought onto the Authority's premises shall have the Contractor's business name and/or logo prominently displayed on both front doors of such vehicle.
- 1.10.4. All necessary signage and barricades shall be furnished by the Contractor at its sole cost. Sufficient quantities shall be stored on-site to safely and completely block-off and/or redirect passengers in case of multiple failures. Escalators shall be blocked off in a manner to prevent unauthorized use by placing an A17.1 approved barricade completely around the entry and exit platform. The use of safety cones or warning tape to block off the entry and exit platform is prohibited. Single bank public-use elevators removed from service shall have signage placed at each level indicating that the unit is out of service, the expected length of the outage, and directing passengers to the next available unit. All equipment outages shall be reported to the Authority as described elsewhere in this document.
- 1.10.5. The Contractor shall be responsible for pumping out or draining all pits and properly disposing of any water/oil, that may be the result of, but not limited to, flooding from storms, backing up of drains, broken pipes/fixtures, and/or ground water intrusion, in accordance with applicable laws and regulations. A portable fluid transfer pump capable of transferring a minimum of 40 G.P.M at a lift of 8 feet, and with a minimum of eight feet of intake hose and twenty-five feet of discharge hose, shall be stored on-site at all times. No additional compensation shall be provided for this action/requirement regardless of the cause of the flooding or seepage. Contractor shall report to the AAR the presence of any fluids in Equipment pits and any potential damages to pit equipment. Contractor shall not be held responsible for damages to the equipment caused by water exposure unless Contractor is responsible to protect equipment against such damage or if the equipment damage is due to prolonged exposure to water where such prolonged exposure could have been prevented by timely action/response by the Contractor.

1.11. COMMUNICATION AND EQUIPMENT MONITORING

- 1.11.1. The Authority shall provide, at its sole cost a sufficient number of two-way radios to be used by its employees and subcontractors. The two-way radios shall be compatible with the Authority's frequency to provide direct communication and/or dispatch with the Authority. While on duty, the on-site Foreman, and all service Mechanics and Helpers shall be equipped with two-way radios. The Contractor's employees and subcontractors shall abide by the Authority's established radio-use procedures and etiquette requirements at all times. No service Mechanic or Helper shall be permitted to work alone in a location that is out of the sight of others without a two-way radio or other form of two-way communication.
- 1.11.2. The Contractor shall be responsible for any damage to, or **loss** of, Authority's equipment and shall return all radio equipment to the Authority at the expiration of the Contract or earlier termination. Contractor shall either replace any lost or damaged equipment with the same or an equivalent model, or reimburse the Authority for the equipment at its current replacement cash value which is calculated as the cost of new

replacement equipment less depreciation, if depreciation is warranted, as determined by the Authority.

- 1.11.3. The Contractor shall provide and maintain, at its sole costs (including any and all maintenance and replacement costs), a paging system for use with the LIFTNET monitoring system. The paging system shall be capable of receiving full text messages of pre-defined elevator faults or conditions. A minimum of four (4) active pagers will be maintained on site. The Paging System (pager) shall receive a text message indicating that a fault has occurred and correctly identify the equipment at fault by the GOAA unit designation/ID within 5 minutes of the LIFTNET system detecting the fault or failure. Contractor is responsible to ensure the pager (supplier/service) has the required response time described herein and is capable of receiving pages (a signal) in all areas of the airport where Contractor's personnel may be working.

1.12. WARRANTY:

- 1.12.1. The Contractor shall provide parts and labor warranty for a period of one (1) year following installation/repair/maintenance of Equipment. During the warranty period, Contractor shall at its sole cost and expense install a replacement for any defective part, and shall re-perform, at no additional cost to Authority, any defective services. This warranty shall not serve as a limitation on Contractor's liability for latent defects in any part or for any workmanship.
- 1.12.2. The Contractor shall provide to the Authority all manufacturers' product warranties for parts and equipment installed on OIA premises.
- 1.12.3. In the event that new, warranted equipment is added to this Contract, Contractor shall perform all maintenance and repairs to this additional Equipment as required by this Contract, to include but not limited to, services related to the warranty of the new Equipment. Contractor shall perform such services per the agreed upon rates so reflected in any resulting Amendment, which shall be based on rates for similar units contained in the Contract as described in Section 2.3 of these Specifications. Contractor shall be solely responsible for any effort associated with seeking additional compensation or reimbursement from the original Equipment manufacturer for performing warranty work, to include but not limited to, any cost associated with warranted parts replacement. Under no circumstances shall the repair or service of any Equipment under this Contract be delayed as the result of a warranty issue/claim. In the event that the Contractor performs, or fails to perform, any action that voids the manufacturer's warranty, the Contractor shall assume the full liability and responsibility of the voided warranty.

PART 2 - PRODUCTS

2.1. PARTS INVENTORY - SUPPLIES

- 2.1.1. Contractor shall purchase at its sole cost and shall maintain, at all times, an on-site spare parts inventory with minimum items/parts listed in Attachment "C" (TBD), and shall use such spare parts exclusively for repair and maintenance of Authority's Equipment covered under this Contract.
- 2.1.2. The items listed in Attachment "C" (TBD) are the minimum requirements. It is Contractor's responsibility to stock a sufficient quantity of those parts and to add any parts not listed to the inventory that would be necessary to ensure all equipment can

be maintained and repaired with minimal downtime. Contractor should expect multiple equipment failures of the same type of equipment during the same period and stock sufficient quantities to ensure downtime is minimized and to increase quantities stocked for those items with long lead times. The Authority reserves the right to require Contractor to stock additional parts and/or increase the quantities of items stocked.

- 2.1.3. The spare parts in Contractor's on-site inventory shall not be used for any other purposes or removed from this job site without the express written approval of the AAR. Contractor shall at its sole cost, insure the on-site spare parts inventory against damage or loss due to theft, vandalism, disappearance, or other similar cause.
- 2.1.4. Original equipment manufacturer (OEM) parts shall be purchased and used in the maintenance and repair of the Authority's Equipment. Non-OEM parts may be used, provided such parts have been approved prior to Contractor's use as being equal or of superior quality to OEM parts by either the manufacturer of the equipment or the AAR. Written approval must be obtained prior to using non-OEM parts.
- 2.1.5. The repair and/or replacement of any system component part (either OEM or Non-OEM), which is covered under the manufacturer's and/or Contractor's warranty, shall be a part of the Work under this Contract, and shall not result in any additional charge to the Authority.
- 2.1.6. The Pricing of all items listed in Attachment "C" (TBD), and any future price changes, shall reflect the price Contractor will/would sell each respective part listed to the Authority. At any time during this contract or at termination of the Contract, the Authority shall have the option of purchasing all or a portion of the required spare parts listed herein at the most recent prices submitted by the Contractor for Attachment "C" (TBD)
- 2.1.7. Contractor shall provide, at no additional cost to the Authority, annual updates to parts inventory to reflect any pricing changes. Any changes/increases in pricing shall be at the lowest price for which the Contractor sells such parts to its best customers or at the Contractor's cost plus five percent (5%) if no such sales of such part or parts have been made
- 2.1.8. Any price increase to the spare parts inventory must be approved by the AAR subject to verification that such increase is warranted and the amount of increase is appropriate. Price increases, per item/part, shall not exceed the maximum percentage allowed **(6%)** by this Contract for materials increases in any single year.
- 2.1.9. In the event that Additional Work is authorized by the Authority, the cost to the Authority for any parts or materials used in such Additional Work shall not exceed the prices provided by the Contractor regarding its most recent pricing/cost submission for Attachment "C" (TBD) as approved by the AAR.
- 2.1.10. The Authority may add or delete parts from the required spare parts inventory as deemed necessary or whenever conveyance equipment is added or deleted from the Contract.
- 2.1.11. Supplies, including maintenance office supplies, shop cleaning supplies, materials not categorized as spare parts but required in the operations/ maintenance of the Equipment under Contract, and other expendable/consumable items and materials as required in the execution of the Work shall be the sole cost of the Contractor without reimbursement from the Authority.

- 2.1.12. The Contractor shall have ninety (90) days from the Contract Effective Date to obtain, and store on-site, all of the required spare parts listed in Attachment C (TBD). In the event that the Contractor fails to provide, and store on-site, the complete parts inventory, a performance deduction (Section 2.7.4 of General Conditions) shall be applied to the monthly maintenance invoice.

2.2. LUBRICANTS – OIL ANALYSIS

- 2.2.1. All lubricants used by Contractor shall comply with the specifications for lubricants recommended by the Equipment manufacturer for the particular unit or device to be lubricated. Rope lubricants shall conform to the manufacturer's recommendations and the ASME Inspector's Manual A17.2. Lubricants shall be stored in properly marked containers. Lubricants and other environmentally controlled substances shall be disposed of by Contractor as required by all applicable laws and environmental regulations. **Contractor is responsible for all costs associated with the cleanup and disposal of spilled or leaking fluids (excluding below ground leaks from hydraulic cylinders which are not caused by Contractor negligence).**
- 2.2.2. It is the Contractor's responsibility, where hydraulic equipment is installed, to monitor the temperature and condition of the oil. Oil temperatures must be maintained within the manufacturer's recommended safe operating range. If no specific manufacturer's recommendation is given, the maximum oil temperature shall not be greater than 140 degrees Fahrenheit. Temperatures exceeding this requirement shall be reported to the AAR. The Contractor shall also maintain a written record in the machine rooms documenting the quantity of hydraulic fluid added to the system and emptied from leakage collection containers and pans. If the quantity of hydraulic fluid loss cannot be accounted for, the Contractor shall perform pressure tests and inspections of the system as outlined in ASME A17.1 (2000), sections 8.11.3.2.1 and 8.11.3.2.2.
- 2.2.3. The Contractor shall maintain an AAR-approved hydraulic oil sampling/testing program. At a minimum, the hydraulic oil shall be sampled/tested biannually. The oil analysis shall be performed on each oil sample by an independent and certified laboratory. The cost of these analyses shall be borne solely by the Contractor. The testing schedule, substances/materials tested for, and results of these analyses shall be provided to the AAR. If the oil analyses indicates or recommends that the oil should be replaced the Authority shall bear the cost for the materials (oil), transportation, disposal, and Contractor shall bear the cost for the labor to replace the oil.

2.3. NEW EQUIPMENT AND EQUIPMENT REMOVED FROM SERVICE

- 2.3.1. It is expected that new equipment will have lower repair requirements for a period of time, therefore all new Equipment added to this Maintenance and Repair Contract shall be maintained by Contractor at the reduced rate of twenty-five percent (25%) below the unit pricing on the Bid Form for similar Equipment. This pricing shall remain in effect for six (6) months.
- 2.3.2. The Authority may remove equipment from passenger service at its discretion at any time during this contract. In this event, the Authority shall deduct from the monthly invoice the amount charged (as indicated on the Bid Form) for the maintenance of the equipment. Deductions will not be taken if the equipment is removed from service for a period of less than 30 days. In the event, units are removed from service for more than 30 days, deductions will be taken based on one week (7 calendar day) intervals. Each interval will be deducted at the rate of twenty-five percent (25%) of the total

monthly charge for the unit. If a unit is returned to service before the end of the interval, the deduction will not include that interval. For example if an elevator is removed from service on January 1, and returned to service on February 17th, the deduction would be for the period of time between February 1 and February 17. The deduction would include two intervals (Feb 1 to Feb 7, and Feb 8 to 14. But Feb 15 to Feb 17 would not be counted since that time period is not a full interval (the interval is less than 7 days). In this example, the deduction would be for two intervals which is 50% of the total monthly charge for the elevator.

PART 3 - EXECUTION

3.1. PERFORMANCE REQUIREMENTS

- 3.1.1. Contractor shall perform all of its obligations and functions under the Contract in accordance with the requirements specified herein, and to the highest industry standards ensuring that the elevators, escalators, and wheelchair lift at the Orlando International Airport will operate at their original design efficiency, and in accordance with the manufacturer's specifications and all applicable code requirements. The Contractor shall coordinate its activities with and adjust its activities to the needs and requirements of the Authority and will perform its activities so as not to annoy, disturb, endanger, unreasonably interfere with, or delay the operations or activities of the Authority, any tenant, or occupant of the premises.
- 3.1.2. The Contractor shall not do or keep anything at the Airport site which will in any way conflict with any law, ordinance, rule or regulation which now or hereafter may be enacted or promulgated by any governing public authority agency; or which will create a safety hazard at the Airport; or create a nuisance; or in any way obstruct or interfere with the rights of other users at the Airport, except as reasonably required in the performance of its obligations and functions hereunder and which has been approved in writing in advance by the AAR; or commit or suffer to be committed any waste upon the site or allow the site to be used for any improper or unlawful purposes; or place any loads upon the floor, walls, or ceiling which endanger the structure; or obstruct the sidewalks or passageways or stairways in front of, within, or adjacent to the site, except as reasonably required in the performance of its obligations and functions hereunder and which has been approved in writing in advance by the AAR.
- 3.1.3. If repair, replacement, and/or refinishing of items not specified in the Contract are required because of the act or omission of the Contractor, the cost of making such repair, replacement and/or refinishing shall be borne solely by the Contractor.

3.2. EQUIPMENT MONITORING REQUIREMENTS (LIFTNET and TALK-A-PHONE)

- 3.2.1. The Contractor is responsible for maintaining the elevator and escalator, monitoring system (LIFTNET) which shall continuously remotely monitor key functions for all of the Authority's vertical and horizontal passenger conveyance systems.
- 3.2.2. The monitoring system is connected to each elevator controller in the elevator machine room, or to the individual controllers located in the pit(s) in the case of escalators. It shall monitor and analyze essential signals. The monitoring system shall transmit to the monitoring stations alarm detection conditions and equipment malfunctions. Equipment performance statistical data shall be continuously captured and stored in

computer memory.

3.2.3. The Contractor shall maintain a minimum of one active and one spare LIFTNET monitoring stations at the Airport facility. Each station consists of a LIFTNET computer with a 19-20 inch LCD flat panel color monitor, keyboard, and mouse. One backup power supply (UPS) shall be maintained per active station.

3.2.3.1. The primary (master/server) LIFTNET monitoring station shall be located and maintained in the Contractor's Office Space.

3.2.3.2. The remainder of the monitoring stations shall be located at sites designated by the AAR.

3.2.3.3. Contractor shall be aware of any software/hardware updates or upgrades available for LiftNet. Contractor is responsible to install any software updates/patches required by LiftNet to preserve the integrity of the data/ system or to correct software issues/problems that prevent the system from functioning as intended at no additional cost to the Authority. The Authority will reimburse Contractor for any upgrades that are requested by the Authority to enhance or improve the system but which are not required by LiftNet.

3.2.4. All LIFTNET monitoring stations are to continuously receive messages, faults and alarms. At a minimum, the system shall monitor and report the following Elevator signals:

3.2.4.1. Alarms

- Alarm button
- Fire service

3.2.4.2. Faults

- Power on/off
- Door Detector
- Safety circuit open
- Door lock
- Machine room temperature exceeds 95 degrees
- Out of level

3.2.4.3. Messages and Status

- Car status (in or out of service)
- Car position (location in hoistway and direction of travel)
- Door status (open/closed)
- Emergency power
- Fault detected
- Group operational mode
- Location and direction of hall calls

3.2.5. All LIFTNET monitoring stations are to continuously receive messages, faults and alarms. At a minimum, the system shall monitor the following Escalator signals and faults:

- Equipment status (in or out of service)

14 00 00 - 18

- Emergency stop /stop button activation
 - No power (electrical supply)
 - Direction
 - Cumulative run time
 - Handrail entry device
 - Handrail speed monitoring device
 - Skirt obstruction device
 - Pit high water level
- 3.2.6. An emergency voice communication system (Talk-A-Phone) shall be maintained in each elevator. This system shall permit direct voice communication between the elevator car and the Authority's Communications Center Operator (911 system). When the emergency phone button is pressed in the elevator, a telephone connection shall be established between the elevator car and the Communications Center operator through the speaker and microphone components of the module. The Contractor shall be responsible for polling (testing) the elevator emergency phone system daily using the "Talk-A-Lert" computer program. If any of the phone lines are found to be out of service, the Contractor will investigate for possible causes. If the phone line to the controller is not in service, the Contractor shall notify Central Plant and/or the AAR as soon as possible.
- 3.2.7. Contractor shall be responsible for the testing/diagnostics, and the removal and replacement of the TALK-A-PHONE device in the elevator cab and all communication lines from the elevator cab to the elevator machine room. Contractor shall bear full responsibility for the cost of all repairs including the shipping and handling costs for off-site repairs of the TALK-A-PHONE equipment. Contractor is not responsible for repairs and/or diagnostics of the communication/phone lines to the elevator machine room.
- 3.2.8. LIFTNET monitoring stations shall receive all shutdown signals and faults. This will apply in situations where the car has either been taken out of service for maintenance and repair or a malfunction has caused the equipment to shutdown.
- 3.2.9. Each monitoring station's monitor screen shall present a graphical plan (layout) view of the elevators located throughout the building(s). When an alarm condition is encountered, the elevator in question shall be illuminated or identified on the screen.
- 3.2.10. Specified reports shall be provided to the AAR by the Contractor on a monthly basis. The reports shall be generated from written and stored data and shall supply the following information for each elevator:
- Total number of entrapments, cause for entrapments and the average per month
 - Total number of shutdowns and the average per month
 - Total number and type of faults and the average per month
 - Total number of accidents and average per month
 - Repair work completed in the last month and additional work status.

3.3. SYSTEM MAINTENANCE REQUIREMENTS

- 3.3.1. The Contractor shall maintain all Equipment under the Contract in compliance with all

requirements of the applicable American Standard Safety Code for Elevators and Escalators; ASME A17 codes; Florida Elevator Code, Chapter 61C-5; National Elevator Industry Field Service Manual; Southern Building Code, Chapter 506; State of Florida Department of Insurance, Division of State Fire Marshal, Chapter 4A47; and all other applicable Federal, State, and Local laws, regulations, ordinances, and codes. The above documents along with the ASME Standards and Inspector's Manual, and the original equipment manufacturers' O&M manual shall be used as a guide to establish that Equipment is operating safely.

- 3.3.2. The Contractor shall perform daily inspections on each unit of elevator, escalator, wheel chair lift, the component parts of each (including emergency telephones, in-car alarm systems and doors), and its operation in accordance with the original equipment manufacturer's maintenance recommendations and, as conditions warrant, shall adjust, lubricate, clean, repair, or replace parts and mechanisms as necessary to keep the Equipment in proper and safe operating condition. The LIFTNET monitoring system shall also be inspected each shift to ensure proper operation. A corrective maintenance work order shall be generated for any needed maintenance or repair tasks that the visual inspections identify. Contractor shall make/provide all elevator door adjustments as necessary to maintain elevator availability at no additional cost to the Authority even if such adjustments are required as the result of impacts (from baggage, carts, material deliveries, etc.) to doors. These impacts will not be considered misuse, abuse, vandalism, or third party damage. If the impact, or cumulative effect of multiple impacts over time, require the replacement of door parts (i.e. gibbs, door panel, etc.), the Authority will compensate Contractor for those parts and labor per the Additional Work terms of this Contract
- 3.3.3. The Contractor shall maintain the signal system, devices, lighting fixtures, including lamps and ballast, and fixture cover plates in proper working order at all times. Signal equipment shall include, but is not limited to, the elevator communication systems, signal buttons, direction indicator lights, position indicators, hall lanterns, mechanical lanterns, mechanical and electrical dials, signal bells, buzzers, gongs, and annunciators.
- 3.3.4. The Contractor shall maintain in proper working order at all times, and replace or repair as necessary, all operating accessories of cabs and hoist way doors and gates, including, without limitation, key switches, locking devices, electronic door edges and/or reopening devices, exhaust fans, plenum chambers, cab mounted air-conditioning units and related components.
- 3.3.5. The Contractor shall replace wire ropes as required to comply with ANSI standards and A17 code requirements. Periodically, the Contractor shall equalize the tensions of all hoist ropes, and lubricate per wire rope manufacturer's recommendations.
- 3.3.6. The Contractor shall examine all safety devices, including without limitation, associated fire alarm equipment and governors, and perform safety tests as required by current applicable codes.
- 3.3.7. The Contractor shall assist the Authority or the Authority's designee in smoke/heat detector testing and in ensuring that all fire safety and protection devices pertaining to the Equipment, function as required by applicable code.
- 3.3.8. The Contractor shall be responsible for testing and maintenance of the Firefighters' Service, including but not limited to, Phase I and II operation, switch operation,

signaling devices, emergency identification signage/displays, emergency lights/jewels, LIFTNET monitoring system, TALK-A-PHONE emergency communication system, batteries for lighting, alarm button/bell, and related devices.

- 3.3.9. Adjustments to the electronic circuits and the sequence of operation of the components shall be in accordance with engineering tolerances established by the manufacturer of the Equipment, and the maintenance of mechanical clearances shall be in accordance with the manufacturer's engineering standard tolerances.
- 3.3.10. Contractor shall replace chipped/broken escalator and moving walkway combplates (as required by the safety code) without reimbursement from the Authority, regardless of the cause.

3.4. MAINTENANCE SCHEDULES

- 3.4.1. Any modifications or changes to the approved Preventative Maintenance Schedule must be authorized by the AAR in writing. The AAR's acceptance or approval of Contractor's maintenance schedule shall not in any way relieve the Contractor of any obligation for maintaining the Equipment in accordance with the requirements of the Contract including, but not limited to, maintaining all the Equipment in accordance with all applicable manufacturer's recommendations.
- 3.4.2. The following minimum preventive maintenance and comprehensive inspections shall be performed:

<u>Type of Equipment</u>	<u>Preventative Maintenance Frequency</u>
Inspection of equipment for Safety	Daily
Inspection of Elevator Cab interior/lighting	Daily
Inspection/testing of Elevator Phones	Daily
Inspection of Escalator steps/combplates	Daily
Geared Traction Elevators	Monthly
Gearless Traction Elevators	Monthly
Hydraulic Elevators	Monthly
Single Drive Escalators	Monthly
Multi-Drive Escalators	Monthly
Wheelchair Lift	Monthly

All Maintenance and Repairs shall be conducted on the work shift (time of day) specified by the AAR (additionally see **paragraph 1.4.1**).

- 3.4.3. The maintenance and/or inspections performed shall follow the manufacturer's inspection or preventative maintenance recommended procedures and checklist when available. In the event that the Equipment manufacturer does not provide an inspection or preventative maintenance checklist, the appropriate ASME Inspection Checklist for Elevators (A134C1, A050C7), Escalators (A141C1), or an equivalent form(s) shall be utilized. All Checklists shall be completed and a summary indicating defects and/or needed repairs, if any, shall be furnished to the AAR immediately after the inspection or preventative maintenance work is completed.

3.5. Additional Work

- 3.5.1. "Additional Work" shall refer to those repairs and/or parts replacement required as a result of vandalism or damage to Equipment caused by third parties. In the event that the damage or wear cannot clearly be attributed to vandalism, or third-party causes, the AAR shall make the final determination.
- 3.5.2. "Additional Work" shall also refer to upgrades, enhancements, modifications, and the replacement or refurbishment of any Equipment, component, or system, as deemed necessary by the Authority to improve the aesthetics, safety, reliability, or performance of the Equipment or system(s) maintained under the Contract.
- 3.5.3. Additional Work shall be performed only upon written authorization of the AAR or designee.

3.6. RECORDS MANAGEMENT AND REPORTING REQUIREMENTS

All reports, log books, work order forms, and other documentation required by the Contract or by any other regulation or code requirement shall be understood to be the property of the Authority. These documents shall be available for inspection at all times and turned over to the Authority at the termination of the Contract.

- 3.6.1. Contractor's Work Order Form - The Contractor shall complete a Contractor's work order (service receipt) for all Additional Work to be performed and submit it to the AAR for written approval. The Contractor's work order form shall be approved by the AAR prior to its use. The Authority reserves the right to modify or replace the Contractor's work order form at any time during the Contract. The Authority may require the Contractor to complete a work order in the Authority's computerized maintenance system (program) in addition to the Contractor's work order form.
- 3.6.2. Maintenance and Status Report - A written Status report shall be delivered to the AAR monthly, including but not limited to, total number of entrapments, cause for entrapments, and the average per month, the number of shutdowns and the average per month, the number and type of faults and the average per month, total number of accidents with causes and average per month, a notice of potential and discovered deficiencies, project/construction (Additional Work) schedules/updates, and planned or scheduled heavy maintenance and/or repairs for all Equipment. The Contractor shall also include in these report details of the nature and extent of any major adjustment, parts replacement, or repairs made to the Equipment.
- 3.6.3. Testing Schedules
 - 3.6.3.1. The Contractor shall notify the AAR of the time and place of tests no later than 48 hours in advance of regularly scheduled inspections/safety tests, including pressure tests and full load tests. The AAR or designee must be notified of the results of each test in writing no later than 72 hours after test completion.
 - 3.6.3.2. The Contractor shall maintain a database of all required testing/inspection pertaining to the Equipment covered by the Contract and notify the AAR if any required testing/inspection is outstanding or delinquent, regardless of whether the testing/inspection is the responsibility of the Contractor or the Authority.
- 3.6.4. **Response Time** - Service mechanics shall respond to any entrapment to which they are dispatched within fifteen (15) minutes of notification. For all other service calls and/or dispatches where the Equipment is out of service (not an entrapment), the Contractor shall respond to restart (escalator or moving walk), or commence repair

within twenty (20) minutes from the time that LIFTNET detects that the equipment is out of service or the Contractor is notified.

- 3.6.5. Reporting Equipment shutdowns - Any Equipment that is removed from service, for unscheduled repair, where the estimated or expected time that it will be out of service will be longer than 30 minutes shall immediately be reported to the Authority Central Plant Dispatcher. The time of day that the Equipment is taken out of service, or discovered inoperative and the estimated time when the Equipment will be returned to service shall be reported. In the event that the Equipment is estimated to be out of service for longer than two (2) hours, the Contractor shall also notify the AAR or designee. The Authority Central Plant Dispatcher shall be notified when the unit is returned to service. Scheduled repairs where the repair is estimated to take over 4 hours to complete shall have a Utility Outage Notice (UON) form completed and submitted to the AAR 72 hours in advance. Equipment shut downs for Preventative Maintenance do not require a UON provided the work is accomplished within the shift identified by the AAR.

3.7. USE OF PREMISES

During the progress of the specified Work, the Contractor shall keep the premises free from accumulation of waste materials, rubbish, and other debris resulting from the Work. At the completion of the Work, the Contractor shall remove all waste materials, rubbish, and debris from, and about the premises as well as all tools, appliances, machinery, and surplus materials, and leave the site clean and ready for occupancy by the Authority. All waste materials associated with this project shall be handled in accordance with all federal, state and local regulations.

3.8. SAFETY AND PROTECTION

The Contractor shall be solely and completely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to all employees on the work site and other persons including, but not limited to, the general public who may be affected thereby.

* * * * * END OF SPECIFICATIONS * * * * *

ATTACHMENTS

- Attachment C

SECTION 14 21 00 - TRACTION ELEVATORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Division includes:

1. ASC: Provide ~~thirty-one~~~~seventeen~~ (31~~47~~) MRL gearless service and passenger elevators. Two (2) of the thirty elevators are planned as future elevators.
2. LSC: Provide twenty-three (23) MRL gearless service and passenger elevators.
- ~~3.~~ 3. PKG: Provide six (6) Overhead Geared passenger elevators.
- ~~3.4.~~ 3.4. GTF: Provide three (3) MRL gearless passenger-shaped and service-shaped passenger elevators.
- ~~4.5.~~ 4.5. Coordinate the work of this Division with work of other Divisions as required to properly execute the work as necessary to maintain satisfactory progress of the work of other Divisions.

- B. Related Work (to include but not limited to the following by other trades):

1. Elevator pit, including sump with pump, elevator machine foundation with block- outs in machine room floor slabs and other similar concrete work such as grouting thresholds.
2. Hoistway enclosures, including cutouts for elevator equipment and components penetrating enclosures, building in and grouting hoistway door frames, grouting thresholds.
3. Structural steel work, including intermediate floor framing where floor height exceeds 14 feet, elevator pit ladders, elevator buffer ladders and/or platforms (as required by pit depth), railings, wire mesh partitions, machine room floor grates and hoisting beam('s) at top of the elevator machine room, and/or hoistway.
4. Waterproofing of elevator pits.
5. Machine room heating, ventilation and air conditioning and temperature control of the machine rooms, hoistway ventilation and sprinklers to meet applicable Codes.
6. Electrical service to fused lockable main disconnects in elevator machine rooms and/or machine or control spaces or closets; electrical service to fused lockable disconnect for each elevator's car lighting; electrical power for elevator installation and testing; electrical disconnecting device to elevator equipment prior to activation of the sprinkler system; electrical service for the machine room (spaces, or closet); receptacles with ground-fault current protection in machine room (spaces, or closet), secondary areas, hoistway, and pit; lighting in the machine room (spaces, or closets), secondary areas and pits; wiring for

- telephone service to the machine room (spaces, or closet).
7. Standby-power supply systems including emergency generators and transfer switches for elevator operation. An electrical control connection needs to be established between standby power system and elevator controls. Additional control features need to be included in electrical switchboards, and transfer switches.
 8. Standby power of normal voltage characteristics via normal electrical feeders to run elevators at full-contract car speed and capacity.
 9. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer switch to a designated elevator control panel. Provide a time delay of 30 - 45 seconds for pre-transfer signal in either direction.
 10. Standby single-phase power to group controller, and each elevator controller for car lighting, exhaust blower, emergency signaling device, air conditioner unit (if equipped with one).
 11. Standby power to machine room, and pit lighting.
 12. Standby power to machine room ventilation or air conditioning.
 13. Standby power to emergency communications devices.
 14. Fire alarm systems including fire initiated devices and interconnecting devices; fire alarm signal lines (main, auxiliary, and machine/control room, space, or closet to contacts in the machine/control room, space, or closet).

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
 1. Signal and operating fixtures, operating panels and indicators.
 2. Cab design, dimensions and layout.
 3. Hoistway door and frame details.
 4. Electrical characteristics and connection requirements.
 5. Expected heat dissipation of elevator equipment in machine room, control space or closet.
- B. Shop Drawings: Submit no less than five copies (unless otherwise directed by the architect) of approval layout drawings. Include the following:
 1. Driving machine, controller, governor and other machine or controller room component locations.
 2. Car, counterweight, sheaves, guide rails, buffers, suspension means, and other components in hoistway.
 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 4. Load reactions at all points of support.
 5. Location of hoisting beams for machine room equipment.
 6. Clearances and over travel of car and counterweight.
 7. Locations in hoistway and machine room of traveling cables and connections for car light and telephone.
 8. Location and sizes of access doors and frames.
 9. Hoistway door and frame details
- C. Samples: All exposed materials with finish and all custom fixture fabrications.

1. Omit all logos from exposed finishes or components.
 2. All cab finishes.
 3. All entrance finishes
 4. Of handicapped Braille tags for car and hall buttons
 5. Of handicapped Braille plates for hoistway door jamb
- D. Maintenance Data: Provide written information necessary for proper maintenance and adjustment of the equipment prior to final acceptance as follows:
1. Straight line wiring diagrams of as-installed elevator circuits with index of location and function of all components. Leave one set in machine rooms. Provide 2 corrected sets for Owner's file 90 days after acceptance.
 2. Lubricating instructions and recommended lubricant grade.
 3. Parts catalogs and maintenance manuals not limited to repair, diagnostic, parts and service, necessary for the maintenance and repair of the elevator equipment shall be provided to the Aviation Authority.
 4. Provide at no additional cost any special tools, laptops, pass words and manuals that are required for maintenance, trouble shooting, adjustments, door operation or performance of safety or code related tests for the Owner's use.
 5. If the Contractor requires the Owner to sign any documents for the special trouble-shooting tool(s), a copy of the agreement, shall be submitted with the bid.
 6. Provide 5 keys for each elevator switch and function. Match existing key system for the project. WD01 fireman's switches, 501CH Access switch, F315 On / Off, F501 Service panel door.
 7. Contractor shall furnish to Aviation Authority any proprietary tools or diagnostic equipment that is required for the maintenance, repair or troubleshooting of the elevator related systems that would prevent an outside elevator company that is not related to the elevator manufacturer from providing maintenance and repair functions / services, or which would prevent the outside elevator company from performing future upgrades or modifications to the elevator or related building systems. (ie, security, fire protection system, etc.)
 8. Submit the recommended monthly and annual testing and inspection schedule for each unit, as applicable, to be incorporated into the Service Contract, as Attachment D.

1.4 SUBSTANTIAL COMPLETION SUBMITTALS

- A. In addition to all other Contract requirements to achieve Substantial Completion, the Contractor shall, as a condition of Substantial Completion of the construction subcontract and before the effective date of the Service Contract, execute and/or deliver the following to the Authority: the Contract, a copy of the Bidder's valid business or occupational license, a copy of Bidder's W -9 Form (Request for Taxpayer Identification Number and Certification), certificate of insurance, performance bond or letter of credit, final approved staffing plan and inventory list, final approved testing and inspection schedule and all other documents and information required by the Contract Documents or the Owner. All of the above documents and information must be furnished and the Contract Documents executed by Contractor, and delivered to Authority, before the Contract will be executed by the Authority
- B. The failure to timely fulfill these obligations shall be just cause for the Authority's withdrawal of such Notice of Intent to Award. In such case, the Contract may be re-advertised and the Authority shall be entitled to receive its damages and costs, including, but not limited to, its attorneys' fees caused by or in connection with the Contractor's failure to fulfill its obligations under this Section.

- C. The Contract shall not be binding upon the Authority until it has been executed by the Authority and a copy of such fully executed Contract is delivered to the Contractor. The Authority reserves the right to cancel the award without liability to any Bidder at any time before the Contract has been fully executed by the Authority and delivered to the Contractor. Accordingly, the Contractor is hereby warned that it should not commence performance or incur costs or expenses in connection with the Contract obligations until it has received from the Authority a final, fully executed copy of the Contract.

1.5 PRE-INSTALLATION CONFERENCE

- A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.
 - 1. Participants:
 - a. Architect.
 - b. OAR.
 - c. Contractor, including superintendent.
 - d. Installer, including project manager and supervisor.
 - e. Manufacturer's qualified technical representative.
 - f. Installers of other construction interfaced with Work.
 - 2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:
 - a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
 - b. Review Contract Document requirements.
 - c. Review approved submittals.
 - d. Review inspection and testing requirements.
 - e. Review environmental conditions and procedures for coping with unfavorable conditions.
 - f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.
 - 3. Record discussions, including decisions and agreements, and prepare report.

1.6 REFERENCES

- A. Comply with applicable building codes and elevator codes at the project site, including but not limited to the following:
 - 1. ASME A17.1 Safety Code for Elevators and Escalators, current adopted edition or as required by the authority having jurisdiction. In areas not covered by AHJ use latest edition of ASME Code.
 - a. NFPA 70 National Electrical Code.
 - b. NFPA 80 Fire Doors and Windows.

- c. Americans with Disabilities Act – Accessibility Guidelines (ADAAG).
 - d. ASME A17.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
 - e. ASME UL 10B and ASTM E152 (or approved equal), Fire tests of door assemblies.
 - f. Model building codes.
 - g. Florida Building Codes, Statutes, Administrative Codes and Safety Guidelines
 - h. All other local applicable codes.
- B. Make application for, secure and pay for all necessary permits and certificates of inspection/operation for all equipment included herein, as required by the various departments of the Local and State Authorities. Furnish the Owner certificates and approval as required by the local governing authorities having jurisdiction.
- C. In addition to the permits, inspections and test specified and the governing codes, the elevator contractor will be required to have performed speed and load carrying capacity and heat tests at his own expense.
- D. Make applications for secure and pay for all necessary delays, waivers, or required to obtain certificate of compliance.
- E. Any damage of any kind to the car or the adjoining structure which may develop through performance of any tests shall be repaired at no additional costs to the Owner.

1.7 CONTRACTORS RESPONSIBILITY

- A. The Elevator Contractor shall coordinate installation and inspection of their work with all trades to ensure timely installation, inspections and overall construction schedule sequencing. Failure of the Elevator Contractor to not coordinate in a timely manner with other trades shall not warrant a delay in schedule or additional costs.
- B. In order to discover and resolve conflicts or lack of definition which might create problems, elevator manufacturer must review contract documents for compatibility with its product prior to bidding. Review structural, architectural, electrical, mechanical documents, and elevator specifications.
- C. Contractor must review all drawings associated with the project to ensure architectural design intents are full achieved, executed and coordinated as needed with other trades.
- D. Submit specific written exception and or clarification with quotation. Compliance with provisions of contract documents is assumed and required in absence of written exception.
- E. Owner will not pay for change to structural, mechanical, electrical, or other systems required to accommodate manufacturer's equipment if not identified before contract award.
- F. The electrical and mechanical design is based on the power characteristics and heat releases outlined in the drawings. The Contractor shall submit with bid any power characteristics or heat releases of this equipment that exceeds those listed in the drawings. Any additions or modifications requested at a later date will be at the expense of the Contractor.

Heat release given as BTU/elevator/hour. All amperages based on 480 volt system. Maintain 50

to 90 degrees F temperature with 90% non-condensing humidity.

- G. Storage of materials: Store materials in a dry protected area. Handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration.

1.8 WARRANTY

- A. Provide warranty to replace, repair, or restore parts or components that fail or do not operate properly due to poor field or factory workmanship, engineering or design for a period of 12 months from the date of Substantial Completion. If turnover for beneficial use occurs prior to Substantial Completion, provide interim warranty/maintenance between turnover and substantial completion, so that 12 month Warranty period is maintained starting at Substantial completion.

1.9 MAINTENANCE

- A. Furnish a preventable maintenance schedule, including all testing and inspection services identified for each elevator for a period of twelve (12) months as a condition of Substantial Condition. The maintenance service shall comprise of regular examinations of the installation by competent and trained mechanics on a routine basis, and shall include all necessary adjustments, greasing, oiling, cleaning, and supply parts and accessories necessary to keep the equipment in good operating condition, except such replacement of parts made necessary by misuse, accidents not attributable to failure of equipment or workmanship, and negligence by the Owner.

~~B.~~

~~C.B.~~ A list of manufacturers recommended spare parts to be stocked (included in the unit price bid) shall be provided by the contractor for approval by the Owner as a condition of substantial completion of the elevator installation. Substantial deviators between the proposed and final inventory list may justify an adjustment to the bid price, if fully documented and approved by the Owner.

~~D.C.~~ Provide in accordance with Section 14 00 00 Escalator, Escalator Maintenance and Repair. Provide bid on a per unit basis with a monthly and annual total outlined in the Contractors bid submittal.

~~D.~~ In the event there is a conflict between this Specification and the Service Contract, the Service Contract will govern on all matters that arise after Substantial Completion.

E. If turnover for beneficial use occurs prior to Substantial Completion, provide interim warranty/maintenance between turnover and substantial completion, so that 12 month Warranty period is maintained starting at Substantial completion.

1.10 QUALITY ASSURANCE

- A. The specific product or material manufactured by any of the following listed manufacturers is "acceptable" only if the specific product or material can evidence exact compliance with the

contract documents and governing codes.

1. KONE Elevator Company
 2. Otis Elevator Company
 3. Schindler Elevator
 4. ThyssenKrupp Elevator
- B. Elevator Contractor must be able to demonstrate that it is a Manufacturer of similar elevators to those specified and which have given satisfactory service; has been in successful operation for at least ten (10) years; maintains locally, an adequate stock of parts for replacement or emergency purposes; has available qualified persons to do the work. Manufacturer means, for the purpose of this Specification section, a legal entity that is regularly engaged in the business of manufacturing the equipment required by this Specification and does not include independent "assemblers" of component parts.

1.11 PARTS AND PRINTED CIRCUIT BOARDS

- A. Contractor guarantees they will sell original manufactured parts and printed circuit boards to the Owner or the Owner's Agent. The same shall not be dependent on an exchange component.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers and dispatching are acceptable:
- | | |
|--------------------------|------------|
| 1. KONE Elevator | KCM 831 |
| 2. Otis Elevator | GCS |
| 3. Schindler Elevator | Miconic TX |
| 4. ThyssenKrupp Elevator | TAC32T |
- B. For cabs and entrances:
1. Eklunds
 2. Hauenstein & Burmeister
 3. KONE Elevator
 4. Otis Elevator
 5. Schindler Elevator
 6. ThyssenKrupp Elevator
 7. Travertine
 8. Tyler Elevator Products
- C. Type and general characteristics:
1. Review drawings for more details. In the event of conflict, drawings supersede.

~~1.~~

Building	HNTB Tag	Levels	Stops	Doors	Notes
ASC	Elevator 14.1	1 to 6	4 Stops	Front @1, 2, 4, 6	5,000 MRL Service Car, 350 fpm, Simplex Elevator
ASC	Elevator 14.2	1 to 4	2 Stops	Front @ 1, 4	5,000 MRL Service Car, 350 fpm. Non-Conveyable, Simplex Elevator
ASC	Elevator 14.3	02-06	3 Stops	Front	4,000 MRL, 350 fpm, glass, passenger
ASC	Elevator 15.1	1 to 4	3 Stops	Front	5,000 MRL Service Car, 200 fpm
ASC	Elevator 16.1	2 to 4	2 Stops	Front @2 /Rear @ 4	4,500 MRL, 200 fpm, "service shape" passenger. Occupied space below pit.
ASC	Elevator 16.2	2 to 4	2 Stops	Front @2 /Rear @ 4	4,500 MRL, 200 fpm, "service shape" passenger. Occupied space below pit.
ASC	Elevator 16.3	2 to 4	2 Stops	Front @2 /Rear @ 4	4,500 MRL, 200 fpm, "service shape" passenger. Occupied space below pit.
ASC	Elevator 18.1	2 & 4	2 stops	Front	4,000 MRL 200 fpm Passenger. Occupied space below pit.
ACS	Elevator 21.1	1 to 2	2 stops	Front	4,000 MRL, Service Shape, 200 fpm
ASC	Elevator 24.2	1, 2, 4	3 Stops	Front @ 1,4 Rear @ 1,2, 4	5,000 MRL Service Car, 350 fpm
ASC	Elevator 24.3	2 to 4	2 stops	Front	FUTURE ELEVATOR 4,000 MRL 200fpm Passenger
ASC	Elevator 24.4	2 to 4	2 stops	Front	FUTURE ELEVATOR 4,000 MRL 200fpm Passenger, Occupied space below pit.
ASC	Elevator 25.1	1 to 6	4 Stops	Front 1, 2, 4, 6	5,000 MRL Service Car, 350 FPM
ASC	Elevator 25.2	1 to 4	2 Stops	Front @ 1, 4	5,000 MRL, Service Car, 350 FPM Non-Conveyable
ASC	Elevator 25.3	2, 4, 6	3 stops	Front	4,000 MRL 350 fpm, glass passenger
<u>ASC</u>	<u>Elevator 26.1</u>	<u>1 to 2</u>	<u>2 stops</u>	<u>Front</u>	<u>"JetBlue" elevator. 4,000lb. capacity MRL; passenger-shaped, 200 FPM</u>
ASC	Elevator 28.1	1 to 2	2 Stops	Front	4,000 MRL passenger shaped, 200 fpm. Service Car.
ASC	Elevator 31.1	1 to 2	2 Stops	Front	4,000 MRL passenger shaped, 200 fpm

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C – PHASE 1 (WS110)

TRACTION ELEVATORS
SECTION 14 21 00

<u>ASC</u>	<u>Elevator 34.1</u>	<u>1 to 2</u>	<u>2 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200 FPM</u>
<u>ASC (North- COBUS)</u>	<u>Elevator 33.1</u>	<u>1 to 2</u>	<u>2 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200FPM</u>
<u>ASC (North- COBUS)</u>	<u>Elevator 33.2</u>	<u>1 to 2</u>	<u>2 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 35.1</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 35.2</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 36.1</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 36.2</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 37.1</u>	<u>1 to 2</u>	<u>2 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 37.2</u>	<u>1 to 2</u>	<u>2 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 38.1</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 38.2</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 39.1</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC</u>	<u>Elevator 39.2</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front @ 1, 2 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM</u>
<u>ASC (South- COBUS Ramp loading Connector)</u>	<u>Elevator 39.3</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200FPM</u>

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C – PHASE 1 (WS110)

TRACTION ELEVATORS
SECTION 14 21 00

<u>ASC</u> <u>(South</u> <u>COBUS</u> <u>Ramp</u> <u>loading</u> <u>Connector)</u>	<u>Elevator 39.4</u>	<u>1 to 4</u>	<u>3 stops</u>	<u>Front</u>	<u>4,000lb. capacity; MRL; passenger-shaped; 200FPM</u>
LST	Elevator 2.1	1 to 6	3 Stops (1,2,6)	Front @ 2, 6 / Rear @ 1	5,000 MRL Service Cars, 350 fpm Non-Conveyable.
LST	Elevator 2.2	1 to 6	5 Stops (1,2,3,6,7)	Front @ 2,3,6,7 / Rear @ 1	5,000 MRL Service Cars, 350 fpm; Non-Conveyable.
LST	Elevator 2.3	1 to 6	3 Stops	Front	3,000lb passenger car, 200fpm
LST	Elevator 5.1	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 5.2	1 to 4	4 stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 5.3	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 5.4	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 6.1	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 6.2	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 6.3	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 6.4	1 to 4	4 Stops (1,2,4,6)	Front	4,000 MRL Passenger, 350 fpm, Glass Cab
LST	Elevator 4.1	1 to 7	5 stops	Front	5,000 MRL Service, 350 fpm Non-Conveyable
LST	Elevator 12.1	3 to 6	2 Stops	Front	5,000 MRL, 200 fpm Service, Walk in pit
LST	Elevator 12.2	1 to 7	4 Stops	Front	5,000 MRL, 350 fpm Service
LST	Elevator 10.1	1 to 6	3 Stops	Front @ 2/ Rear @ 1,6	5,000 MRL Service Cars, 350 fpm Non-Conveyable

ORLANDO INTERNATIONAL AIRPORT
SOUTH TERMINAL C – PHASE 1 (WS110)

TRACTION ELEVATORS
SECTION 14 21 00

LST	Elevator 10.2	1 to 7	5Stops	Front @ 2, 7 / Rear @ 1,3,6	5,000 MRL Service Cars, 350 fpm Non-Conveyable
LST	Elevator 8.1	1 to 3	2 Stops	Front @ 1/ Rear @ 3	5,000 MRL, Service, 200 fpm. Non-conveyable
LST	Elevator 8.2	1 to 3	2 Stops	Front @ 1/ Rear @ 3	5,000 MRL, Service, 200 fpm. Non-conveyable
LST	Elevator 8.3	1 to 2	2 Stops	Front	3,000 MRL Passenger, 200 fpm.
LST	Elevator 6.5	2 to 6	3 Stops (2,4,6)	Front	4,000 MRL, Passenger, 350 fpm. Occupied space below pit.
LST	Elevator 6.6	2 to 6	3 Stops (2,4,6)	Front	4,000 MRL, Passenger, 350 fpm. Occupied space below pit.
LST	Elevator 6.7	2 to 6	3 Stops (2,4,6)	Front	4,000 MRL, Passenger, 350 fpm. Occupied space below pit.
LST	Elevator 6.8	2 to 6	3 Stops (2,4,6)	Front	4,000 MRL, Passenger, 350 fpm. Occupied space below pit.
GARAGE	Elevator 3.1	1-6	6 Stops	Front Only	Triplex. 7,000lb overhead geared traction. 5' center opening doors. 350 fpm See Drawings.
GARAGE	Elevator 3.2	1-6	6 Stops	Front Only	Triplex. 7,000lb overhead geared traction. 5' center opening doors. 350 fpm See Drawings.
GARAGE	Elevator 3.3	1-6	6 Stops	Front Only	Triplex. 7,000lb overhead geared traction. 5' center opening doors. 350 fpm See Drawings.
GARAGE	Elevator 4.1	1-6	6 Stops	Front @ 1,3 Rear @ 2,3,5,6	Triplex. 7,000lb overhead geared traction. 5' center opening doors. 350 fpm See Drawings.
GARAGE	Elevator 4.2	1-6	6 Stops	Front @ 1,3 Rear @ 2,3,5,6	Triplex. 7,000lb overhead geared traction. 5' center opening doors. 350 fpm See Drawings.
GARAGE	Elevator 4.3	1-6	6 Stops	Front @ 1,3 Rear @ 2,3,5,6	Triplex. 7,000lb overhead geared traction. 5' center opening doors. 350 fpm See Drawings.
<u>GTF</u>	<u>TBD1Elevator 5.1</u>	<u>3 to 5</u>	<u>3</u>	<u>Front @ 3, 5 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM; Occupied space below pit.</u>
<u>GTF</u>	<u>TBD1Elevator 5.2</u>	<u>3 to 5</u>	<u>3</u>	<u>Front @ 3, 5 Rear @ 4</u>	<u>4,500lb. capacity; MRL; service-shaped; 200FPM; Occupied space below pit.</u>
<u>GTF</u>	<u>TBD1Elevator 2.1</u>	<u>1 to 4</u>	<u>3</u>	<u>Front @ 1, 2, 4</u>	<u>5,000lb. AIA capacity; MRL; service-shaped; 200FPM; Class C platform.</u>

2.2 PERFORMANCE

- A. Speed: +/- 3% under any loading condition.
- B. Capacity: Safely lower, stop and hold up to 125% rated load. As required by ASME A17.1 Code.
- C. Leveling: +/- 1/8" under any loading condition.
- D. Door Closing Time, Force and Kinetic Energy: Comply with ASME A17.1 Code and ADA requirements.
- E. Floor-to-Floor Performance Time: Floor to floor performance time (from time door starts closing at one floor to fully opened and level on next successive typical floor, regardless of loading conditions or direction of travel). Performance requirements are based on 12' 0" typical floor-to-floor heights. Adjust times by .2 seconds for each foot of travel.
 - 1. 200 Feet Per Minute 48" Center Opening Doors: 11.0-11.5 Seconds
 - 2. 200 Feet Per Minute 54" Side Opening Doors: 14.0-14.5 Seconds
 - 3. 350 Feet Per Minute 48" Center Opening Doors: 10.0-10.5 Seconds
 - 4. 350 Feet Per Minute 54" Side Opening Doors: 13.0-13.5 Seconds
 - 5. 350 Feet Per Minute 60" Center Opening Doors: 9.5-10.0 Seconds
- F. Ride Quality:

- 1. The following parameters define the standard for quality elevator ride for the high speed elevators:

Design Speed	Adjacent Peak to Peak	Acceleration
200 FPM	17 mg (mille g's)	3.0 ft./sec ²
350 FPM	17 mg (mille g's)	3.0 ft./sec ²

- 2. Recording accelerometer tests shall be conducted on each elevator traveling at design speed between terminal landings without stopping in both the Up and Down directions with a maximum load of 500 pounds placed symmetrically in the car. Recordings shall be taken with the accelerometer on the platform in the plane of the car guide rails and perpendicular to the plane of the car guide rails. The accelerometer tests shall be made with the sensing unit placed in the center of the elevator car enclosure mounted directly on top of the car platform. The accelerometer and the recording device shall be calibrated just prior to the test, shall provide continuous direct reading on paper tape at a speed not less than 1 inch per second, shall be sensitive to the accelerations in a band width from 0.25 to 10 hertz and be equipped with an ISO2631 filter or equivalent. One set of recordings for each elevator shall become the property of the Owner as a permanent record.
 - a. The maximum horizontal acceleration permitted in each plane shall be determined from the charts of "Elevator Motion Measurement" in accordance with the following criteria and evaluation method:
 - 1) If the results exceed the maximum specified, the rail alignment, the rail joints, and the guides shall be adjusted to correct the ride characteristic in each plane separately to this maximum.
 - 2) The instantaneous acceleration recorded for a trip of the full travel of the elevator in both the Up and Down directions shall not exceed the tabulated

values. Adjacent peak-to-peak values of instantaneous acceleration shall be used to determine the zero reference line.

2.3 MACHINE ROOM EQUIPMENT

- A. Identification: Provide identifying numbers on drive, machine, governor, controller and disconnect switch, and car light disconnect switch.
- B. MRL Gearless: Elevators shall have permanent magnet gearless machines located in the overhead of the hoistway. All components shall be located so that safe and efficient access is provided from the top of the elevator car top. Machine shall be effectively isolated from the building structure.
- C. Geared Machine: The garage elevator machines shall be of the geared single wrap traction type with the motor, brake, and traction sheave mounted on a continuous bedplate. Sound isolation pads shall be installed beneath the machine bedplate to reduce vibration and noise transmission to the building structure.
- D. Motors: The motor shall be designed for elevator service with high starting torque and low starting current and be provided with devices to protect against overloading. The motor shall be of alternating current type. Motor armature shall be dynamically balanced and supported by appropriate ball or roller bearings.
- E. Brake: The brake shall be spring applied and electrically released and designed to hold the car at the floor after it has come to rest and provide smooth stops under variable loads.
- F. Governor: The car safety shall be operated by a centrifugal speed governor located at the top of the hoistway or the machine room. The governor shall actuate a switch when excessive speed occurs, disconnecting power to the motor and applying the brake application of the safety.
- G. Drive System:
 - 1. A variable voltage variable frequency AC drive system shall be provided. Power for the system will be taken from the building 3 phase power supply. The AC voltage will be changed to DC, and a power transistor inverter circuit will change the DC voltage to AC to power the elevator motor. Motor speed and torque will be controlled by varying the frequency and amplitude of the AC. A digital velocity encoder shall be provided on the motor giving feedback to the controller on motor speed and position. Provide line filters, noise spike or notching suppressors on regenerative systems to insure other computer-operated equipment in the building will not be affected.
 - 2. The system shall meet or exceed all requirements of IEEE 519 standard for general systems. The position selector shall be part of the microprocessor system. The car position in the hoistway shall be digitized through a primary position encoder. The microprocessor control system shall store the floor position and slowdown points in memory.
 - 3. The drive control system shall be a dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit accurate position/velocity feedback and shall permit a fast and accurate control of acceleration and deceleration. The vertical acceleration rate shall be not less than 3.3 ft./sec.² for speeds through 700 fpm, and 4 ft./sec.² for speeds over 700 fpm.

4. The drive shall be the Contractor's Regenerative Version, and the system shall be designed such that on emergency power there will be no regenerative power returned to the temporary power system.

H. Unintended Motion:

1. Provide a device to stop the car in case of unintended movement with the doors open or overspeed in the up direction.

2.4 AUTOMATIC TWO WAY LEVELING.

- A. Each elevator will have two-way leveling to automatically bring the car to a stop level with any floor for which a stop has been initiated, regardless of load, rope stretch or direction of travel.

2.5 NORMAL STOPPING DEVICES

- A. Provide slow-down and normal stopping devices on top of each car.

2.6 GUARDS

- A. In addition to guards for sheaves and other similar items hereinafter specified, attention is directed to the requirements relative to guarding of exposed gears, counterweights, sprockets, tape or rope sheaves, or devices of selectors, floor controllers, or signal machines, and the ropes, chains, or tapes for driving same in machine rooms, pits, car tops and secondary spaces. Kick angles shall be included around all unprotected openings in the machine room floor.

2.7 OPERATION AND CONTROL SYSTEMS

- A. Provide "Simplex Collective" operation for single elevators using a microprocessor- based controller. Operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
- B. Provide "Group Automatic" operation and control systems for each group of elevators.

2.8 OPERATION

- A. General Operation and Control: A microprocessor based control system shall be provided to perform all of the functions of safe elevator motion and elevator door control. This shall include all of the hardware required to connect, transfer and interrupt power, and protect the motor against overloading. The system shall also perform car operational and group supervisory control. Each controller cabinet containing memory equipment shall be properly shielded from line pollution. Micro- computer system shall be designed to accept reprogramming with minimum system down time.
- B. Anticipated in Rush Device: To maintain sufficient lobby elevator capacity to handle anticipated heavy in rush traffic the system shall include a device to call all of the cars in the group to the

lobby without waiting for a lobby call. The device shall only operate predetermined heavy rush periods. During these periods, cars shall be automatically dispatched from the lobby when they become loaded nearly to capacity or, if not loaded to capacity, on a variable time interval calculated on the basis of the number of cars at the lobby and other data representative of traffic in the system. The cars shall continue to operate in this manner until the end of the predetermined period.

- C. Off Peak Geographical Spacing: When the cars are at rest, they shall be assigned throughout the building to pre-determined zones. The first car entering a zone shall become assigned to that zone. A car may run through an occupied, assigned zone in search of an occupied zone in which to park. While there are no calls registered the cars shall remain in a zone parked with door closed. The lowest zone shall consist of the main floor and adjacent floor, above or below, as required to suit design requirements. The remaining floors shall be divided into equal zones with one car randomly assigned to each zone. Optimized response to hall calls shall be below, as required to suit design requirements. The remaining floors shall be divided into equal zones with one car randomly assigned to each zone. Optimized response to hall calls shall be achieved by computing a relative system response (RSR) time for each registered hall call. The computation of each car's (RSR) time to a hall call shall be based on, but not limited to, such relevant factors as distance, service to previously assigned car, and hall calls, car load, direction, door and car motion status, and coincidence of car and hall calls. The car with the least RSR shall have this call assigned to it. RSR computations for each hall call are repeated several times a second and the hall call assignment might be changed if a more suitable car is found.
- D. Moderate Up and Moderate Down Traffic programs: When incoming traffic at the lobby floor increases as indicated by two cars leaving the lobby in the up direction, filled to capacity with a predetermined adjustable time period, cars assigned to upper zones shall be called to the lobby without waiting for a lobby call. Calls shall be automatically dispatched from the lobby when they become loaded nearly to capacity or, if not loaded to capacity, on a variable time interval calculated on the basis of the number of cars at the lobby and other data representative of traffic in the system. The cars shall continue to operate in this manner until the lobby traffic has been reduced to a predetermined level. When down calls above the lobby increases to a predetermined level, assignment of a car to the lobby ceases and the lobby car shall travel up to assist the other cars. Cars arriving at the lobby, after discharging passenger shall be dispatched upward. The cars shall continue to operate in this manner until the down traffic has been reduced to a pre-determined level.
- E. Anticipated Exit Device: To prepare the system for heavy outgoing traffic, operation shall be such that upon arrival at the lobby of any car, loaded more than a pre-determined capacity during a regularly anticipated exit period, assignment of a car to the lobby ceases and the lobby car shall travel up to assist the other cars. Cars arriving at the lobby, after discharging passengers, shall be dispatched upward. The cars shall continue to operate in this manner until the end of the regularly anticipated exit period.
- ~~F. Car to Lobby Operation: Provide a key operated switch for each elevator in the Life Safety Panel which, when actuated, shall cause the corresponding elevator to make a trip to the lobby as soon as the car is available for response to the special call.~~
- ~~G.F.~~ Load Weighing Dispatching: A load weighing device shall be provided which shall dispatch the cars away from the main lobby floor when the load in the car reaches a pre-determined capacity. The load dispatch weight shall be adjustable.
- ~~H.G.~~ Load Weighing Bypass: A load weighing device shall be provided which shall be set to operate

at a pre-determined percentage of the load in the car. The car shall bypass hall calls when this device is actuated. The bypass load weight shall be adjustable and separate from the load weighing dispatch weight.

J.H. Anti-nuisance: A system shall be provided so that when the number of car calls is greatly disproportionate with the weight of the car all car calls shall be canceled without making any stops. The ratio of calls to weight shall be adjustable.

J.I. Car Button Independent Service all Elevators: A Switch shall be provided in the car operating station which, when actuated, shall disconnect the elevator from the hall buttons, and permit operation from the car buttons only.

K.J. Car Reversal Operation: A car without registered car call arriving at a floor where both up and down hall calls are registered shall initially respond to the hall call in the direction that the car was traveling. If no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite direction.

L.K. Car Delay Operation: If, for any reason, the doors are prevented from closing and the car is unable to respond to a call, the calls shall be transferred to another car.

2.9 GENERAL OPERATIONS AND CONTROL

- A. Control of the elevator shall be automatic in operation by means of pushbuttons in the car numbered to correspond to floors served, for registering car stops and by up/down push buttons at each intermediate landing and call pushbuttons at terminal landings.
- B. The momentary pressing of one or more buttons shall dispatch the car to designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which buttons are pressed.
- C. Each landing call shall be canceled when answered.
- D. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or up hall buttons have been pressed. It shall not stop at floors where down buttons only have been pressed unless the stop for the floor has been registered by a car button, or unless the down call is at the highest floor for which any buttons have been pressed.
- E. The pressing of an up button when the car is traveling in the down direction shall not interrupt the travel unless the stop for that floor has been registered by a car button, or unless the up call is the lowest for which any button has been pressed.
- F. When the car has responded to high or lowest stop, and stops are registered for the opposite direction, its travel shall reverse automatically and it shall then clear the calls registered for that direction.
- G. Should both up and down call be registered at an intermediate floor, only the call corresponding to the direction in which the car is traveling shall be canceled upon the stopping of the car at the landing.
- H. An adjustable time delay shall be provided so that after the car has stopped in response to a

hall button, the entering passenger may register his car button before the car will reverse to answer calls in opposite direction.

- I. Car station shall contain a key operated toggle switch for the car light, a fan switch and a door open button for stopping the closing motion of the doors and causing them to return automatically to their position.
- J. The buttons in the car and hall stations shall be of the light-up type and shall indicate that a call has been registered for that landing.
- K. Elevators shall have car button independent service. When a key operated switch in the car panel is activated the car shall be disconnected from the hall buttons and shall only respond to car buttons. Car doors shall be closed by pressing the door close button.
- L. Elevator Successive Starting. After all drives in a group have been shut down, only a single drive shall be allowed to start up at one time.
- M. Contractor must review elevator drawings and inventory to ensure control system's have proper operation design and functionality based on the intended use and floors served. Elevators appearing to share the same general location may or may not be grouped together.

2.10 AUXILIARY OPERATION AND CONTROLS

- A. General: In addition to primary control system features, provide the following controls or operational features for the passenger and service elevators, except where otherwise indicated.
- B. Special Emergency Service – Phase I: The activation of a key switch in a lobby level hall station shall return all cars in the group express to the designated floor and by- pass all car and hall calls. The cars shall park at the designated floor with the doors open and will not respond to car or hall calls unless the SES-II switch in the car is activated. This system shall be in conformance with the applicable ASME code. The key switch shall comply with local code requirements.
- C. Special Emergency Service – Phase II: In-car control of each elevator during the emergency operation, by means of a key switch in each car shall be provided. Operation shall be per ASME A17.1. The key switch shall comply with local code requirements.
- D. Emergency Lighting and alarm Bell (Power to Car): Remote emergency alarm bell, located where directed, so it can be heard outside the hoistway, to be arranged to sound automatically in response to activation of alarm button.
- E. Emergency lighting and Alarm Bell (No Electrical Power to Car): Car mounted 12 volt battery unit including solid state charger and testing means enclosed in common metal container rechargeable lead acid or nickel cadmium battery with 10 year minimum life expectancy. When normal power to the car fails the system shall automatically provide power to the car emergency light and to the alarm bell circuit. Operation shall be in accordance with ASME A17.1.
- F. Emergency power operation: Elevators shall be designed to operate from the stand by power system. Coordinate with MEP provider to determine the number of elevators in the group that can be run at any given time. Provide a manual key switch for selection of elevators after automatic selection occurs.

- G. Emergency Exhaust Fan: Any glass elevators located where direct sunlight can reach the cab must be equipped with a battery backup exhaust fan, three speed. Provide industry standard three speed ventilation fan elsewhere capable of providing code compliant operation based on the size of the cab.
- H. Hoistway Access Switches: Hoistway access switches shall be provide at the top and bottom landings in the hoistway door jamb as required by local code.
- I. Liftnet system: Provide Liftnet system components and all connections to communicate with the Owners existing system. Include sensor for pit water level monitoring.
- J. Auto light / fan shutdown: Provide auto shut down function for car lights and fans. Time to be field programmable.
- K. Provide door hold function in all service elevators. Activation will hold doors open for 20-30 seconds or until a door close or floor registration occurs.

2.11 GUIDE RAILS

- A. Car and counterweight guide rails, brackets and bracket spacing shall conform to ASME A17.1 Code requirements. Design brackets to accommodate offsets or variations in hoistway walls. Include ladder brackets where necessary. Rail alignment shall be within 1/16 inch. Provide rail backing and intermediate counterweight tie brackets. Provide structural steel or supports to achieve code-required rail deflection limits, as required by manufacturer's design and system. Provide intermediate structural supports as required for manufacturer's design and system. Any vertical structural members spanning between hoistway divider beams must be included in the scope of execution, if required by the selected manufacturer's design. No additional structural points of attachment other than those shown on the Contract Documents will be provided.

2.12 MACHINE AND EQUIPMENT SUPPORT BEAMS

- A. Provide structural steel beams required for direct support of and attachment to building structure of hoist machine, governor, and hoist rope dead-end hitch assemblies.
- B. Provide bearing plates, anchors, shelf angles, blocking, embedment, etc. for support and fastening of hoisting beams, machine beams, or equipment to the building structure.
- C. Isolate machine beams to prevent noise and vibration transmission to building structure.
- D. A suspension by means that cannot be physically examined shall be provided with a tool that allows inspection of the suspension means.

2.12.13 PIT SWITCH

- A. Provide a lockable pit switch adjacent to the pit ladder. Provide an additional pit stop switch where the pit depth exceeds 66 inches.

2.132.14 SUSPENSION MEANS

- A.E. Suspension means and their connections shall conform to ASME A17.1.
- B.F. A suspension by means that cannot be physically examined shall be provided with a tool that allows inspection of the suspension means.
- C.G. Provide all tools required by local codes to inspect the means of inspection

2.142.15 ELEVATOR COUNTERWEIGHTS

- A. A counterweight shall be provided for each elevator equal in weight to approximately the weight of the car plus a minimum of 40 to 45 percent of the rated load. Counterweight fillers shall be fabricated of precision flame cut steel plates. They shall lay flat in the weight frame and not rattle when the car is in motion. They shall be sized in a way to facilitate accurate balance of the elevator car,
- B. Provide Counterweight Guard where compensation is not provided and where counterweights are adjacent to other elevators.
- C. Counterweight safeties shall be provided if there is occupied space below the pit level.

2.152.16 CAR AND COUNTERWEIGHT BUFFERS

- A. Suitable oil buffers with necessary blocking and extensions shall be provided under the elevator car and counterweight. Oil buffers shall be provided with a switch that prevents the car from moving if the plunger is not in it's fully extended position.

2.162.17 OVERHEAD SWITCHES

- A. One emergency stop switch shall be located beside top access door of elevators without overhead machine location.

2.172.18 HOISTWAY DOOR INTERLOCK

- A. Each elevator hoistway door shall be equipped with a hoistway unit system hoistway door interlock. The interlock shall prevent the operation of the elevator driving machine by the normal operating device unless the hoistway is locked in the closed position. The interlock shall also prevent the opening of the hoistway door from the landing side unless the car is either stopped or being stopped. Provide door restrictors.

2.182.19 HOISTWAY DOOR UNLOCKING DEVICES

- A. Unlocking devices shall be provided at all floors where allowed by code. Escutcheons shall be provided in all openings; finish of escutcheons shall be metal and match door finish.

2-192.20 ELEVATOR COMPENSATION

- A. Compensation, when required by drive design, shall be provided for the weight of hoisting ropes and unbalanced portion of traveling cables. Such compensation shall consist of iron or steel wire ropes or Whisperflex at duties below 500 fpm attached to the underside of the car and counterweight.

2-202.21 ELECTRICAL WIRING

- A. Electrical wiring shall comply with the ASME A17.1 and NFPA 70, National Electrical Codes and all applicable local codes. Wiring shall be included for all devices installed.
 - 1. Furnish and install complete insulated wiring to connect all parts of the equipment. Properly ground all components as required by NFPA 70, National Electric Code.
 - 2. Insulated wiring shall have a flame retarding and moisture resisting outer cover and shall be run in a metal conduit, metallic tubing, or wire ducts.
 - 3. Provide 10 percent spare wires between each controller, leveling device, hoistway junction box, and control panel, also, provide 10 percent spare conductors in each trail cable; all spares shall be properly tagged or otherwise identified with clear and indelible markings.
 - 4. Tag code all field wiring at junction points; control wiring in traveling cables at their terminals in the machine room: elevator car junction box and connections within the car. Test entire wiring system for insulation to ground.
 - 5. Provide total of six (6) shielded pairs for security use in the traveling cables for each elevator. The shielded pairs shall be located in a cable which is not used to carry alternating current circuits. The shielded wiring shall extend from the top of the elevator to a junction box in the elevator machine room.
 - 6. Provide two separate stranded Coaxial Cable for camera usage. Assist in camera installation with security camera contractor, both inside elevator, on top of elevator and in control room. Coax cables shall be ran separate from elevator traveling cable and be a home run from the elevator machine room to the top of the elevator in order to reach the top back corner of the elevator with a 6 foot extra loop. The security camera contractor intends on housing converter for security wiring within the car operating panels, elevator contractor to open car operating panels to assist security provider with safe access.

2-212.22 TOP OF CAR OPERATING DEVICE

- A. Each elevator shall be provided with an operation device mounted from or on the car cross-head which will permit slow speed (150 fpm or less) operation for purposes of adjustment, inspection, maintenance, and repair. A transfer switch shall be provided in the top of the car operating device fixture, which will permit the disconnection of hoistway switch or switches and render the top of car operating device operative. The operating device shall be mounted in a metal box and shall be rigidly secured in a position conveniently accessible to workmen on top of the car and accessible from the landing side without getting on the car top.

2-222.23 LUBRICATION

- A. Suitable means shall be provided for lubrication, with oil or grease, for all bearing surfaces in

connection with the elevator installation.

2.232.24 CAR TOP LIGHTS

- A. Electric light with wire guard and GFCI convenience outlet fixture on car top, which shall meet the requirements of ASME A17.1.

2.242.25 DOOR OPERATOR

- A. A heavy duty, master door operator capable of opening door at not less than 1½" fps and accomplishing reversal in 2½" maximum door movement. Doors shall open automatically when car arrives at floor to permit transfer of passengers; after timed interval, door shall automatically close. Arrange operator so doors can be opened by hand from inside car in case of power failure, if car is within leveling zone.
- B. Door operation shall be "closed loop" system which gives constant feedback of the position and velocity of the elevator doors. System shall automatically overcome door resistance by increasing the power supply to the motor and increasing the torque required to maintain velocity. If a service tool is needed to make digital adjustments, provide the Owner with the service tool and all required manuals.

2.252.26 DOOR OPENING AND DOOR CONTROL DEVICE

- A. Provide Tri Tronics proximity type door protection for all elevators.
- B. Door open timing feature.
 - 1. Operate in conjunction with proximity devices to provide adjustable, reduced, hold open time once beams are broken and re-established.
 - 2. When doors are held open beyond an adjustable time, buzzer sounds and doors shall close at reduced speed.
 - 3. The door hold open times between car and hall calls shall be separately adjustable. Door speed, thrust and kinetic energy shall comply with the ASME A17.1 Code. Door hold open times for both car and hall shall comply with "Handicapped Requirements".

2.262.27 FINAL LIMIT SWITCHES

- A. In addition to the normal limit switches, a hoistway final limit switch shall be installed at the top and at the bottom of each hoistway.
- B. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the time the buffer is engaged by the car or counterweight.

2.272.28 CAR FRAME AND SAFETY

- A. Car frame shall be fabricated from formed or structural steel members and shall have adequate

bracing to support the platform and car enclosure. The car safety shall be an integral part of the car frame with safety blocks located in the bottom members of the car frame. The safety shall be flexible guide clamp type. Car frame shall be designed for Class A loading for all passenger use elevators and Class C loading for all service elevators.

2.282.29 PLATFORM

- A. The car platform shall be constructed of steel with $\frac{3}{4}$ " plywood sub-floor and fire proofing on the underside. The platform shall rest on rubber pads designed to form an isolating cushion between the car and car frame. Coordinate sill height with flooring. Design platform for Class A loading for all passenger use elevators and Class C loading for all service elevators.

2.292.30 ROLLER GUIDES

- A. Rubber synthetic tired roller spring guides, set in adjustable castings, shall be mounted on the top and bottom of the car and counterweight to engage the guide rails.

2.302.31 CAR DOOR HANGERS AND TRACKS

- A. Hang doors on sheave type hangers with polyurethane rollers that roll on a polished steel track and guided at the bottom by non-metallic shoes sliding in a smooth threshold groove. Minimum two shoes per door panel.

2.312.32 CAR DOOR ELECTRICAL CONTACT

- A. Shall operate in conjunction with car door so elevator cannot operate unless doors are closed or within the tolerance allowed by Code.
- B. A car door interlock shall be provided for all glass elevators to prevent car door from being opened out of the locking zone given there is no fascia requirement.

2.322.33 HOISTWAY ENTRANCES

- A. Entrances shall be complete with frames, doors, sight guards, sills, fascia plates, toe guards, headers, struts, hanger covers, tracks, hangers, miscellaneous hardware and related parts. Entrances shall carry UL label for Class "B" 1 ½ hour fire rating (or approved equal). Entrance profiles, finishes and details as shown on the drawings.
- B. Frames: Frame finish for all entrances shall be satin stainless steel, see architectural drawings.
- C. Doors and Sight Guards: Provide horizontal sliding doors of flush construction and sound deadened. Doors shall be fabricated from a minimum of #16 gauge satin stainless steel, unless the cab is specified to be a glass cab with glass cab doors, at which point the hoistway doors shall have a portion of glass with a stainless trim extending at least 4 inches around the entire door. Glass shall adhere to ASME A17.1 requirements, and meet design requirements shown in Contract documents.

- D. Sills: Extruded nickel silver at all floors. Sills shall be level with finished floor.
- E. Sill Supports: Any support angles required shall be furnished and installed by the elevator contractor.
- F. Hanger Supports: Hanger supports or headers shall be formed sections securely bolted to the strut angles.
- G. Fascia Plates: Concealed fascia plates shall be steel, material reinforced to insure a flat even surface throughout, and shall be securely fastened to hanger housings and sill above. Fascia plates shall be finish painted with one coat of rust inhibitive prime paint or of galvanized material.
- H. Struts and Closers: Structural steel angles and other similar methods shall be furnished of sufficient size to accommodate the door closers. Angles shall be continuous and be securely bolted to the sills and building beams above.
 - 1. Hoistway door closers for all elevators shall utilize Smart-Tork reel closures to ensure varying building air pressure does not impact the elevator door closing performance.
- I. Header: 3/16" thick steel formed to provide stiffening flanges.
- J. Door Hangers and Tracks: Hangers for each hoistway entrance shall be of the sheave type arranged for two point suspension of the doors, and shall have brackets integral with door, or applied. Sheave and rollers shall be of steel with sealed ball bearings and there shall be adjustable ball bearings rollers to take up thrust of doors. Tracks shall be cold drawn or cold rolled steel of smooth surface and working section and shall be oiled with wick type lubrication. All hanger assemblies must have door retainer devices at top and bottom of hoistway doors.
- K. Hanger Cover Plates: Shall be made of steel and shall be removable type. Cover plates shall be arranged to assure hanger accessibility from within the car. Cover plates shall be finish painted with one coat of rust-inhibitive prime paint.
- L. Floor Numbers: Provide floor numbers within the hoistway in compliance with ASME A17.1 Code.
- M. Guides: Each door panel shall contain two gibs with fire tabs.
- N. Jamb and Plates: Provide cast plates on each elevator entrance jamb in compliance with requirements of A.D.A. Submit sample for approval.

2.332.34 PASSENGER CAR ENCLOSURE

- A. Passenger Car interiors as shown in the Architect's drawings and standards described further herein. Provide custom cab interior finishes, custom cab shells, as required to comply with design shown in Contract documents.
- B. Provide self-contained roof top air conditioners for parking garage elevators. Place thermostat and controls in cab service cabinet. Include top mounted condensate boiler system to vaporize condensation water.

- C. Ventilation: Morrison Products, Inc. three-speed model or pre-approved equal that meets the noise and vibration requirements as well as air flow volume requirements dictated by code. Provide auxiliary power for ventilation on glass observation elevators.
- D. Cab shells shall be constructed of a minimum of 14-gauge re-enforced satin finish stainless steel formed panels. Elevators feature Glass walls shall include glass that meets ASME 17.1 requirements.
- E. Canopy: Reinforced 12-gauge furniture steel formed panels with lockable, contacted, hinged emergency exit. Interior finish white reflective baked enamel.
- F. Front and Rear Return Panels: Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin stainless steel.
- G. Entrance Columns and Transom: Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin stainless steel.
- H. Canopy: Reinforced 12-gauge furniture steel formed panels with lockable, contacted, hinged emergency exit.
- I. All materials must meet applicable code requirements, including but not limited material flame spread application and glass enclosure code requirements.
- J. See Architectural drawings and material specifications for additional details.

2.342.35 SERVICE CAR ENCLOSURE

- A. Flooring: ¼" stainless steel checker plate over 3/4" thick marine plywood sub-floor.
- B. Canopy: Reinforced 12-gauge furniture steel formed panels with lockable, contacted, hinged emergency exit. Interior finish white reflective baked enamel.
- C. Front and Rear Return Panels: Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin finish stainless steel.
- D. Entrance Columns and Transom: Reinforced 14-gauge furniture steel clad with minimum 16-gauge satin finish stainless steel.
- E. Shell/Side/Rear Wall Finish: Heavily Reinforced 14-gauge satin finish stainless steel formed panels no more than 18" wide with light-proof joints. There shall not be any flex to the panels if reinforced sufficiently. Apply sound deadening mastic to exterior.
- F. Lighting: LED flat lighting fixtures flush mounted in canopy with expanded metal protective diffuser and steel guard over fixtures on car top. Provide protective covers. Lighting shall not be impacted by cab extension provisions that may exist. Lighting shall achieve 200lx at floor of interior.
- G. Handrails/Guardrails: Two lines. Top handrail line minimum 1½" diameter stainless steel grab bar with backing plates and captive nuts. Lower guardrail line 4" x 3/8" solid stainless steel flatstock bars mounted on both sides and rear of the car. Locate bottom guardrail line at 8"

above car floor and handrail line at 32" above the car floor. Bolt rails through car walls from back and mount on 1½" deep solid round stainless steel standoff spacers no more than 18" O.C. Return handrail/guardrail ends to car walls. Note: for rear opening elevators, rear hand and guardrails not required.

- H. Ventilation: Provide inconspicuous ventilation means to comply with Code.
- I. Pads and Permanently Mounted Hooks: Removable pads. Two pads covering side walls and adjacent front returns and one covering rear wall. Provide cutouts to access main car operating panel and fire service panel. Color to be determined by Facility.
- J. Cab Interior and Door Opening Dimensions per Architectural Drawings.

2.352.36 CAR DOORS

- A. Car doors shall be 1 inch thick, of flush design metal construction, with interior reinforcing and sound deadening insulation. They shall be adequately reinforced to withstand operational stresses and as required to accept hangers, interlocks and other accessories.
 - 1. The finish of the car doors shall be as detailed in the architectural drawings.
- B. The car door system shall be designed so that the car doors may not be opened more than 4" from the inside of the car if the car is outside the unlocking zone of a landing.
- C. Car door guides: Car doors shall have a minimum of two gibs per panel.
- D. Car sills: Car sills shall be extruded nickel silver.
- E. Infrared door protection: The contractor shall furnish and install only Tri-Tronics model infrared safety edges. Interruption of one or more of the beams shall cause the doors to stop and reopen.

2.35 EMERGENCY EXITS

- A. All cars shall have ceiling emergency exits. Including interlocks as required by ASME A17.1 Code.

2.36 HALL BUTTON FIXTURES

- A. Elevators shall have two (2) flush mounted pushbutton fixtures at each floor when more than one elevator is present, otherwise where single (simplex) elevators are present, provide one (1) flush mounted pushbutton fixture at each floor level. Where designated by architectural drawings, provide custom fixture, fixture housing, fixture location and or fixture installation coordination with other trades.
- B. Passenger Elevators: Provide EPCO WA-9PC or pre-approved equal. Include up and down arrow integral with button face. Illumination shall be white.

- C. Service Elevators: Provide buttons as specified in the car operating panel
- D. Include rated boxes and wiring as required.
- ~~E. Include integral fireman's phone jacks. Include all wiring and conduit to Life Safety Panel.~~
- F.E. Including phase I key with, Phase I engraved instructions and emergency power jewel in first floor hall station. Coordinate key switch with existing switches.
- G.F. Provide emergency communication phone line monitoring device in accordance with code requirements in first floor hall station.
- H.G. Provide engraved "flame" emergency signage integral with hall pushbutton fixtures in accordance with code requirements.

2.37 HALL LANTERN FIXTURES

- A. Provide a hall lantern with an audible signal at each landing entrance for each elevator. The lanterns, when illuminated, shall indicate which elevator car will stop at the landing and in which direction the car is set to travel. When the car reaches a predetermined distance from the floor where it is going to stop, the corresponding hall lantern shall illuminate and the gongs sound once for up and twice for down. The hall lantern shall remain illuminated until the car doors close in preparation for leaving the floor. Provide on all floors.
 - 1. Faceplates shall have a satin stainless steel finish.
 - 2. Provide LED bulbs arrow indications.
 - 3. Shall be easily visible from anywhere in the corridor area.
 - 4. Fixtures design shall be pre-approved by GOAA and in accordance with the ITF and PDL elevators as well as in accordance with the architectural drawings.
 - 5. Illumination shall be green in the up direction and red in the down direction.
 - 6. Fixture shall be vandal resistant for service elevators, 7 jewel type design arrows.
 - 7. Fixture shall be digital type lantern for passenger elevators.
 - 8. Fixture shall have flush design.
 - 9. Hall Lanterns must be designed with gongs/chimes that can be heard clearly within a noisy airport corridor space. Volumes must be set to the maximum level.

2.38 CAR POSITION INDICATOR

- A. The elevators shall have one digital readout fixture, with 2" high characters, above each car operating panel.
- B. Fixtures shall be LED type and include floor sounding adjustable electronic chime of no less than 20 Decibels at not more than 1500 hertz, shall sound as the car is passing or stopping at a floor.
- C. Electronic Voice Annunciator shall have a selectable voice male or female and be able to announce floor, floor selection and direction of travel.
- D. Illumination of LED digital fixture shall be red.

2.39 CAR OPERATING PANELS

- A. The elevators shall have the following quantity of custom car operating panels:
1. Center Opening, Front Only Doors: Two (2) Car Operating Panels
 2. Side Opening, Front Only Doors: One (1) Car Operating Panel
 3. Center Opening, Front and Rear Doors: Four (4) Car Operating Panels
 4. Side Opening, Front and Rear Doors: Two (2) Car Operating Panels
 5. Glass Enclosure Elevators to utilize an applied car operating panel with 45 degree angled metal edge with security fasteners, positioned on the side walls in between glass panels as shown in architectural drawings.
 6. Remaining car operating panels are to be full swing car operating panels.
 7. All car operating panels to have satin stainless finish.
- B. The car operating panels shall include the following:
1. Passenger Elevators: Self-illuminating floor registration elongated metal faced bar buttons. Match design of current GOAA ITF & PDL elevators. Buttons shall have floor designation engraved. Buttons shall illuminate white. Provide EPCO RB-9 button or pre-approved equal. Alarm, door control buttons shall be EPCO SSL-PC button or pre-approved equal.
 2. Service Elevators: Self-illuminating floor registration vandal resistant metal buttons. Match design of current GOAA ITF & PDL elevators. Buttons shall have floor designation engraved to the side of the button in 1" letters. Buttons shall illuminate white. Provide EPCO SURVPL-SPC button or pre-approved equal. Alarm, door control buttons shall be EPCO SURVPL-SPC button or pre-approved equal.
 3. Firefighter's key switch, pilot light, call cancel and buzzer in a locked cabinet with graphics as required by local code. Key cabinet to match existing units.
 - ~~4. Jack for Firefighter's headset. Include wiring to fire control panel.~~
 - ~~5.4.~~ All buttons shall be designated by raised markings with Braille, applied with concealed fasteners to meet ADA requirements. Stick-on markings are not acceptable.
 - ~~6.5.~~ Engraved elevator number, Phase II fireman's instructions, no smoking sign and elevator capacity on each faceplate or return panel as required by local code.
 - ~~7.6.~~ Lockable service cabinet containing controls for fan switch, car light switch, light rheostat, independent service, inspection service, 120 volt convenience outlet and incorporate an Emergency light test button. Cabinet lockset to be Illinois type F315 keyed.
 - ~~8.7.~~ ADA hands free phone compatible with Owners existing systems shall be flush mounted in the swing front return.
 - ~~9.8.~~ Logos or manufacturer's name are not permitted on exposed surfaces.
 - ~~10.9.~~ Certificate holder compatible with the certificate furnished by the AHJ.

2.40 COMMUNICATIONS SYSTEMS

- A. The emergency communication system shall be mounted behind the main car operating panel and be designed to provide two-way communication between the elevator and a point outside the hoistway. Audio and visual two-way communication is required. System shall automatically dial a programmable number to a point outside hoistway.
- B. Visual messages shall be provided to indicate the status of an emergency call. The visual message will illuminate and shall read: "Message Received" when the emergency call button is pressed.

- C. Raised letter and Braille shall be integrated and permanently marked on the faceplate identifying the device as a speech independent emergency telephone. Surface painted or applied graphics shall not be acceptable.
- D. Emergency communication system must be able to provide receiving agent with information identifying building and elevator number whenever an emergency call is placed.
- E. Emergency communication system shall comply with Federal Communication Commission (FCC) regulations and Americans with Disabilities Act (ADA).
- F. When the party called by someone in the cab hangs up, the telephone shall disconnect immediately without giving a busy signal in the cab.
- G. The instruments shall be designed in a way that up to six (6) instruments can operate on a single telephone line and provide connection to all six (6) cars at the same time.
- H. The system shall have the ability to communicate from Machine room to each individual car.
- I. System shall be compatible with Owner's existing systems.

2.41 SMOKE SENSOR TIE-IN

- A. System to interface with smoke sensors, including alternate level refuge. (Others will run wiring from the smoke sensors to the elevator machine room interface where the elevator contractor connects to their controls).
- B. Elevator contract to provide all necessary interface equipment with their submittal drawings.

~~2.42 LIFE SAFETY PANEL~~

- ~~A. Elevator bid price shall include the cost of all wiring and conduit from various elevator banks to the fire command panel. Faceplate shall be No. 4 finish stainless steel. Life safety panel shall include all elevators.~~
- ~~1. One fireman's SES switch (on/off) per elevator bank.~~
- ~~2. Jack for Firefighters Communication Devices.~~
- ~~3. Emergency power pilot light and interlocking push button switches for Fireman's override of the automatic selection system, buttons to be behind lockable door.~~
- ~~4. Communication system as required by local code.~~

2.432.42 SECURITY INTERFACE FOR ELEVATORS WITH CARD READERS

- A. Elevator contractor shall provide cut-out in the COP faceplate (including mounting studs) with a tinted non-scratch flush mounted window and space behind within each elevator that requires a security cardholder. Refer to the security section. The security contractor shall furnish the card reader or key pad to the elevator contractor for mounting. The elevator contractor shall provide all required mounting accessories and shall mount the card reader within the elevator cab.

Brackets to hold the card reader in place shall be durable and non-metallic.

- B. The security contractor shall co-ordinate with the elevator contractor to connect the traveling cable provided by the elevator contractor within the elevator cab to the mounted card reader. The elevator contractor shall provide and mount glass panel to cover the mounted card reader. Mount the card reader so the window panel is flush to the front of the swing front return.
- C. The security contractor shall connect the traveling cable provided by the elevator contractor within the elevator machine room to the security remote field panel.
- D. The security contractor shall provide an interface panel within the elevator machine room. This panel shall contain two terminal strips. The security contractor shall label the terminal strips with the required connections from the elevator controller. The elevator contractor shall wire from the elevator controller to these terminal strips. Coordinate with the security contractor to provide all required connections and compatible low voltage contact closures from the elevator controller to this terminal strip to allow the following operation:
 - 1. Signal from the security system to initiate elevator control by the card reader.
 - 2. On card reader mode: The security system shall indicate to the elevator controller which floors are selectable by the cardholder within that elevator. The elevator controller shall enable those floor selection buttons only. When a floor is selected, the elevator controller should disable all other floors from being selected and signal the security system that a selection has been made.
 - 3. Signal from the security system to remove the elevator from under card reader control to normal operation.
- E. Submit an alternate price at bid if this interface can be accomplished via an RS-32 protocol interface.

2.442.43 ELEVATOR MANAGEMENT SYSTEM

~~B-A.~~ For all of the vertical transportation herein, a Lift-Net Elevator Monitoring and Management system shall be provided. The system shall comply with the requirement's set forth herein and shall include a monitoring system in each machine room and connected to existing Lift-Net system in central command.

- ~~C-B.~~ General: Provide an interactive system to monitor and manage the elevator equipment ("units") hereinafter called "system." Data collection, data storage, and real-time monitoring portion of the system shall be based on Microsoft Windows and be able to run on Windows 2000 Pro, XP Pro, or later operating systems. Provide the following features:
- A. Network based, capable of interfacing with control systems via either serial data link or hardwired interface connections.
 - B. Operate on any TCP/IP based network system including but not limited to an Ethernet, Token Ring, Arc-Net, Lift-Net, etc.
 - C. Expansion capability to add unlimited number of monitoring terminals on the network.
 - D. Monitoring terminals shall operate peer-to-peer or with a single client server. Failure of a single network device shall not affect the operation of the remainder of the system.

- E. Complete backup of system data shall be accomplished at any single terminal/server location.
- F. Display multiple banks, including multiple buildings, on a single monitoring terminal screen.

D.C. Monitoring Display: The system shall be capable of simultaneous monitoring of at least five hundred units on a single monitoring station utilizing a graphical representation of a plan view of the facility. Each elevator shown on the plan view shall be individually displayed and shall be visible on the monitoring system display terminal without the need to scroll. Each individual unit, when operating “normally,” shall be displayed in green. In the event of a malfunction of any individual unit, the unit shall be displayed by a red blinking light on the monitoring system display. Units which are intentionally placed out of service shall be shown as yellow in the display mode. When malfunctioning units, or units intentionally placed out of service are returned to normal operation the graphical representation for that unit(s) shall automatically return to green. The user shall have the ability to display additional information, such as the cause of fault/alarm, for all units by selecting the unit with a “mouse click” from the plan view of the facility. All monitored units shall be visible from any monitoring terminal on the network. Entry into the network shall be multi-level password protected.

E.D. System Capabilities:

- A. The system shall be capable of real time display of all monitored status points on all monitored equipment. Fault and event notification screens and audible alarms shall be immediately displayed on selected monitoring stations. Different fault and event tables shall be defined on a per-bank basis. The system shall collect and store all status, fault, and event information for later reporting and analysis. The system shall provide statistical analysis of hall call response times, traffic patterns, fault conditions, service logs, and security usage in graphical and tabular format.
- B. The system shall maintain a record of every status point change occurring on the monitored equipment and provide the ability to replay these events in a simulation at a later time in real time, slow speed, single step, reverse, or fast forward. This information shall be retained for a period of at least twenty-six weeks and a mechanism shall be provided whereby this information may be archived.
- C. The system shall store traffic fault and statistical data for a period of at least three (3) years. The system shall log error type, car number, floor position, and major system status points whenever a fault or logged event occurs.
- D. The system shall provide interactive control of certain features provided in the elevator control system. These features may be revised as the requirements of the building change. Some of these interactive controls may include, but are not limited to: Security floor lockouts, entering car and hall calls, Firefighters’ service, lobby recall, VIP service, up/down peak service, etc.
- E. In the case of a power failure the system shall be capable of connecting to emergency power back-up unit. The loss of power shall not affect any stored data. The system shall have the capability to detect the loss (disconnect) of any individual unit from the monitoring system by periodically polling all units to ensure that normal communications between the unit(s) and the terminals/server are maintained.
- F. The system will automatically re-boot the program and continue to operate after a power loss or other system malfunction.

F.E. Monitoring Equipment: The monitoring equipment shall have these minimum characteristics:

- A. Monitoring Station Hardware: Provide a monitoring station in each machine room and on for each facility in central command.
 - a. Central Processing Unit: IBM compatible microcomputer – desk top or mini-tower (multiple machine rooms or lobby displays)
 - b. Type: Pentium or most current high-performance processor
 - c. Speed: Most current high-performance
 - d. Internal Hard Drive: Adequate storage for three years data for entire system
 - e. Modem: Most current high-performance
 - f. Display Monitor: 19" – 20" LCD flat panel, color, capable of simultaneous display of all monitored units
 - g. Printer: Current HP Color Desk Jet Series
 - h. Keyboard: MS Windows compatible
 - i. Mouse: MS Windows compatible
 - j. Power Requirements: 90-230 Volts AC, 50-60Hz @ 8A
- B. Monitoring Station Operating System Software
 - a. MS Windows 2000 Pro, XP Pro, or later
 - b. MS Windows 2000 Server or later

G.F. Network requirements:

- A. Maximum local network rated distance (2-20 gauge shielded TP): > 10 miles
- B. Elevator Contractor shall provide assistance to Network Contractor with installation of network system in elevator equipment spaces at no additional cost.
- C. Elevator Contractor is responsible for material and labor required for the connectivity and testing of all elevator management
- D. Refer to Division 28 for Network information.

H.G. Monitoring Requirements: The system shall display and record the following information for each monitored unit. Serial data links may include many more points. Items listed below are minimum requirements.

- A. Group status:
 - a. Group operational mode
 - b. All units to be monitored on the same screen in a graphical format
 - c. In/out of service
 - d. Standby power
 - e. Supervisory failure
 - f. Location and direction of hall calls
 - g. Shunt Trip status.
- B. Individual car status, expandable menus:
 - a. Direction of travel
 - b. Independent service
 - c. Inspection service
 - d. Firefighters' service
 - e. Position of elevator
 - f. Door status (open, opening, closing, closed)
 - g. Door dwell time
 - h. Load by-pass
 - i. Standby power
 - j. Power on/off
 - k. Door detector
 - l. Safety circuit
 - m. Door zone

- n. Stop switch
- o. Alarm button
- p. Registered car calls
- q. Out of level
- r. Machine room temperature exceeds 95 degrees
- s. Stop counter (number of starts)
- t. Car speed
- u. Door open times
- v. Door close time
- w. Start to stop motion time
- x. Emergency 2-way communication device
- y. Air conditioner/heater
- C. Keyboard, mouse, and time clock control capabilities:
 - a. Floor lockouts (car or hall)
 - b. Lobby recall
 - c. VIP service
 - d. Firefighters' service
 - e. Up/down peak
- D. Faults monitored with visual and audible alarm, triggered by combinations of any of the above status points:
 - a. Safety circuit
 - b. Alarm bell
 - c. Stop switch
 - d. Emergency 2-way communication device
 - e. Door reversal device
 - f. At least six (6) user selectable faults or events (i.e. water in pit, high machine room/cab temperature)

4.H. Reporting Requirements: System shall provide reports in color graphical format both on-screen and in printed form capability to conveniently switch from one report type to another and from one bank to another using minimal mouse clicks and key strokes. Reports shall be displayed after minimal waiting time. Data for all reports shall be continuously recorded and stored. Reports shall be displayed by simply selecting a date and time range, bank of equipment and report type. Date and time range selections shall carry forward from one report selection to the next. Reporting functions shall be sub-divided into the following categories:

- A. Traffic Reports:
 - a. Number of hall calls per floor (hall call distribution on a per floor basis)
 - b. Number of hall calls per hour (24 hour time-line)
 - c. Hall call waiting times per floor (hall call waiting time distribution on a per floor basis)
 - d. Hall call waiting times per hour (24 hour time-line)
 - e. Distributed hall call response graph (24 hour time-line)
 - f. Detailed hall call response graph (% calls / n seconds)
 - g. Longest wait times including floor #, wait time, date, time and direction
- B. Fault Reports:
 - a. Ten most recent faults (most recent faults listed per bank)
 - b. Fault Log: Displays the entire fault log for a given time period
 - c. Faults per car (fault distribution on a per car basis)
 - d. Faults per floor (fault distribution on a per floor basis)
 - e. Faults per day/week/month (fault distribution on a per unit or group basis)
- C. Car Use Statistics:

- a. Car use by hour (24 hour time-line of car calls, car starts, door cycles, delayed car, load by pass)
- b. Car use statistics (same as above, shown for an entire bank)
- D. Group Service Log:
 - a. Cars in service (24 hour time-line with text log of group availability of each car)
 - b. Group functions (24 hour time-line with text log of actuation of group functions – Up peak, down peak, fire service, emergency power, etc.

J.I. Interactive Features: The control system shall be capable where desired of operating interactive control features provided in the elevator control system. These features may be revised as the requirements of the building change. Some of these interactive controls may include but are not limited to: security floor lockouts, entering car and hall calls, Firefighters' return service, lobby recall, VIP service, up/down peak or hospital Code Blue service. Local codes may affect the availability or operation of these features.

- A. Security Access Features: The monitoring system shall be capable of providing security enable/disable of all hall and car calls through on-screen menus at a minimum. The monitoring system shall also be capable of interfacing directly with card readers and security keypads in stand-alone mode, and indirectly through a serial interface with a third party security system. When in stand-alone mode, the monitoring system shall maintain a database of elevator users and security pass codes. When on secure mode the use of each elevator will be recorded in a file together with the time, authorized pass code and destination for each call.
- B. Elevator Control Features: Each elevator shall be capable of being controlled through the monitoring system. All control points shall be capable of seven-day twenty-four hour time clock automatic operation or manual operation from the mouse and keyboard. The control points shall include, but not be limited to, the following (where allowed by local codes):
 - a. Lobby recall
 - b. Car call security lockout
 - c. Hall call security lockout
 - d. Independent service
- C. Paging Feature: The monitoring system shall be capable of paging a service technician or other personnel based on pre-defined parameters of elevator faults or conditions. The paging system shall provide the ability to page multiple numbers determined by the type of event triggering the notification and shall be able to page different numbers based on preset times of day (i.e. different shifts). The system shall be capable of sending text messages to full text pagers in addition to supporting standard DTMF pagers.
- D. Remote Access Feature: The monitoring system shall be capable of allowing approved individuals under multi-level password control to access all system features via the local area network, internet, or via modem over the public telephone network to review the performance of the equipment or to evaluate a fault condition. The remote access feature shall be integrated into the monitoring system and shall not use third party "remote control" software products.

K.J. Elevators to be integrated into existing Lift Net monitoring system and communicate to the Central Control room of the facility. Coordinate use of LAN with the Owner. For non LAN functions provide wiring and conduit for all components furnished.

- L-K. Lift-net system shall be connected to a new USP power back up system furnished fully by Elevator Contractor.

PART 3 – EXECUTION

3.1 SCOPE

- A. Installation shall meet all of the standard requirements outlined herein and inspection, tolerances, and qualifications. All work required for completion of a first-class installation is the responsibility of the Contractor, even if not included in this specification.
- B. Labeling of disconnects with feed location information and shunt trip locations to be by the elevator contractor.

3.2 HOISTWAYS

- A. Entire front of hoistway will be left open until the hoistway entrances have been installed. After the guide rails have been erected and aligned, install frames in alignment with the guide rails, after which the wall may be completed. Coordinate this phase of the work to provide minimum delay in completion.

3.3 PAINTING

- A. All elevator equipment not painted, located within the machine room or hoistway, shall be given a finish coat of paint. Material that has factory finish paint shall have all scratches or mars repainted after installation. Any galvanized finishes do not need to be painted.
- B. Finish coat shall have hard, tough semi-gloss surface.
- C. Elevator machine room and pit floors shall be painted with an oil resistant polyurethane high gloss enamel paint or approved equivalent. Color shall be terra cotta (Tough Shield #1231-108) or approved equivalent.

3.4 CLEAN UP

- A. Remove trash daily from hoistways, pits, and machine rooms including all packing material and debris resulting from this work. Leave all elevator spaces broom clean.

3.5 ACCEPTANCE TESTING

- A. Tests shall be performed by the Elevator Contractor at his expense in the presence of the Owner's representative. The elevators shall be subjected to the following acceptance inspection and tests:

- 1. Inspection and tests required by applicable portions of Requirements, 1.03.

2. Inspection and tests required by Federal, State, and Local codes and ordinances.
3. Test safety circuit, loop circuit, and the drive circuits at 500 volts. Minimum resistance to ground shall be one megohm.
4. General riding quality, leveling accuracy, and quietness of operation shall be acceptable to the Owner's representative.

3.6 USE OF ELEVATORS

- A. The elevators shall not be used for construction purposes or during the period prior to turning over the project to the Owner, without Owner's written authorization. Should the elevators be authorized for temporary use, the following conditions shall apply:
 1. The Elevator Contractor shall provide a temporary acceptance form for the user to sign.
 2. The Warranty period commences upon Substantial Completion and GOAA receives and approves the recommended spare parts list and staffing plan, regardless of any temporary use agreement.
 3. The user shall provide, if job conditions require, all temporary enclosures, guards or other projection of the hoistway openings, power, signal devices, car lights, protection of any elevator entrances, cars, fixtures, and any other equipment that is installed.
 4. The user shall return the elevators in the same condition they were in when placed on temporary service and shall pay the Elevator Contractor for repairs or clean up.
 5. The user shall allow the Elevator Contractor to perform routine maintenance or repairs.
 6. The cost of temporary service shall be worked out between the Elevator Contractor and the user.
- B. As elevators are completed, the Owner shall have the prerogative of accepting and using them, shutting them down, or accepting them under an Interim Service Agreement described below:
 1. The Owner shall have the prerogative of continuing the Interim Service Agreement until all elevators in the group (or building or APM/ITF Programs) are completed.
 2. The Warranty period commences upon Substantial Completion and GOAA receives and approves the recommended spare parts list and staffing plan, regardless of any Interim Use Agreement.
 3. Cost of interim service shall not exceed the prorated unit price for Year One included on the Bid Form.

3.7 INSTRUCTIONS TO OWNER

- A. Before final acceptance, Contractor shall instruct Owner's personnel how to use elevator during automatic operation, independent service, secured mode and fireman's service.

3.8 ACCEPTANCE

- A. Final acceptance of the installation shall be made only after all field inspections and tests are complete, punch list items are complete, all Owner's information items listed in 1.4 have been furnished, and the Owner's representative is satisfied that the installation has been satisfactorily completed.

END OF SECTION 14 21 00

SECTION 14 24 00 - HYDRAULIC ELEVATORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Division includes:

1. ASC: Provide one (1) Hydraulic Freight Service Elevator.
2. Coordinate the work of this Division with work of other Divisions as required to properly execute the work as necessary to maintain satisfactory progress of the work of other Divisions.

- B. Related Work (to include but not limited to the following by other trades):

1. Elevator pit, including sump with pump, elevator machine foundation with block-outs in machine room floor slabs and other similar concrete work such as grouting thresholds.
2. Hoistway enclosures, including cutouts for elevator equipment and components penetrating enclosures, building in and grouting hoistway door frames, grouting thresholds.
3. Structural steel work, including intermediate floor framing where floor height exceeds 14 feet, elevator pit ladders, elevator buffer ladders and/or platforms (as required by pit depth), railings, wire mesh partitions, machine room floor grates and hoisting beam(s) at top of the elevator machine room, and/or hoistway.
4. Waterproofing of elevator pits.
5. Machine room heating, ventilation and air conditioning and temperature control of the machine rooms, hoistway ventilation and sprinklers to meet applicable Codes.
6. Electrical service to fused lockable main disconnects in elevator machine rooms and/or machine or control spaces or closets; electrical service to fused lockable disconnect for each elevator's car lighting; electrical power for elevator installation and testing; electrical disconnecting device to elevator equipment prior to activation of the sprinkler system; electrical service for the machine room (spaces, or closet); receptacles with ground-fault current protection in machine room (spaces, or closet), secondary areas, hoistway, and pit; lighting in the machine room (spaces, or closets), secondary areas and pits; wiring for telephone service to the machine room (spaces, or closet).
7. Standby-power supply systems including emergency generators and transfer switches for elevator operation. An electrical control connection needs to be established between standby power system and elevator controls. Additional control features need to be included in electrical switchboards, and transfer switches.
8. Standby power of normal voltage characteristics via normal electrical feeders to run elevators at full-contract car speed and capacity.
9. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer

switch to a designated elevator control panel. Provide a time delay of 30 - 45 seconds for pre-transfer signal in either direction.

10. Standby single-phase power to group controller, and each elevator controller for car lighting, exhaust blower, emergency signaling device, air conditioner unit (if equipped with one).

11. Standby power to machine room, and pit lighting.

12. Standby power to machine room ventilation or air conditioning.

13. Standby power to emergency communications devices.

7. —

8-14. Fire alarm systems including fire initiated devices and interconnecting devices; fire alarm signal lines (main, auxiliary, and machine/control room, space, or closet to contacts in the machine/control room, space, or closet.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels and indicators.
 2. Cab design, dimensions and layout.
 3. Hoistway door and frame details.
 4. Electrical characteristics and connection requirements.
 5. Expected heat dissipation of elevator equipment in machine room, control space or closet.
- B. Shop Drawings: Submit no less than five copies (unless otherwise directed by the architect) of approval layout drawings. Include the following:
1. Driving machine, controller, governor and other machine or controller room component locations.
 2. Car, counterweight, sheaves, guide rails, buffers, suspension means, and other components in hoistway.
 3. Rail bracket spacing; maximum loads imposed on guide rails requiring load transfer to building structural framing.
 4. Load reactions at all points of support.
 5. Location of hoisting beams for machine room equipment.
 6. Clearances and over travel of car and counterweight.
 7. Locations in hoistway and machine room of traveling cables and connections for car light and telephone.
 8. Location and sizes of access doors and frames.
 9. Hoistway door and frame details
- C. Samples: All exposed materials with finish and all custom fixture fabrications.
1. Omit all logos from exposed finishes or components.
 2. All cab finishes.
 3. All entrance finishes
 4. Of handicapped Braille tags for car and hall buttons
 5. Of handicapped Braille plates for hoistway door jamb

- D. Maintenance Data: Provide written information necessary for proper maintenance and adjustment of the equipment prior to final acceptance as follows:
1. Straight line wiring diagrams of as-installed elevator circuits with index of location and function of all components. Leave one set in machine rooms. Provide 2 corrected sets for Owner's file 90 days after acceptance.
 2. Lubricating instructions and recommended lubricant grade.
 3. Parts catalogs and maintenance manuals not limited to repair, diagnostic, parts and service, necessary for the maintenance and repair of the elevator equipment shall be provided to the Aviation Authority.
 4. Provide at no additional cost any special tools, laptops, pass words and manuals that are required for maintenance, trouble shooting, adjustments, door operation or performance of safety or code related tests for the Owner's use.
 5. If the Contractor requires the Owner to sign any documents for the special trouble-shooting tool(s), a copy of the agreement, shall be submitted with the bid.
 6. Provide 5 keys for each elevator switch and function. Match existing key system for the project. WD01 fireman's switches, 501CH Access switch, F315 On / Off, F501 Service panel door.
 7. Contractor shall furnish to Aviation Authority any proprietary tools or diagnostic equipment that is required for the maintenance, repair or troubleshooting of the elevator related systems that would prevent an outside elevator company that is not related to the elevator manufacturer from providing maintenance and repair functions / services, or which would prevent the outside elevator company from performing future upgrades or modifications to the elevator or related building systems. (ie, security, fire protection system, etc.)
 8. Submit the recommended monthly and annual testing and inspection schedule for each unit, as applicable, to be incorporated into the Service Contract, as Attachment D.

1.4 SUBSTANTIAL COMPLETION SUBMITTALS

- A. In addition to all other Contract requirements to achieve Substantial Completion, the Contractor shall, as a condition of Substantial Completion of the construction subcontract and before the effective date of the Service Contract, execute and/or deliver the following to the Authority: the Contract, a copy of the Bidder's valid business or occupational license, a copy of Bidder's W -9 Form (Request for Taxpayer Identification Number and Certification), certificate of insurance, performance bond or letter of credit, final approved staffing plan and inventory list, final approved testing and inspection schedule and all other documents and information required by the Contract Documents or the Owner. All of the above documents and information must be furnished and the Contract Documents executed by Contractor, and delivered to Authority, before the Contract will be executed by the Authority
- B. The failure to timely fulfill these obligations shall be just cause for the Authority's withdrawal of such Notice of Intent to Award. In such case, the Contract may be re-advertised and the Authority shall be entitled to receive its damages and costs, including, but not limited to, its attorneys' fees caused by or in connection with the Contractor's failure to fulfill its obligations under this Section.
- C. The Contract shall not be binding upon the Authority until it has been executed by the Authority and a copy of such fully executed Contract is delivered to the Contractor. The Authority reserves the right to cancel the award without liability to any Bidder at any time before the Contract has been fully executed by the Authority and delivered to the Contractor. Accordingly, the Contractor

is hereby warned that it should not commence performance or incur costs or expenses in connection with the Contract obligations until it has received from the Authority a final, fully executed copy of the Contract.

1.5 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Before Work begins, conduct conference at Project site.

1. Participants:

- a. Architect.
- b. OAR.
- c. Contractor, including superintendent.
- d. Installer, including project manager and supervisor.
- e. Manufacturer's qualified technical representative.
- f. Installers of other construction interfaced with Work.

2. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:

- a. Tour representative areas of Work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
- b. Review Contract Document requirements.
- c. Review approved submittals.
- d. Review inspection and testing requirements.
- e. Review environmental conditions and procedures for coping with unfavorable conditions.
- f. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.

3. Record discussions, including decisions and agreements, and prepare report.

1.6 REFERENCES

A. Comply with applicable building codes and elevator codes at the project site, including but not limited to the following:

1. ASME A17.1 Safety Code for Elevators and Escalators, current adopted edition or as required by the authority having jurisdiction. In areas not covered by AHJ use latest edition of ASME Code.
 - a. NFPA 70 National Electrical Code.
 - b. NFPA 80 Fire Doors and Windows.
 - c. Americans with Disabilities Act – Accessibility Guidelines (ADAAG).
 - d. ASME A17.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
 - e. ASME UL 10B and ASTM E152 (or approved equal), Fire tests of door assemblies.

- ~~f.~~ Model building codes.
- ~~f.g.~~ Florida Building Codes, Statutes, Administrative Codes and Safety Guidelines
- ~~g-h.~~ All other local applicable codes.

- B. Make application for, secure and pay for all necessary permits and certificates of inspection/operation for all equipment included herein, as required by the various departments of the Local and State Authorities. Furnish the Owner certificates and approval as required by the local governing authorities having jurisdiction.
- C. In addition to the permits, inspections and test specified and the governing codes, the elevator contractor will be required to have performed speed and load carrying capacity and heat tests at his own expense.
- D. Make applications for secure and pay for all necessary delays, waivers, or required to obtain certificate of compliance.
- E. Any damage of any kind to the car or the adjoining structure which may develop through performance of any tests shall be repaired at no additional costs to the Owner.

1.7 CONTRACTORS RESPONSIBILITY

- ~~A.~~ The Elevator Contractor shall coordinate installation and inspection of their work with all trades to ensure timely installation, inspections and overall construction schedule sequencing. Failure of the Elevator Contractor to not coordinate in a timely manner with other trades shall not warrant a delay in schedule or additional costs.

- ~~A.B.~~ In order to discover and resolve conflicts or lack of definition which might create problems, elevator manufacturer must review contract documents for compatibility with its product prior to bidding. Review structural, architectural, electrical, mechanical documents, and elevator specifications.

- ~~B.C.~~ Submit specific written exception and or clarification with quotation. Compliance with provisions of contract documents is assumed and required in absence of written exception.

- ~~C.D.~~ Owner will not pay for change to structural, mechanical, electrical, or other systems required to accommodate manufacturer's equipment if not identified before contract award.

- ~~D.E.~~ The electrical and mechanical design is based on the power characteristics and heat releases outlined in the drawings. The Contractor shall submit with bid any power characteristics or heat releases of this equipment that exceeds those listed in the drawings. Any additions or modifications requested at a later date will be at the expense of the Contractor.

Heat release given as BTU/elevator/hour. All amperages based on 480 volt system. Maintain 50 to 90 degrees F temperature with 90% non-condensing humidity.

- ~~E.F.~~ Storage of materials: Store materials in a dry protected area. Handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration.

1.8 WARRANTY

- A. Provide warranty to replace, repair, or restore parts or components that fail or do not operate properly due to poor field or factory workmanship, engineering or design for a period of 12 months from the date of Substantial Completion.

1.9 MAINTENANCE

- A. Furnish a preventable maintenance schedule, including all testing and inspection services identified for each elevator for a period of twelve (12) months as a condition of Substantial Condition. The maintenance service shall comprise of regular examinations of the installation by competent and trained mechanics on a routine basis, and shall include all necessary adjustments, greasing, oiling, cleaning, and supply parts and accessories necessary to keep the equipment in good operating condition, except such replacement of parts made necessary by misuse, accidents not attributable to failure of equipment or workmanship, and negligence by the Owner.

~~B. Repair work shall be carried out only by the Elevator Contractor's qualified personnel, using only original manufacturer specified parts furnished by the Elevator Contractor and shall not be assigned or transferred to any agent.~~

~~C. Contractor shall respond immediately to all service calls for warranty related issues 7 days per week, 24 hours per day, and shall arrive onsite within 2 hours of the initial call to make repairs. In the event of an entrapment, Contractor's response time to arrive on site shall not exceed 15 minutes. If Contractor exceeds this time, the Authority may elect to use its own elevator maintenance contractor to perform the recovery service. In this event, the Contractor shall be responsible to reimburse the Authority for any costs incurred by using its own elevator contractor. The Authority's use of its own elevator contractor shall not in any way reduce, diminish, or void the warranty provided herein.~~

~~D. Only OEM trained elevator technicians / mechanics with a minimum of five (5) years maintenance experience shall make repairs or perform warranty work to the elevators.~~

E.B. A list of manufacturers recommended spare parts to be stocked (included in the unit price bid) shall be provided by the contractor for approval by the Owner as a condition of substantial completion of the elevator installation. Substantial deviators between the proposed and final inventory list may justify an adjustment to the bid price, if fully documented and approved by the Owner.

F.C. Provide in accordance with Section 14 00 00 Escalator, Escalator Maintenance and Repair. Provide bid on a per unit basis with a monthly and annual total outlined in the Contractors bid submittal.

G.D. In the event there is a conflict between this Specification and the Service Contract, the Service Contract will govern on all matters that arise after Substantial Completion.

1.10 QUALITY ASSURANCE

- A. The specific product or material manufactured by any of the following listed manufacturers is "acceptable" only if the specific product or material can evidence exact compliance with the contract documents and governing codes.

1. KONE Elevator Company
 2. Otis Elevator Company
 3. Schindler Elevator
 4. ThyssenKrupp Elevator
 5. Alternative Manufacturers of Controllers may be considered given the Freight Elevator Application. Submit Controller information as part bid submittal.
- B. Elevator Contractor must be able to demonstrate that it is a Manufacturer of similar elevators to those specified and which have given satisfactory service; has been in successful operation for at least ten (10) years; maintains locally, an adequate stock of parts for replacement or emergency purposes; has available qualified persons to do the work. Manufacturer means, for the purpose of this Specification section, a legal entity that is regularly engaged in the business of manufacturing the equipment required by this Specification and does not include independent "assemblers" of component parts.

1.11 PARTS AND PRINTED CIRCUIT BOARDS

- A. Contractor guarantees they will sell original manufactured parts and printed circuit boards to the Owner or the Owner's Agent. The same shall not be dependent on an exchange component.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The following manufacturers and dispatching are acceptable:
1. KONE Elevator
 2. Otis Elevator
 3. Schindler Elevator
 4. ThyssenKrupp Elevator
 5. Alternative Manufacturers of Controllers may be considered given the Freight Elevator Application. Submit Controller information as part bid submittal.
- B. For cabs and entrances:
1. Ecklunds
 2. Hauenstein & Burmeister
 3. KONE Elevator
 4. Otis Elevator
 5. Schindler Elevator
 6. ThyssenKrupp Elevator
 7. Travertine
 8. Tyler Elevator Products
- C. Type and general characteristics:

Building	HNTB Tag	Levels	Stops	Doors	Notes
ASC	Elevator 24.1	1-2	2 Stops Front @ 1, Rear @ 1,2	10' x 10'	10,000lb MRL -Class B <u>HOLELESS</u> Freight 100 fpm

2.2 PERFORMANCE

- A. Speed: +/- 10% under any loading condition.
- B. Capacity: Safely lower, stop and hold up to 125% rated load. As required by ASME A17.1 Code.
- C. Leveling: +/- 1/8" under any loading condition.
- D. Designed for heavy duty type usage, and minimum 80 starts per hour.
- E. Door Closing Time, Force and Kinetic Energy: Comply with ASME A17.1 Code and ADA requirements.
- F. Ride Quality:
 - 1. The elevator shall accelerate and decelerate without any sudden change in speed. Operation shall always be smooth and quiet under any loading condition.

2.3 MACHINE ROOM EQUIPMENT

- A. Identification: Provide identifying numbers on pumping unit, controller and disconnect switch, and car light disconnect switch.
- B. Pump Unit: Assembled unit consisting of positive displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping, manual lowering functions, shut off valve, oil reservoir with protected vent opening, oil level gauge, outlet strainer, drip pan, MEI Silencer, all mounted on isolating pads. Provide heavy duty motor with soft start. Provide dual pumping units per manufacturers recommendation to accommodate duty.
- C. The valve of the power units shall contain, safety check valve, up and down direction and leveling valves, high-pressure relief valve, manual lowering valve and a "no pressure sensing device."
- D. Permissible minimum hydraulic fluid level shall be clearly indicated. Hydraulic fluid shall be of good grade to assure free flow when cool, and have minimum flash point of 400° F. Provide initial supply of hydraulic fluid for operation of elevator.
- E. Furnish and install connections between the storage tank, pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. All connections

between the discharge side of the pump, check valve, muffler, cylinder, lowering valves shall be of schedule forty (40) steel with screw, flanged, welded, or approved flexible or mechanical couplings.

- F. Support all horizontal piping. Place hangers or supports within 12" (305 mm) on each side of every change of direction of pipe line and space supports not over 10' (3050 mm) apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents. Provide supports under pipe to floor.
- G. Provide all piping from remote machine room to hoistway, including necessary supports or hangers. If remote piping is underground or in damp, inaccessible areas, install hydraulic piping through PVC sleeve pipe.
- H. Install pipe sleeves where pipes pass through walls or floors. After installation of piping, equip the sleeves with snug fitting inner liner of approved fire caulking.
- I. Install blowout proof, non-hammering, oil hydraulic muffler, MEI Silencer, in the hydraulic fluid supply pressure line near power unit in machine room. Design muffler to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoistway. Fluid flow will be controlled on positive and gradual manner to insure smooth starting and stopping of elevator.
- J. Provide safety check valve between cylinder and flexible pump connection which will hold elevator with specified load at any point when pump stops or pressure drops below minimum operating levels.
- K. Use the minimum number of Victaulic fittings possible for the installation of the pump unit. All piping shall meet or exceed current ASME code requirements.

2.4 NORMAL STOPPING DEVICES

- A. Provide slow-down and normal stopping devices on top of each car.

2.5 OPERATION AND CONTROL SYSTEMS

- A. Provide typical Freight Operation, Single Automatic Pushbutton Microprocessor-Based.
 - 1. Operate car without attendant from pushbuttons in car and at each landing. When car is idle, automatically start car and dispatch it to appropriate floor when call is registered by pressing car or hall pushbutton.
 - 2. Illuminate, "in use" lights in each hall pushbutton station when car is responding to registered car or hall call. Prevent registration of another call until trip is complete including time for passenger transfer and registration of car call if car is responding to a hall call. Extinguish "in use" light to indicate system is available to respond to next hall call.
- B. General Operation and Control: A microprocessor based control system shall be provided to perform all of the functions of safe elevator motion and elevator door control. This shall include

all of the hardware required to connect, transfer and interrupt power, and protect the motor against overloading. The system shall also perform car operational and group supervisory control. Each controller cabinet containing memory equipment shall be properly shielded from line pollution. Micro-computer system shall be designed to accept reprogramming with minimum system down time.

C. Power Door Operation: Provide New

1. Open door and gate automatically when car arrives at a floor. Control door and gate closing by using constant-pressure buttons on car or at each floor. Provide passenger sequence operation. Provide reversing safety edge device on car gate. Provide automatic door and gate closing feature with warning buzzer.

2.6 AUXILIARY OPERATION AND CONTROLS

- A. General: In addition to primary control system features, provide the following controls or operational features for the elevator, except where otherwise indicated.
- B. Special Emergency Service – Phase I: The activation of a key switch in a lobby level hall station shall return all cars in the group express to the designated floor and by-pass all car and hall calls. The cars shall park at the designated floor with the doors open and will not respond to car or hall calls unless the SES-II switch in the car is activated. This system shall be in conformance with the applicable ASME code. The key switch shall comply with local code requirements.
- C. Special Emergency Service – Phase II: In-car control of each elevator during the emergency operation, by means of a key switch in each car shall be provided. Operation shall be per ASME A17.1. The key switch shall comply with local code requirements.
- D. Emergency Lighting and alarm Bell (Power to Car): Remote emergency alarm bell, located where directed, so it can be heard outside the hoistway, to be arranged to sound automatically in response to activation of alarm button.
- E. Emergency lighting and Alarm Bell (No Electrical Power to Car): Car mounted 12 volt battery unit including solid state charger and testing means enclosed in common metal container rechargeable lead acid or nickel cadmium battery with 10 year minimum life expectancy. When normal power to the car fails the system shall automatically provide power to the car emergency light and to the alarm bell circuit. Operation shall be in accordance with ASME A17.1.
- F. Emergency power operation: Elevators shall be designed to operate from the stand by power system. Coordinate with MEP provider to determine the number of elevators in the group that can be run at any given time. Provide a manual key switch for selection of elevators after automatic selection occurs.
- G. Emergency Exhaust Fan: Provide industry standard three speed ventilation fan capable of providing code compliant operation based on the size of the cab.
- H. Hoistway Access Switches: Hoistway access switches shall be provide at the top and bottom landings in the hoistway door jamb.
- I. Liftnet system: Provide Liftnet system components and all connections to communicate with the

Owners existing system. Include sensor for pit water level monitoring.

- J. Auto light / fan shutdown: Provide auto shut down function for car lights and fans. Time to be field programmable.

2.7 GUIDE RAILS

- A. Car guide rails, brackets and bracket spacing shall conform to ASME A17.1 Code requirements. Design brackets to accommodate offsets or variations in hoistway walls. Include ladder brackets where necessary. Rail alignment shall be within 1/16 inch.

2.8 PIT SWITCH

- A. Provide a lockable pit switch adjacent to the pit ladder. Provide an additional pit stop switch where the pit depth exceeds 66 inches.

2.9 HOISTWAY

- A. Jack Support and Fluid Shut-Off Valves: Provide steel pit channels to support jack assembly and transmit loads to building structure. Provide intermediate stabilizers as required. Provide manual on/off valves in oil lines adjacent to pump unit and jack units in pit.
- B. Cylinders: Seamless steel pipe. Design head to receive unit-type packing and provide means to collect oil at cylinder head and return automatically to oil reservoir. Provide secondary containment/cylinder protection. Provide cylinder stabilizer bracketing between guide rails as required.
- C. Plungers: Polished seamless steel tubing or pipe. If plunger length exceeds 24'-0", provide two or more sections not exceeding 16'-0" in length, or coordinate installation of longer unit at the jobsite. Join sections by internal threaded couplings. Multiple section jack units shall be factory polished while assembled and marked for proper future reassembly. Isolate plunger from car frames.

C.

- D. Well Hole Casing:
 - 1. Well hole is to be provided by Elevator Contractor. No additional compensation will be allowed for unforeseen conditions of any kind or spoil removal.
 - 2. Install steel outer casing. Install watertight sleeve over jack assembly for secondary containment prior to insertion into the outer casing. Extend PVC sleeve through pit floor slab to underside of jack support beams and seal with non-permeable membrane. Seal well opening at the pit floor with hydraulic quick setting cement. Provide PVC vision/access ports.
- E. Landing System: Provide New Vane Type Landing System

2.10 CAR BUFFERS

- A. Suitable spring buffers with necessary blocking and extensions shall be provided under the elevator car.

2.11 HOISTWAY ENTRANCE

- A. Entrances shall be complete with frames, doors, sight guards, sills, fascia plates, toe guards,

headers, struts, hanger covers, tracks, hangers, miscellaneous hardware and related parts. Entrances shall carry UL label for Class "B" 1 ½ hour fire rating (or approved equal). Entrance profiles, finishes and details as shown on the drawings.

- B. Frames: Frame finish for all entrances shall be satin stainless steel, inclusive of braille.
- C. Entrance Equipment: Provide New.
 - a. Door Guide Tracks: Continuous steel angles or formed steel tracks fastened to hoistway door jamb.
 - b. Door Guide Shoes: Machined iron shoes. Four shoes per door panel, with not less than 2-1/2" lateral contact per shoe.
 - c. Door Interlocks: Provide New.
 - d. Hoistway Door Unlocking Device: Provide New. Provide unlocking device with pull chain under hinged, lockable cover with stainless steel No. 4 finish at all floors
 - e. Vertical Bi Parting Freight Door Panels with sight window: Provide New. Design shall include weatherizing to limit air and rain transfer into the hoistway where there are external hoistway doors.
 - f. 12 gauge formed steel plates welded into frame angles. Provide with safety astragals, vision panels, and truckable sills.
 - g. Electrostatically paint door panels and frames a color approved by Purchaser. Doors and frames shall be fully prepared to accept new painting to include sanding and cleaning as needed.
- D. Sills and Sill Supports: Adequate for Class B Loading.

2.12 ELECTRICAL WIRING

- A. Electrical wiring shall comply with the ASME A17.1 and NFPA 70, National Electrical Codes and all applicable local codes. Wiring shall be included for all devices installed.
 - 1. Furnish and install complete insulated wiring to connect all parts of the equipment. Properly ground all components as required by NFPA 70, National Electric Code.
 - 2. Insulated wiring shall have a flame retarding and moisture resisting outer cover and shall be run in a metal conduit, metallic tubing, or wire ducts.
 - 3. Provide 10 percent spare wires between each controller, leveling device, hoistway junction box, and control panel, also, provide 10 percent spare conductors in each trail cable; all spares shall be properly tagged or otherwise identified with clear and indelible markings.
 - 4. Tag code all field wiring at junction points; control wiring in traveling cables at their terminals in the machine room: elevator car junction box and connections within the car. Test entire wiring system for insulation to ground.
 - 5. Provide total of six (6) shielded pairs for security use in the traveling cables for each elevator. The shielded pairs shall be located in a cable which is not used to carry alternating current circuits. The shielded wiring shall extend from the top of the elevator to a junction box in the elevator machine room.
 - 6. Provide a two stranded Coaxial Cables for ~~future~~ camera usage. Assist in camera installation with security camera contractor, both inside elevator, on top of elevator and in control room. Coax cables shall be ran separate from elevator traveling cable and be a home run from the elevator machine room to the top of the elevator in order to reach the top back corner of the elevator with a 6 foot extra loop. The security camera

contractor intends on housing converter for security wiring within the car operating panels, elevator contractor to open car operating panels to assist security provider with safe access.

2.13 TOP OF CAR OPERATING DEVICE

- A. Each elevator shall be provided with an operation device mounted from or on the car cross-head which will permit slow speed ~~(150 fpm or less)~~ operation for purposes of adjustment, inspection, maintenance, and repair. A transfer switch shall be provided in the top of the car operating device fixture, which will permit the disconnection of hoistway switch or switches and render the top of car operating device operative. The operating device shall be mounted in a metal box and shall be rigidly secured in a position conveniently accessible to workmen on top of the car and accessible from the landing side without getting on the car top.

2.14 LUBRICATION

- A. Suitable means shall be provided for lubrication, with oil or grease, for all bearing surfaces in connection with the elevator installation.

2.15 CAR TOP LIGHTS

- A. Electric light with wire guard and GFCI convenience outlet fixture on car top, which shall meet the requirements of ASME A17.1.

2.16 FINAL LIMIT SWITCHES

- A. In addition to the normal limit switches, a hoistway final limit switch shall be installed at the top and at the bottom of each hoistway.
- B. Final limit switches shall be so located that they open at or about the time the buffer is engaged by the time the buffer is engaged by the car or counterweight.

2.17 CAR FRAME

- A. Car frame shall be fabricated from formed or structural steel members and shall have adequate bracing to support the platform and car enclosure. Car frame shall be designed for Class B loading.

2.18 PLATFORM

- A. The car platform shall be constructed of steel with appropriate fire proofing, support and reinforcement for anticipated maximum rated loads. and fire proofing on the underside. The platform shall rest on rubber pads designed to form an isolating cushion between the car and car frame. Coordinate sill height with flooring. Design platform for Class B loading.

2.19 ROLLER GUIDES

- A. Rubber synthetic tired roller guides, set in adjustable castings, shall be mounted on the top and bottom of the car to engage the guide rails.

2.20 CAR ENCLOSURE

- A. Car interiors as shown in the Architect's drawings. Design intent should be typical freight application.

2.21 CAR GATES

- A. Power Freight Door and Gate Operator: ~~Provide New.~~ Provide means to open doors and gate from inside of car in the event of power failure.
- B. Car Gates: Provide New. Power operated, vertical rise, minimum 6'-0" high, constructed of 12 gauge welded wire mesh welded into frame angles. Mount car gate lift chains on hoistway side of car gate. Include reversing safety edge devices in accordance with Code requirements. Electrostatically paint the same color as the entrance frame and hoistway doors.

2.35 EMERGENCY EXITS

- A. All cars shall have ceiling emergency exits. Including interlocks as required by ASME A17.1 Code.

2.36 HALL BUTTON FIXTURES

- A. Provide flush mount fixtures on all floors and openings served. The buttons shall be vandal resistant stainless steel button with LED illuminated halo. Face-plates shall be oversized and have a satin stainless steel finish. All fasteners to be vandal resistant. Include "In Use" light. Buttons shall match car operating panel buttons.
- B. Include rated boxes and wiring as required.
- C. Include integral fireman's phone jacks at each lobby. Include all wiring and conduit to Life Safety Panel.
- D. Including phase I key with, Phase I engraved instructions and emergency power jewel in first floor hall station. Coordinate key switch with existing switches.
- E. Provide emergency communication phone line monitoring device in accordance with code requirements in first floor hall station.
- F. Provide engraved "flame" emergency signage integral with hall pushbutton fixtures in accordance with code requirements.

2.37 HALL LANTERN FIXTURES

- A. Provide a hall lantern with an audible signal at each landing entrance for each elevator. The lanterns, when illuminated, shall indicate which elevator car will stop at the landing and in which direction the car is set to travel. When the car reaches a predetermined distance from the floor where it is going to stop, the corresponding hall lantern shall illuminate and the gongs sound once for up and twice for down. The hall lantern shall remain illuminated until the car doors close in preparation for leaving the floor. Provide on all floors.
1. Faceplates shall have a satin stainless steel finish.
 2. Provide LED bulbs arrow indications.
 3. Shall be easily visible from anywhere in the corridor area.
 4. Fixtures design shall be pre-approved by GOAA.
 5. Illumination shall be white in the up direction and red in the down direction.
 6. Fixture shall be vandal resistant.
 - 4-7. Fixture shall have flush design.

2.38 CAR POSITION INDICATOR

- A. The elevators shall have one digital readout fixture, with 2" high characters, above each car operating panel.
- B. Fixtures shall be LED type and include floor sounding adjustable electronic chime of no less than 20 Decibels at not more than 1500 hertz, shall sound as the car is passing or stopping at a floor.
- B-C. Illumination of LED digital fixture shall be red.

2.39 CAR OPERATING PANELS

- A. The elevator shall have one applied, vandal resistant type car operating panel flush on the side wall and inclusive of all freight elevator functions.
- B. The car operating panels shall include the following:
1. Provide one car operating panel at the front entry and one at the rear entry of the elevator.
 2. Self-illuminating floor registration ~~elongated buttons~~ vandal resistant buttons. Match design of current GOAA elevators ~~that have vandal resistant buttons-~~ Buttons shall be stainless steel with center LED jewel illuminating in bright white color.
 - 4-3. All buttons shall have 1" engraved lettering with black in-fill as to the floor destination (i.e. Mechanical Level) adjacent to each of the floor pushbuttons.
 - 2-4. Provide Alarm, door control buttons.
 - 3-5. Firefighter's key switch, pilot light, call cancel and buzzer in a locked cabinet with graphics as required by local code. Key cabinet to match existing units.
 - 4-6. Jack for Firefighter's headset. Include wiring to fire control panel.
 - 5-7. All buttons shall be designated by raised markings with Braille, applied with concealed fasteners to meet ADA requirements. Stick-on markings are not acceptable.

- ~~6-8.~~ Engraved elevator number, Phase II fireman's instructions, no smoking sign and elevator capacity on each faceplate or return panel as required by local code.
- ~~7-9.~~ Lockable service cabinet containing controls for fan switch, car light switch, light rheostat, independent service, inspection service, 120 volt convenience outlet and incorporate an Emergency light test button. Cabinet lockset to be Illinois type F315 keyed.
- ~~8-10.~~ ADA hands free phone compatible with Owners existing systems shall be flush mounted in the swing front return.
- ~~9-11.~~ Logos or manufacturer's name are not permitted on exposed surfaces.
- ~~10-12.~~ Certificate holder compatible with the certificate furnished by the AHJ.
- ~~11-13.~~ Class Loading Information.
- ~~12-14.~~ "Freight Only" signage.

2.40 COMMUNICATIONS SYSTEMS

- A. The emergency communication system shall be mounted behind the main car operating panel and be designed to provide two-way communication between the elevator and a point outside the hoistway. Audio and visual two-way communication is required. System shall automatically dial a programmable number to a point outside hoistway.
- B. Visual messages shall be provided to indicate the status of an emergency call. The visual message will illuminate and shall read: "Message Received" when the emergency call button is pressed.
- C. Raised letter and Braille shall be integrated and permanently marked on the faceplate identifying the device as a speech independent emergency telephone. Surface painted or applied graphics shall not be acceptable.
- D. Emergency communication system must be able to provide receiving agent with information identifying building and elevator number whenever an emergency call is placed.
- E. Emergency communication system shall comply with Federal Communication Commission (FCC) regulations and Americans with Disabilities Act (ADA).
- F. When the party called by someone in the cab hangs up, the telephone shall disconnect immediately without giving a busy signal in the cab.
- G. The instruments shall be designed in a way that up to six (6) instruments can operate on a single telephone line and provide connection to all six (6) cars at the same time.
- H. The system shall have the ability to communicate from Machine room to each individual car.
- I. System shall be compatible with Owner's existing systems.

2.41 SMOKE SENSOR TIE-IN

- A. System to interface with smoke sensors, including alternate level refuge. (Others will run wiring from the smoke sensors to the elevator machine room interface where the elevator contractor connects to their controls).

- B. Elevator contract to provide all necessary interface equipment with their submittal drawings.

2.42 LIFE SAFETY PANEL

- A. Elevator bid price shall include the cost of all wiring and conduit from various elevator banks to the fire command panel. Faceplate shall be No. 4 finish stainless steel. Life safety panel shall include all elevators.

~~1. Position indicators with direction arrows for all elevators.~~

~~2.1.~~ One fireman's SES switch (on/off) per elevator bank.

~~3.2.~~ Jack for Firefighters Communication Devices.

~~4.3.~~ Emergency power pilot light and interlocking push button switches for Fireman's override of the automatic selection system, buttons to be behind lockable door.

~~5.4.~~ Communication system as required by local code.

~~2.43 SECURITY PANEL~~

- ~~A. All security monitoring functions shall be integrated into the Lift Net system.~~

~~2.44~~2.43 SECURITY INTERFACE FOR ELEVATORS WITH CARD READERS

- A. Elevator contractor shall provide cut-out in the COP faceplate (including mounting studs) with a tinted non-scratch flush mounted window and space behind within each elevator that requires a security cardholder. Refer to the security section. The security contractor shall furnish the card reader or key pad to the elevator contractor for mounting. The elevator contractor shall provide all required mounting accessories and shall mount the card reader within the elevator cab. Brackets to hold the card reader in place shall be durable and non-metallic.
- B. The security contractor shall co-ordinate with the elevator contractor to connect the traveling cable provided by the elevator contractor within the elevator cab to the mounted card reader. The elevator contractor shall provide and mount glass panel to cover the mounted card reader. Mount the card reader so the window panel is flush to the front of the swing front return.
- C. The security contractor shall connect the traveling cable provided by the elevator contractor within the elevator machine room to the security remote field panel.
- D. The security contractor shall provide an interface panel within the elevator machine room. This panel shall contain two terminal strips. The security contractor shall label the terminal strips with the required connections from the elevator controller. The elevator contractor shall wire from the elevator controller to these terminal strips. Coordinate with the security contractor to provide all required connections and compatible low voltage contact closures from the elevator controller to this terminal strip to allow the following operation:
1. Signal from the security system to initiate elevator control by the card reader.
 2. On card reader mode: The security system shall indicate to the elevator controller which floors are selectable by the cardholder within that elevator. The elevator controller shall enable those floor selection buttons only. When a floor is selected, the elevator controller should disable all other floors from being selected and signal the security system that a

- selection has been made.
3. Signal from the security system to remove the elevator from under card reader control to normal operation.
- E. Submit an alternate price at bid if this interface can be accomplished via an RS-32 protocol interface.

2.452.44 ELEVATOR MANAGEMENT SYSTEM

- A. For all of the vertical transportation herein, a Lift-Net Elevator Monitoring and Management system shall be provided. The system shall comply with the requirement's set forth herein and shall include a monitoring system in each machine room and connected to existing Lift-Net system in central command.
- B. General: Provide an interactive system to monitor and manage the elevator equipment ("units") hereinafter called "system." Data collection, data storage, and real-time monitoring portion of the system shall be based on Microsoft Windows and be able to run on Windows 2000 Pro, XP Pro, or later operating systems. Provide the following features:
1. Network based, capable of interfacing with control systems via either serial data link or hardwired interface connections.
 2. Operate on any TCP/IP based network system including but not limited to an Ethernet, Token Ring, Arc-Net, Lift-Net, etc.
 3. Expansion capability to add unlimited number of monitoring terminals on the network.
 4. Monitoring terminals shall operate peer-to peer or with a single client server. Failure of a single network device shall not affect the operation of the remainder of the system.
 5. Complete backup of system data shall be accomplished at any single terminal/server location.
 6. Display multiple banks, including multiple buildings, on a single monitoring terminal screen.
- C. Monitoring Display: The system shall be capable of simultaneous monitoring of at least five hundred units on a single monitoring station utilizing a graphical representation of a plan view of the facility. Each elevator shown on the plan view shall be individually displayed and shall be visible on the monitoring system display terminal without the need to scroll. Each individual unit, when operating "normally," shall be displayed in green. In the event of a malfunction of any individual unit, the unit shall be displayed by a red blinking light on the monitoring system display. Units which are intentionally placed out of service shall be shown as yellow in the display mode. When malfunctioning units, or units intentionally placed out of service are returned to normal operation the graphical representation for that unit(s) shall automatically return to green. The user shall have the ability to display additional information, such as the cause of fault/alarm, for all units by selecting the unit with a "mouse click" from the plan view of the facility. All monitored units shall be visible from any monitoring terminal on the network. Entry into the network shall be multi-level password protected.
- D. System Capabilities:
1. The system shall be capable of real time display of all monitored status points on all monitored equipment. Fault and event notification screens and audible alarms

shall be immediately displayed on selected monitoring stations. Different fault and event tables shall be defined on a per-bank basis. The system shall collect and store all status, fault, and event information for later reporting and analysis. The system shall provide statistical analysis of hall call response times, traffic patterns, fault conditions, service logs, and security usage in graphical and tabular format.

2. The system shall maintain a record of every status point change occurring on the monitored equipment and provide the ability to replay these events in a simulation at a later time in real time, slow speed, single step, reverse, or fast forward. This information shall be retained for a period of at least twenty-six weeks and a mechanism shall be provided whereby this information may be archived.
3. The system shall store traffic fault and statistical data for a period of at least three (3) years. The system shall log error type, car number, floor position, and major system status points whenever a fault or logged event occurs.
4. The system shall provide interactive control of certain features provided in the elevator control system. These features may be revised as the requirements of the building change. Some of these interactive controls may include, but are not limited to: Security floor lockouts, entering car and hall calls, Firefighters' service, lobby recall, VIP service, up/down peak service, etc.
5. In the case of a power failure the system shall be capable of connecting to emergency power back-up unit. The loss of power shall not affect any stored data. The system shall have the capability to detect the loss (disconnect) of any individual unit from the monitoring system by periodically polling all units to ensure that normal communications between the unit(s) and the terminals/server are maintained.
6. The system will automatically re-boot the program and continue to operate after a power loss or other system malfunction.

E. Monitoring Equipment: The monitoring equipment shall have these minimum characteristics:

1. Monitoring Station Hardware: Provide a monitoring station in each machine room and on for each facility in central command.
 - a. Central Processing Unit: IBM compatible microcomputer – desk top or mini-tower (multiple machine rooms or lobby displays)
 - b. Type: Pentium or most current high-performance processor
 - c. Speed: Most current high-performance
 - d. Internal Hard Drive: Adequate storage for three years data for entire system
 - e. Modem: Most current high-performance
 - f. Display Monitor: 19" – 20" LCD flat panel, color, capable of simultaneous display of all monitored units
 - g. Printer: Current HP Color Desk Jet Series
 - h. Keyboard: MS Windows compatible
 - i. Mouse: MS Windows compatible
 - j. Power Requirements: 90-230 Volts AC, 50-60Hz @ 8A
2. Monitoring Station Operating System Software
 - a. MS Windows 2000 Pro, XP Pro, or later
 - b. MS Windows 2000 Server or later

F. Network requirements:

1. Maximum local network rated distance (2-20 gauge shielded TP): > 10 miles
2. Elevator Contractor shall provide assistance to Network Contractor with installation of network system in elevator equipment spaces at no additional cost.

3. Elevator Contractor is responsible for material and labor required for the connectivity and testing of all elevator management
4. Refer to Division 28 for Network information.

G. Monitoring Requirements: The system shall display and record the following information for each monitored unit. Serial data links may include many more points. Items listed below are minimum requirements.

1. Group status:
 - a. Group operational mode
 - b. All units to be monitored on the same screen in a graphical format
 - c. In/out of service
 - d. Standby power
 - e. Supervisory failure
 - f. Location and direction of hall calls
 - g. Shunt Trip status.
2. Individual car status, expandable menus:
 - a. Direction of travel
 - b. Independent service
 - c. Inspection service
 - d. Firefighters' service
 - e. Position of elevator
 - f. Door status (open, opening, closing, closed)
 - g. Door dwell time
 - h. Load by-pass
 - i. Standby power
 - j. Power on/off
 - k. Door detector
 - l. Safety circuit
 - m. Door zone
 - n. Stop switch
 - o. Alarm button
 - p. Registered car calls
 - q. Out of level
 - r. Machine room temperature exceeds 95 degrees
 - s. Stop counter (number of starts)
 - t. Car speed
 - u. Door open times
 - v. Door close time
 - w. Start to stop motion time
 - x. Emergency 2-way communication device
 - y. Air conditioner/heater
3. Keyboard, mouse, and time clock control capabilities:
 - a. Floor lockouts (car or hall)
 - b. Lobby recall
 - c. VIP service
 - d. Firefighters' service
 - e. Up/down peak
4. Faults monitored with visual and audible alarm, triggered by combinations of any of the above status points:
 - a. Safety circuit
 - b. Alarm bell
 - c. Stop switch
 - d. Emergency 2-way communication device

- e. Door reversal device
 - f. At least six (6) user selectable faults or events (i.e. water in pit, high machine room/cab temperature)
- H. Reporting Requirements: System shall provide reports in color graphical format both on-screen and in printed form capability to conveniently switch from one report type to another and from one bank to another using minimal mouse clicks and key strokes. Reports shall be displayed after minimal waiting time. Data for all reports shall be continuously recorded and stored. Reports shall be displayed by simply selecting a date and time range, bank of equipment and report type. Date and time range selections shall carry forward from one report selection to the next. Reporting functions shall be sub-divided into the following categories:
 - 1. Traffic Reports:
 - a. Number of hall calls per floor (hall call distribution on a per floor basis)
 - b. Number of hall calls per hour (24 hour time-line)
 - c. Hall call waiting times per floor (hall call waiting time distribution on a per floor basis)
 - d. Hall call waiting times per hour (24 hour time-line)
 - e. Distributed hall call response graph (24 hour time-line)
 - f. Detailed hall call response graph (% calls / n seconds)
 - g. Longest wait times including floor #, wait time, date, time and direction
 - 2. Fault Reports:
 - a. Ten most recent faults (most recent faults listed per bank)
 - b. Fault Log: Displays the entire fault log for a given time period
 - c. Faults per car (fault distribution on a per car basis)
 - d. Faults per floor (fault distribution on a per floor basis)
 - e. Faults per day/week/month (fault distribution on a per unit or group basis)
 - 3. Car Use Statistics:
 - a. Car use by hour (24 hour time-line of car calls, car starts, door cycles, delayed car, load by pass)
 - b. Car use statistics (same as above, shown for an entire bank)
 - 4. Group Service Log:
 - a. Cars in service (24 hour time-line with text log of group availability of each car)
 - b. Group functions (24 hour time-line with text log of actuation of group functions – Up peak, down peak, fire service, emergency power, etc.
- I. Interactive Features: The control system shall be capable where desired of operating interactive control features provided in the elevator control system. These features may be revised as the requirements of the building change. Some of these interactive controls may include but are not limited to: security floor lockouts, entering car and hall calls, Firefighters' return service, lobby recall, VIP service, up/down peak or hospital Code Blue service. Local codes may affect the availability or operation of these features.
 - 1. Security Access Features: The monitoring system shall be capable of providing security enable/disable of all hall and car calls through on-screen menus at a minimum. The monitoring system shall also be capable of interfacing directly with card readers and security keypads in stand-alone mode, and indirectly through a serial interface with a third party security system. When in stand-alone mode, the monitoring system shall maintain a database of elevator users and security pass codes. When on secure mode the use of each elevator will be recorded in a file together with the time, authorized pass code and destination for each call.

2. Elevator Control Features: Each elevator shall be capable of being controlled through the monitoring system. All control points shall be capable of seven-day twenty-four hour time clock automatic operation or manual operation from the mouse and keyboard. The control points shall include, but not be limited to, the following (where allowed by local codes):
 - a. Lobby recall
 - b. Car call security lockout
 - c. Hall call security lockout
 - d. Independent service
 3. Paging Feature: The monitoring system shall be capable of paging a service technician or other personnel based on pre-defined parameters of elevator faults or conditions. The paging system shall provide the ability to page multiple numbers determined by the type of event triggering the notification and shall be able to page different numbers based on preset times of day (i.e. different shifts). The system shall be capable of sending text messages to full text pagers in addition to supporting standard DTMF pagers.
 4. Remote Access Feature: The monitoring system shall be capable of allowing approved individuals under multi-level password control to access all system features via the local area network, internet, or via modem over the public telephone network to review the performance of the equipment or to evaluate a fault condition. The remote access feature shall be integrated into the monitoring system and shall not use third party "remote control" software products.
- J. Elevators to be integrated into existing Lift Net monitoring system and communicate to the Central Control room of the facility. Coordinate use of LAN with the Owner. For non LAN functions provide wiring and conduit for all components furnished.
- K. Lift-net system shall be connected to a new USP power back up system furnished fully by Elevator Contractor.

PART 3 – EXECUTION

3.1 SCOPE

- A. Installation shall meet all of the standard requirements outlined herein for installation and inspection, tolerances, and qualifications. All work required for completion of a first-class installation is the responsibility of the Contractor, even if not included in this specification.
- B. Performance of the elevator shall meet requirements outlined herein.
- C. Labeling of disconnects with feed location information and shunt trip locations to be by the elevator contractor.

3.2 HOISTWAYS

- A. Entire front of hoistway will be left open until the hoistway entrances have been installed. After the guide rails have been erected and aligned, install frames in alignment with the guide rails, after which the wall may be completed. Coordinate this phase of the work to provide minimum delay in completion.

3.3 PAINTING

- A. All elevator equipment not painted, located within the machine room or hoistway, shall be given a finish coat of paint. Material that has factory finish paint shall have all scratches or mars repainted after installation. Any galvanized finishes do not need to be painted.
- B. Finish coat shall have hard, tough semi-gloss surface.
- C. Elevator machine room and pit floors shall be painted with an oil resistant polyurethane high gloss enamel paint or approved equivalent. Color shall be terra cotta (Tough Shield #1231-108) or approved equivalent.

3.4 CLEAN UP

- A. Remove trash daily from hoistways, pits, and machine rooms including all packing material and debris resulting from this work. Leave all elevator spaces broom clean.

3.5 ACCEPTANCE TESTING

- A. Tests shall be performed by the Elevator Contractor at his expense in the presence of the Owner's representative. The elevators shall be subjected to the following acceptance inspection and tests:
 - 1. Inspection and tests required by applicable portions of Requirements, 1.03.
 - 2. Inspection and tests required by Federal, State, and Local codes and ordinances.
 - 3. Test safety circuit, loop circuit, and the drive circuits at 500 volts. Minimum resistance to ground shall be one megohm.
 - 4. General riding quality, leveling accuracy, and quietness of operation shall be acceptable to the Owner's representative.

3.6 USE OF ELEVATORS

- A. The elevators shall not be used for construction purposes or during the period prior to turning over the project to the Owner, without Owner's written authorization. Should the elevators be authorized for temporary use, the following conditions shall apply:
 - 1. The Elevator Contractor shall provide a temporary acceptance form for the user to sign.
 - 2. The Warranty period commences upon Substantial Completion and GOAA receives and approves the recommended spare parts list and staffing plan, regardless of any temporary use agreement.
 - 3. The user shall provide, if job conditions require, all temporary enclosures, guards or other projection of the hoistway openings, power, signal devices, car lights, protection of any elevator entrances, cars, fixtures, and any other equipment that is installed.
 - 4. The user shall return the elevators in the same condition they were in when placed on temporary service and shall pay the Elevator Contractor for repairs or clean up.
 - 5. The user shall allow the Elevator Contractor to perform routine maintenance or repairs.
 - 6. The cost of temporary service shall be worked out between the Elevator Contractor and

the user.

- B. As elevators are completed, the Owner shall have the prerogative of accepting and using them, shutting them down, or accepting them under an Interim Service Agreement described below:
 - 1. The Owner shall have the prerogative of continuing the Interim Service Agreement until all elevators in the group (or building or APM/ITF Programs) are completed.
 - 2. The Warranty period commences upon Substantial Completion and GOAA receives and approves the recommended spare parts list and staffing plan, regardless of any Interim Use Agreement.
 - 3. Cost of interim service shall not exceed the prorated unit price for Year One included on the Bid Form.

3.7 INSTRUCTIONS TO OWNER

- A. Before final acceptance, Contractor shall instruct Owner's personnel how to use elevator during automatic operation, independent service, secured mode and fireman's service.

3.8 ACCEPTANCE

- A. Final acceptance of the installation shall be made only after all field inspections and tests are complete, punch list items are complete, all Owner's information items listed in 1.4 have been furnished, and the Owner's representative is satisfied that the installation has been satisfactorily completed.

END OF SECTION 14 21 00

SECTION 14 31 00 – ESCALATORS

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 (including all sustainability requirements), apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Escalator Technical Specifications.
 - 2. Performance criteria.
 - 3. Provide Escalators per drawings.
- B. Related Requirements:
 - 1. Structural work to support escalator truss.
 - 2. Pit at bottom. Division 03
 - 3. Completion of finished floor to the level of floor plates. Division 09.
 - 4. Enclose sides of truss. Division 09.
 - 5. Temporary power for starting, testing and adjusting. Division 26.
 - 6. Electrical power to machine room including correct sized circuit breakers, lighting and convenience outlets. Division 26.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
 - 1. Indicators.
 - 2. Dimensions and layout.
 - 3. Motor data.
 - 4. Balustrade details.
 - 5. Step details.
 - 6. Walk on plate details.
 - 7. Skirt details
 - 8. Decking details.
 - 9. Electrical characteristics and connection requirements.
 - 10. Expected heat dissipation of Escalator equipment in equipment space.
- B. Shop Drawings: Submit no less than five copies (unless otherwise directed by the architect) of approval layout drawings. Include the following:
 - 1. Design information, including equipment lists and compliance with applicable agencies.
 - 2. Escalator layout in plan and section.
 - 3. Details of escalator controls including but not limited to emergency stop switches, key switches and access panels.
 - 4. Control plate complete with exact representation of graphics.
 - 5. Dimensioned layout of escalator pit showing escalator equipment, mechanical, electrical and structural elements and all accessories required to complete the work in compliance with Contract Documents.

14 31 00 - 1

- C. Samples: All exposed materials with finish and all custom fabrications.
 - 1. Omit all logos from exposed finishes or components.
 - 2. Glass. Provide three (3) 8" x 8" samples
 - 3. Stainless Steel. Provide three (3) 8" x 8" samples
- D. Maintenance Data: Provide written information necessary for proper maintenance and adjustment of the equipment prior to final acceptance as follows:
 - 1. Straight line wiring diagrams of as-installed Escalator circuits with index of location and function of all components. Leave one set in machine rooms. Provide 2 corrected sets for Owner's file 90 days after acceptance.
 - 2. Lubricating instructions and recommended lubricant grade.
 - 3. Parts catalogs and maintenance manuals not limited to repair, diagnostic, parts and service, necessary for the maintenance and repair of the Escalator equipment shall be provided to the Aviation Authority.
 - 4. Provide at no additional cost any special tools, laptops, pass words and manuals that are required for maintenance, trouble shooting, adjustments, door operation or performance of safety or code related tests for the Owner's use.
 - 5. If the Contractor requires the Owner to sign any documents for the special trouble-shooting tool(s), a copy of the agreement, shall be submitted with the bid.
 - 6. Provide 5 keys for each escalator switch and function. Match existing key system for the project.
 - 7. Contractor shall furnish to Aviation Authority any proprietary tools or diagnostic equipment that is required for the maintenance, repair or troubleshooting of the Escalator related systems that would prevent an outside Escalator company that is not related to the Escalator manufacturer from providing maintenance and repair functions / services, or which would prevent the outside Escalator company from performing future upgrades or modifications to the Escalator or related building systems. (ie, security, fire protection system, etc.)
 - 8. Submit the recommended monthly and annual testing and inspection schedule for each unit, as applicable, to be incorporated into the Service Contract.

1.4 SUBSTANTIAL COMPLETION SUBMITTALS

- A. In addition to all other Contract requirements to achieve Substantial Completion, the Contractor shall, as a condition of Substantial Completion of the construction subcontract and before the effective date of the Service Contract, execute and/or deliver the following to the Authority: the Contract, a copy of the Bidder's valid business or occupational license, a copy of Bidder's W -9 Form (Request for Taxpayer Identification Number and Certification), certificate of insurance, performance bond or letter of credit, final approved staffing plan and inventory list, final approved testing and inspection schedule and all other documents and information required by the Contract Documents or the Owner. All of the above documents and information must be furnished and the Contract Documents executed by Contractor, and delivered to Authority, before the Contract will be executed by the Authority
- B. The failure to timely fulfill these obligations shall be just cause for the Authority's withdrawal of such Notice of Intent to Award. In such case, the Contract may be re-advertised and the Authority shall be entitled to receive its damages and costs, including, but not limited to, its attorneys' fees caused by or in connection with the Contractor's failure to fulfill its obligations under this Section.

- C. The Contract shall not be binding upon the Authority until it has been executed by the Authority and a copy of such fully executed Contract is delivered to the Contractor. The Authority reserves the right to cancel the award without liability to any Bidder at any time before the Contract has been fully executed by the Authority and delivered to the Contractor. Accordingly, the Contractor is hereby warned that it should not commence performance or incur costs or expenses in connection with the Contract obligations until it has received from the Authority a final, fully executed copy of the Contract.

1.5 PRE-INSTALLATION CONFERENCE

- A. Pre-installation Conference: Conduct conference at Project site.
- B. Minimum Agenda: Installer shall demonstrate understanding of the Work required by describing detailed procedures for preparing, installing, and cleaning the Work. Demonstration shall include, but not be limited to, following topics:
 - 1. Tour representative areas of work, inspect and discuss condition of substrate, and other preparatory work performed by other trades.
 - 2. Review Contract Document requirements.
 - 3. Review approved submittals.
 - 4. Review inspection and testing requirements.
 - 5. Review environmental conditions and procedures for coping with unfavorable conditions.
 - 6. Resolve deviations or differences between Contract Documents and the manufacturer's specifications.
- C. Record discussions, including decisions and agreements, and prepare report.

1.6 REFERENCES

- A. Comply with applicable building codes and Escalator codes at the project site, including but not limited to the following:
 - 1. ASME A17.1 Safety Code for Elevators and Escalators, current adopted edition or as required by the authority having jurisdiction. In areas not covered by AHJ use latest edition of ASME Code.
 - a. NFPA 70 National Electrical Code.
 - b. NFPA 80 Fire Doors and Windows.
 - c. Americans with Disabilities Act – Accessibility Guidelines (ADAAG).
 - d. ASME A17.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
 - e. ASME UL 10B and ASTM E152 (or approved equal), Fire tests of door assemblies.
 - f. Model building codes.
 - g. Florida Building Codes, Statutes, Administrative Codes and Safety Guidelines.
 - h. All other local applicable codes.
- B. Make application for, secure and pay for all necessary permits and certificates of inspection/operation for all equipment included herein, as required by the various departments of the Local and State Authorities. Furnish the Owner certificates and approval as required by the local governing authorities having jurisdiction.

~~G.~~

~~D.C.~~ In addition to the permits, inspections and test specified and the governing codes, the escalator contractor will be required to have performed speed and load carrying capacity and heat tests at his own expense.

~~E.D.~~ Make applications for secure and pay for all necessary delays, waivers, or required to obtain certificate of compliance.

~~F.E.~~ Any damage of any kind to the car or the adjoining structure which may develop through performance of any tests shall be repaired at no additional costs to the Owner.

1.7 CONTRACTORS RESPONSIBILITY

- A. The Escalator Contractor shall coordinate installation and inspection of their work with all trades to ensure timely installation, inspections and overall construction schedule sequencing. Failure of the Elevator Contractor to not coordinate in a timely manner with other trades shall not warrant a delay in schedule or additional costs.
- B. In order to discover and resolve conflicts or lack of definition which might create problems, escalator manufacturer must review contract documents for compatibility with its product prior to bidding. Review structural, architectural, electrical, mechanical documents, and escalator specifications.
- C. Contractor must review all drawings associated with the project to ensure architectural design intents are full achieved, executed and coordinated as needed with other trades.
- D. Submit specific written exception and or clarification with quotation. Compliance with provisions of contract documents is assumed and required in absence of written exception.
- E. Owner will not pay for change to structural, mechanical, electrical, or other systems required to accommodate manufacturer's equipment if not identified before contract award.
- F. The electrical and mechanical design is based on the power characteristics and heat releases outlined in the drawings. The Contractor shall submit with bid any power characteristics or heat releases of this equipment that exceeds those listed in the drawings. Any additions or modifications requested at a later date will be at the expense of the Contractor.
- G. Heat release given as BTU/escalator/hour. All amperages based on 480 volt system. Maintain 50 to 90 degrees F temperature with 90% non-condensing humidity.
- H. Storage of materials: Store materials in a dry protected area. Handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration

1.8 WARRANTY

- A. Provide warranty to replace, repair, or restore parts or components that fail or do not operate properly due to poor field or factory workmanship, engineering or design for a period of 12 months from the date of Substantial Completion. If turnover for beneficial use occurs prior to Substantial Completion, provide interim warranty/maintenance between

turnover and substantial completion, so that 12 month Warranty period is maintained starting at Substantial completion.

1.9 MAINTENANCE

- A. Furnish a preventable maintenance schedule, including all testing and inspection services identified for each escalator for a period of twelve (12) months as a condition of Substantial Condition. The maintenance service shall comprise of regular examinations of the installation by competent and trained mechanics on a routine basis, and shall include all necessary adjustments, greasing, oiling, cleaning, and supply parts and accessories necessary to keep the equipment in good operating condition, except such replacement of parts made necessary by misuse, accidents not attributable to failure of equipment or workmanship, and negligence by the Owner.
- B. A list of manufacturers recommended spare parts to be stocked (included in the unit price bid) shall be provided by the contractor for approval by the Owner as a condition of substantial completion of the escalator installation. Substantial deviations between the proposed and final inventory list may justify an adjustment to the bid price, if fully documented and approved by the Owner.
- C. Provide in accordance with Section 14 00 00 Escalator, Escalator Maintenance and Repair. Provide bid on a per unit basis with a monthly and annual total outlined in the Contractors bid submittal.
- D. In the event there is a conflict between this Specification and the Service Contract, the Service Contract will govern on all matters that arise after Substantial Completion.
- D.E. If turnover for beneficial use occurs prior to Substantial Completion, provide interim warranty/maintenance between turnover and substantial completion, so that 12 month Warranty period is maintained starting at Substantial completion.

1.10 QUALITY ASSURANCE

- A. The specific product or material manufactured by any of the following listed manufacturers is "acceptable" only if the specific product or material can evidence exact compliance with the contract documents and governing codes.
 - 1. KONE Escalator Company – Heavy Duty Grade Escalator
 - 2. Otis Escalator Company - Heavy Duty Grade Escalator
 - 3. Schindler Escalator - Heavy Duty Grade Escalator
 - 4. ThyssenKrupp Escalator - Heavy Duty Grade Escalator
- B. Escalator Contractor must be able to demonstrate that it is a Manufacturer of similar Escalators to those specified and which have given satisfactory service; has been in successful operation for at least ten (10) years; maintains locally, an adequate stock of parts for replacement or emergency purposes; has available qualified persons to do the work. Manufacturer means, for the purpose of this Specification section, a legal entity that is regularly engaged in the business of manufacturing the equipment required by this Specification and does not include independent "assemblers" of component parts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are acceptable:

1. Heavy Duty Escalators:

- a. Kone
- b. Otis
- c. Schindler
- d. ThyssenKrupp

B. Type and General Characteristics:

Bldg.	Type/HNTB Tag	Levels	Step Size	Notes
ASC	Escalator 16.1	2 to 3	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC	Escalator 16.2	2 to 3	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC	Escalator 16.3	Future	Future	Future
ASC	Escalator 33.2	1 to 2	40"	15'-6" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC	Escalator 35.1	2 to 4	40"	17'-6" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC	Escalator 36.1	2 to 4	40"	17'-6" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC	Escalator 38.1	2 to 4	40"	17'-6" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC	Escalator 39.1	2 to 4	40"	17'-6" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC (Ramp Loading Connector)	Escalator 39.2	1 to 2	40"	15'-6" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
ASC (Ramp Loading Connector)	Escalator 39.3	2 to 4	40"	16'-0" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator 56.1	1 to 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings

LST	Escalator <u>56.2</u>	1 to 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.3</u>	1 to 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.4</u>	1 to 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.5</u>	1 to 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.6</u>	1 to 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.7</u>	2 to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.8</u>	2 to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.9</u>	2 to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.10</u>	2 to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.11</u>	2 to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.12</u>	2 to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.13</u>	<u>43</u> to <u>64</u>	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.14</u>	<u>43</u> to <u>64</u>	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.15</u>	<u>43</u> to <u>64</u>	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.16</u>	<u>43</u> to <u>64</u>	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.17</u>	<u>43</u> to 4	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator <u>56.18</u>	<u>43</u> to <u>64</u>	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings

LST	Escalator 67.1	4 to 6	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator 67.2	4 to 6	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
LST	Escalator 67.3	Future	Future	Future
GTF/PG	Escalator 3.1	4 to PG 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step See Drawings
GTF/PG	Escalator 3.2	4 to PG 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF/PG	Escalator 3.3	4 to PG 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF/PG	Escalator 3.4	4 to PG 2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF	Escalator 3.5	4 to Prom	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF	Escalator 3.6	4to Prom	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF	Escalator 3.7	4 to Prom	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF	Escalator 3.8	4 to Prom	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF	Escalator TBD4 Escalator 3.1	3 to 4	40"	<u>10'-2" travel.</u> Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
GTF	Escalator TBD4 Escalator 3.2	3 to 4	40"	<u>10'-2" travel.</u> Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
<u>GTF</u>	<u>Escalator 3.3</u>	<u>Pkg Lvl 2 to 4</u>	<u>40"</u>	<u>25'-4" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings</u>
<u>GTF</u>	<u>Escalator 3.4</u>	<u>Pkg Lvl 2 to 4</u>	<u>40"</u>	<u>25'-4" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings</u>
<u>GTF</u>	<u>Escalator 5.1-TBD3</u>	<u>4 to 5</u>	<u>40"</u>	<u>13'-10" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings</u>
<u>GTF</u>	<u>Escalator TBD45.2</u>	<u>4 to 5</u>	<u>40"</u>	<u>13'-10" travel. Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings</u>

<u>GTF</u>	<u>Escalator</u> <u>TBD5 Escalator 5.3</u>	<u>Pkg Lvl 2</u> <u>to 3 to 42</u>	<u>40"</u>	<u>10'-225'-4" travel. Three Flat Steps,</u> <u>100 FPM, Step Loading Rating mini-</u> <u>um 245lbs per step. See Drawings</u>
<u>GTF</u>	<u>Escalator</u> <u>TBD6 Escalator 5.4</u>	<u>Pkg Lvl 2</u> <u>to 3 to 42</u>	<u>40"</u>	<u>10'-225'-4" travel. Three Flat Steps,</u> <u>100 FPM, Step Loading Rating mini-</u> <u>um 245lbs per step. See Drawings</u>
PKG	Escalator E122	1-2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
PKG	Escalator E123	1-2	40"	Three Flat Steps, 100 FPM, Step Loading Rating minimum 245lbs per step. See Drawings
<u>PKG</u>	<u>Escalator E124</u>	<u>1-2</u>	<u>40"</u>	<u>Three Flat Steps, 100 FPM, Step</u> <u>Loading Rating minimum 245lbs per</u> <u>step. See Drawings</u>
<u>PKG</u>	<u>Escalator E125</u>	<u>1-2</u>	<u>40"</u>	<u>Three Flat Steps, 100 FPM, Step</u> <u>Loading Rating minimum 245lbs per</u> <u>step. See Drawings</u>

2.2 DESIGN AND FABRICATION

- A. Escalators shall be heavy duty design, capable of operating in a 24 hour facility with heavy usage. The escalators shall be designed and manufactured to include all energy saving/reduction methods and means (see alternates also). Moisture resistant design shall be incorporated for vertical transportation that is exposed to outside air. Vandal resistant design shall be incorporated for all vertical transportation on this project.
- B. The escalators shall also comply with applicable wind load standards if escalators are designated for outside exposure.

2.3 PERFORMANCE REQUIREMENTS

- A. Speed shall be +/- 3% under any loading condition
- B. The escalator shall not make any objectionable noise during operation such as grinding, squeaking and or noise that exceed 60dB measured from 3' from the step or landing plate.

2.4 TRUSS

- A. Type: Truss shall be designed and constructed of structural steel, ASTM A36, to safely carry the entire load of the escalator including all parts of same, together with the full capacity load and including the weight of the balustrade and truss covering as detailed on the drawings.
 1. Top end of truss shall carry the drive machine and controller.
 2. Trusses shall be designed to support the cladding over the exterior of truss.
 3. Trusses shall have a safety factor in accordance with the requirements of the Safety Code and other codes having jurisdiction.
 4. Clad any exposed portion of truss in satin stainless steel, grade 308.

2.5 INTERMEDIATE STRUCTURAL SUPPORT FOR TRUSSES

- 4.A. Provide intermediate structural support for escalator truss as required based on manufacturer's requirements. Due to travel length intermediate structural supports will be required for some escalators, including Escalators 3.3 and 3.4, Escalators 6.7 – 6.12, and PKG Garage Escalators. Escalator scope must include all required intermediate supports as part of complete installation scope.

2.52.6 STEPS

A. Step Design:

1. Steps shall be of the horizontal tread formation.
 - a. Vertical Rise Between Steps: 8-1/8" maximum.
 - b. Horizontal Distance Between Noses of Steps: 13-3/4" minimum.
 - c. Clearance Between Steps: 1/8" maximum.
2. Step Frames: Cast aluminum reinforced and braced to carry step threads and maximum load per stop under eccentric loading conditions without distortion.
3. Step Wheels: Shall be designed for quiet operation and must be of a type which will ensure rotation and prevention of flat spots, complete with bearings and provisions for retention of ample lubricant to ensure satisfactory operation without frequent lubrication.
4. Design of steps and required attachments shall permit the steps to be removed without disturbing the balustrades or dismantling any part of the chains.
5. Design of stairway shall permit chain to run without the steps for convenience in cleaning and inspection.
6. Exposed Gearing, Sprockets, Chains: Shall be covered with guards.
7. Side Panels or Guards: Removable type for inspection and maintenance.
8. Provide 3 flat steps at the entrance of each escalator landing.
9. Steps shall be 40" wide.
10. Step loading capabilities should be equal to or greater than 245lbs per step.

B. Step Treads:

1. Type: One-piece cast aluminum cleat type, with square edges, designed to ensure a secure foothold and comfortable tread surface, mill finish, black in color.
2. Cleats: 1/8" wide maximum, spaced so that ends are flush with step riser.
3. Grooves: 1/4" wide maximum, 7/16" deep minimum.
4. Sides: To be located with minimum clearance at adjustable curtain boards.

C. Step Risers:

1. Cleat type constructed of aluminum.

D. Step Drive Units:

1. Top Member of Step Driving Unit: Shall be carried on two brackets rigidly attached to truss to ensure and maintain proper alignment of the unit, and shall be removable intact from the truss.
2. Lower Member of Step Driving Unit: Shall be removable intact from the truss, and be mounted on supporting brackets or pedestals provided with rollers which operate on tracks located at each side of truss, and be designed and installed to automatically maintain proper tension on the step chains by means of either tension weights or compression springs.

3. Bearings: Ball or roller type, dustproof and self-aligning, complete with ample means for lubricating and adjustment for wear.
 4. Chain Sprockets for Step Drive Units: Shall be designed for smooth operation, and be accurately machined to distribute load evenly on sprocket teeth and on chain rollers.
 5. Contractor's Option: Instead of step drive units specified above, provide a step driving arrangement utilizing laminating plates secured to each other by means of step axles to drive the step wheels.
- E. Step Chains:
1. Type: Endless roller type, one located on each side of steps made of high grade steel links with hardened pins and rollers designed to accurately engage the drive sprockets to ensure smooth operation.
 2. Provision shall be made to prevent sagging or buckling of chains and to prevent the steps from coming in contact with each other and to also maintain substantially constant distances between step axles of all exposed steps.
 3. Step chain shall be provided with a tension device at lower landing to maintain proper tension.
 4. Safety Factor: Not less than ten and shall consist of hardened steel links throughout.

2-62.7 HANDRAIL AND BALUSTRADE ASSEMBLY

- A. Type: Traction or positive handrail drive complete with balustrade and interior panels.
- B. Handrails: Fabricated of laminated canvas and black rubber, spliced and vulcanized to create a strong and smooth splice.
1. Handrail shall operate on brass, bronze or steel guides of sealed type, complete with provisions for lubrication.
 2. Canvas shall not be exposed.
 3. The extended newel shall be designed and fabricated so that the handrail will disappear into the balustrade at a point difficult to reach.
 - 3-4. Where adjacent escalators share a common landing, newels must align. Top end newels must align with bottom end newels where adjacent escalators share a common landing.
- C. Balustrades: Tempered glass complete with covers, moldings, skirt panels and all accessories required for complete installations, fabricated of stainless steel with No. 4 satin finish.
1. Glass Panels: 3/8" clear tempered glass, ASTM C1048, Condition A (uncoated) without vertical metal mullions at interior panels, with glass joints vertical to landing not to truss.
 2. Skirt Panels: 16 gauge stainless steel No. 4 finish laminated to fire-retardant rubberized sound-deadening board. Provide temporary strippable factory applied protective coating on exposed surfaces.
- D. Balustrade Lighting: Provide continuous LED lighting strips under handrail guides at structural glass interior panels consisting of key-operated switch to control lighting. Color shall be white. Provide integral 3500°K LED balustrade lighting to target a minimum illuminance of 10 fc.

2.72.8 MISCELLANEOUS COMPONENTS

- A. Exterior Quality:
 - 1. Contractor shall ensure that all measures are taken to include exterior escalator quality components, design and construction to withstand temperature, humidity, water, appropriate wind load conformance requirements and direct sunlight impact. Contractor must detail these inclusions in their bid submittal. This applies to any escalator designated for exterior building installation per the architectural drawings.
- B. Landing and Floor Plates:
 - 1. Type: Cast aluminum of slip-resistant design, removable for access to drive machines and pits.
 - 2. Design of landing and floor plates shall harmonize with steps and comb plates.
 - 3. Transition at landing shall have 3 flat steps
- C. Drip Pans: Oil-tight construction is required for entire length and width of each truss.
- D. Tracks:
 - 1. Type: "Closed", smooth for continuous support of chain wheels from sprocket to sprocket, constructed of drawn steel or other alloy, of proper rigidity, and installed and supported to ensure perfect alignment and smooth operation of the running gear under all conditions.
 - 2. All tracks shall have a smooth finish track surface.
 - 3. Carriages and curved tracks for guiding the steps at the upper and lower landings shall be provided with machined guiding surfaces, or formed from cold rolled steel bars.
 - 4. Curved chain wheel tracks at upper landing shall be made easily removable and replaceable.
 - 5. Tracks at lower landing shall be designed to accommodate movement of carriage unit.
 - 6. Transition between incline and upper landing shall be accomplished by a curved track system with a minimum of 70" radius.
 - 7. Transition between incline and lower landing, a minimum of 48" radius.
- E. Comb Plates:
 - 1. Type: Shall have yellow metal surfaces, with comb teeth spaced so that cleats of step treads will pass between combs with minimum clearance.
 - 2. Comb teeth shall be made in sections so that damaged or worn section can be readily replaced without disturbing balance of comb.
 - 3. Comb teeth shall be formed to correspond to form of treads to obtain uniform side clearance.
- F. Deck Covers and Moldings: Constructed of metal and finished to match skirt panels, adequately reinforced.
- G. Barrier Panels: Clear, tempered glass panels, cantilevered from deck cover between adjacent, parallel escalators.
- H. Where required by code, anti-slide devices shall be provided.

- I. Fault Indicator: Provide upper and lower end of truss with fault indicator to display source of fault without removal of equipment access plate. Locate indicator in handrail inlet box or deck board visible from landing plate.
- J. Pit Flood Detector: Provide a high level water alarm switch in the escalator pits, interconnected to the control system as required to stop the escalator in the event water is detected in the pits. The escalator shall stop "gently" to prevent harm to passengers. The device shall be able to be turned off and reset via a key switch external to the escalator.

2-82.9 OPERATION

- A. Driving Machine:
 - 1. Type: Worm gear type especially designed for escalator service, provided with accurately machined worm and gear driven by a moderate speed motor.
 - 2. Motors: Shall be designed to operate on 460-480 volt, 3 phase, 60 hertz electric current.
 - 3. Driving Machine: Shall be located at upper end of truss.
 - 4. Contractor's Option: Machines may be located along the incline provided easy access is provided for maintenance and inspection.
 - 5. Units shall operate at 100 feet per minute (FPM) and shall have the ability to be field adjusted to normally operate <80 FPM should GOAA elect to have a normal slower operating speed than industry standard.
- B. Controller:
 - 1. Type: Full magnetic, continuous duty and reversing type designed to protect the motor against overload.
 - 2. Control Transformers: Provide in each controller to reduce control voltage to pushbutton circuit, etc., 110-120 volt single phase, 60 hertz, AC.
 - 3. Should power failure occur, or any safety device operate, the controller shall automatically cut off power to the motor and apply the service brake to bring the escalator to a quick and smooth stop.
 - 4. Controllers and all wiring for outside units to be NEMA 4 or equivalent and rated for exterior operation including temperature and humidity conditions.
 - 5. Provide Contractor's Variable Voltage Variable Frequency Drive.
 - 6. **Alternate (If not standard in Contractor's product line, list as separate cost for all escalators in package as part of bid submittal):** Provide escalator power feedback drive units. Provide a regenerative drive system. The system shall produce clean power with harmonic distortion within the guidelines of IEEE 519.
 - 7. **Alternate (If not standard in Contractor's product line, list as separate cost for all escalators in package as part of bid submittal):** Standby Speed Operation: Provide inverter control that will run the escalator at reduced speed when no passengers are on the step band.
 - a. Speed shall change from the Owner specified speed to no less than 10fpm. Passenger detection means shall be provided at both landings of the escalator. Detection of any approaching passenger shall occur sufficiently in advance of boarding to cause the escalator to reach full operating speed before a passenger walking at 270 feet per minute reaches the comb plate.
 - b. Passenger detection shall remain active at the egress landing to detect a passenger approaching against the direction of escalator travel and shall

cause the escalator to accelerate to full speed and sound the alarm at the approaching landing before the passenger reaches the comb plate.

- c. Automatic deceleration shall not occur at less than three times the time it takes to transfer a passenger between landings. A means shall be provided to detect failure of the passenger detection means and shall cause the escalator to operate at owner specified speed not to exceed rated speed

C. Emergency Stop Buttons:

- 1. Shall be located at top and bottom landings and on controller and shall be designed, on momentary pressure of either button, to cut off the current supply to the motor and bring the escalator to rest. All controls and switches to be NEMA 4 rated or equivalent for units located outside air conditioned spaces.

D. Safety Brake:

- 1. Shall be of a type which is positive in operation and shall be brought into action each time the escalator is stopped, and shall automatically stop the escalator whenever the power is interrupted from any cause or by any of the safety devices, and shall hold the escalator stationary with full load.
- 2. If the escalator shall be operated by main drive chain and sprocket driving chains, a broken chain safety shall be provided which will set an emergency brake mounted on the upper sprocket shaft, and will stop the escalator.
- 3. Units outside air condition spaces to have shrouds or means to protect brake from water intrusion.

E. Overspeed Governor:

- 1. Shall be designed to cut off current supply to motor and bring escalator to rest, should it attain a speed in excess of 140 percent of rated speed.

F. Non-Reversing Device:

- 1. Shall be designed to stop escalator automatically should the direction of travel be accidentally reversed while escalator is operating in ascending direction.

G. Control Buttons and Key-Operated Switches:

- 1. Shall be provided in the lower ends of the upper and lower newels of escalator to control the following.
 - a. The stopping of all motion of escalator - pushbuttons (both at top and bottom).
 - b. The direction of travel of escalator - key switches (at top and bottom).
 - c. The starting of escalators (at top and bottom).
- 2. Plates shall be of matching material, flush mounted, and suitably inscribed with letters, figures and direction arrows which are readily visible from a standing position.
- 3. Bottom plate, at the bottom and top of escalator, shall contain a stop button and key switch which will permit the operation of the escalator in either up or down direction.
- 4. Stop button and the key switch shall be interconnected so that the escalator can be brought to rest before the direction of travel can be changed.
- 5. Contractor shall connect with approved type conduit and wiring all of the above buttons and switches to the controller which shall be located in the machine space at the top of escalator.
- 6. Escalators that are located outside in non-air conditioned spaces shall have NEMA 4 or equivalent components.

7. Provide 5 keys for each function, match all keys to Owners standard key system.
- H. Safety Devices:
 1. Safety devices shall consist of a broken chain device, overspeed governor, non-reversing device, safety brake, emergency stop buttons, and such other safety devices as may be included in applicable safety codes.
 2. Contractor shall furnish and install a step skirt safety device on each escalator.
 3. Device shall consist of safety switches so mounted alongside the steps that they will effectively stop the escalator should the steps be forced out of line due to the introduction of an object between the escalator and step riser.
- I. Broken Chain Device:
 1. Shall be provided with electric contacts which will be opened and cause the brake to be applied when step chains break or should the tension on the chains drop below or exceed a predetermined value.

2-92.10 ESCALATOR MANAGEMENT SYSTEMS

- A. For all of the vertical transportation herein, a Lift-Net Elevator Monitoring and Management system shall be provided. The system shall comply with the requirement's set forth herein and shall include a monitoring system in each machine room and connected to existing Lift-Net system in central command.
- B. General: Provide an interactive system to monitor and manage the elevator equipment ("units") hereinafter called "system." Data collection, data storage, and real-time monitoring portion of the system shall be based on Microsoft Windows and be able to run on Windows 2000 Pro, XP Pro, or later operating systems. Provide the following features:
 1. Network based, capable of interfacing with control systems via either serial data link or hardwired interface connections.
 2. Operate on any TCP/IP based network system including but not limited to an Ethernet, Token Ring, Arc-Net, Lift-Net, etc.
 3. Expansion capability to add unlimited number of monitoring terminals on the network.
 4. Monitoring terminals shall operate peer-to peer or with a single client server. Failure of a single network device shall not affect the operation of the remainder of the system.
 5. Complete backup of system data shall be accomplished at any single terminal/server location.
 6. Display multiple banks, including multiple buildings, on a single monitoring terminal screen.
- C. Monitoring Display: The system shall be capable of simultaneous monitoring of at least five hundred units on a single monitoring station utilizing a graphical representation of a plan view of the facility. Each elevator shown on the plan view shall be individually displayed and shall be visible on the monitoring system display terminal without the need to scroll. Each individual unit, when operating "normally," shall be displayed in green. In the event of a malfunction of any individual unit, the unit shall be displayed by a red blinking light on the monitoring system display. Units which are intentionally placed out of service shall be shown as yellow in the display mode. When malfunctioning units, or units intentionally placed out of service are returned to normal operation the graphical representation for that unit(s) shall automatically return to green. The user shall have the ability to display additional information, such as the cause of fault/alarm, for all units by selecting the unit with a "mouse click" from the plan view of the facility. All monitored units shall be visible from any

monitoring terminal on the network. Entry into the network shall be multi-level password protected.

D. System Capabilities:

1. The system shall be capable of real time display of all monitored status points on all monitored equipment. Fault and event notification screens and audible alarms shall be immediately displayed on selected monitoring stations. Different fault and event tables shall be defined on a per-bank basis. The system shall collect and store all status, fault, and event information for later reporting and analysis. The system shall provide statistical analysis of hall call response times, traffic patterns, fault conditions, service logs, and security usage in graphical and tabular format.
2. The system shall maintain a record of every status point change occurring on the monitored equipment and provide the ability to replay these events in a simulation at a later time in real time, slow speed, single step, reverse, or fast forward. This information shall be retained for a period of at least twenty-six weeks and a mechanism shall be provided whereby this information may be archived.
3. The system shall store traffic fault and statistical data for a period of at least three (3) years. The system shall log error type, car number, floor position, and major system status points whenever a fault or logged event occurs.
4. The system shall provide interactive control of certain features provided in the elevator control system. These features may be revised as the requirements of the building change. Some of these interactive controls may include, but are not limited to: Security floor lockouts, entering car and hall calls, Firefighters' service, lobby recall, VIP service, up/down peak service, etc.
5. In the case of a power failure the system shall be capable of connecting to emergency power back-up unit. The loss of power shall not affect any stored data. The system shall have the capability to detect the loss (disconnect) of any individual unit from the monitoring system by periodically polling all units to ensure that normal communications between the unit(s) and the terminals/server are maintained.
6. The system will automatically re-boot the program and continue to operate after a power loss or other system malfunction.

E. Monitoring Equipment: The monitoring equipment shall have these minimum characteristics:

1. Monitoring Station Hardware: Provide a monitoring station in each machine room and on for each facility in central command.
 - a. Central Processing Unit: IBM compatible microcomputer – desk top or mini-tower (multiple machine rooms or lobby displays)
 - b. Type: Pentium or most current high-performance processor
 - c. Speed: Most current high-performance
 - d. Internal Hard Drive: Adequate storage for three years data for entire system
 - e. Modem: Most current high-performance
 - f. Display Monitor: 19" – 20" LCD flat panel, color, capable of simultaneous display of all monitored units
 - g. Printer: Current HP Color Desk Jet Series
 - h. Keyboard: MS Windows compatible
 - i. Mouse: MS Windows compatible
 - j. Power Requirements: 90-230 Volts AC, 50-60Hz @ 8A
2. Monitoring Station Operating System Software
 - a. MS Windows 2000 Pro, XP Pro, or later
 - b. MS Windows 2000 Server or later

- F. Network requirements:
1. Maximum local network rated distance (2-20 gauge shielded TP): > 10 miles
 2. Elevator Contractor shall provide assistance to Network Contractor with installation of network system in elevator equipment spaces at no additional cost.
 3. Elevator Contractor is responsible for material and labor required for the connectivity and testing of all escalator management.
 4. Refer to Division 28 for Network information.
- G. Monitoring Requirements: The system shall display and record the following information for each monitored unit. Serial data links may include many more points. Items listed below are minimum requirements.
1. Group status:
 - a. Group operational mode
 - b. All units to be monitored on the same screen in a graphical format
 - c. In/out of service
 - d. Standby power
 - e. Supervisory failure
 - f. Location and direction of hall calls
 - g. Shunt Trip status.
 2. Individual car status, expandable menus:
 - a. Direction of travel
 - b. Independent service
 - c. Inspection service
 - d. Firefighters' service
 - e. Position of elevator
 - f. Door status (open, opening, closing, closed)
 - g. Door dwell time
 - h. Load by-pass
 - i. Standby power
 - j. Power on/off
 - k. Door detector
 - l. Safety circuit
 - m. Door zone
 - n. Stop switch
 - o. Alarm button
 - p. Registered car calls
 - q. Out of level
 - r. Machine room temperature exceeds 95 degrees
 - s. Stop counter (number of starts)
 - t. Car speed
 - u. Door open times
 - v. Door close time
 - w. Start to stop motion time
 - x. Emergency 2-way communication device
 - y. Air conditioner/heater
 3. Keyboard, mouse, and time clock control capabilities:
 - a. Floor lockouts (car or hall)
 - b. Lobby recall
 - c. VIP service
 - d. Firefighters' service
 - e. Up/down peak

4. Faults monitored with visual and audible alarm, triggered by combinations of any of the above status points:
 - a. Safety circuit
 - b. Alarm bell
 - c. Stop switch
 - d. Emergency 2-way communication device
 - e. Door reversal device
 - f. At least six (6) user selectable faults or events (i.e. water in pit, high machine room/cab temperature)
- H. Reporting Requirements: System shall provide reports in color graphical format both on-screen and in printed form capability to conveniently switch from one report type to another and from one bank to another using minimal mouse clicks and key strokes. Reports shall be displayed after minimal waiting time. Data for all reports shall be continuously recorded and stored. Reports shall be displayed by simply selecting a date and time range, bank of equipment and report type. Date and time range selections shall carry forward from one report selection to the next. Reporting functions shall be sub-divided into the following categories:
 1. Traffic Reports:
 - a. Number of hall calls per floor (hall call distribution on a per floor basis)
 - b. Number of hall calls per hour (24 hour time-line)
 - c. Hall call waiting times per floor (hall call waiting time distribution on a per floor basis)
 - d. Hall call waiting times per hour (24 hour time-line)
 - e. Distributed hall call response graph (24 hour time-line)
 - f. Detailed hall call response graph (% calls / n seconds)
 - g. Longest wait times including floor #, wait time, date, time and direction
 2. Fault Reports:
 - a. Ten most recent faults (most recent faults listed per bank)
 - b. Fault Log: Displays the entire fault log for a given time period
 - c. Faults per car (fault distribution on a per car basis)
 - d. Faults per floor (fault distribution on a per floor basis)
 - e. Faults per day/week/month (fault distribution on a per unit or group basis)
 3. Car Use Statistics:
 - a. Car use by hour (24 hour time-line of car calls, car starts, door cycles, delayed car, load by pass)
 - b. Car use statistics (same as above, shown for an entire bank)
 4. Group Service Log:
 - a. Cars in service (24 hour time-line with text log of group availability of each car)
 - b. Group functions (24 hour time-line with text log of actuation of group functions – Up peak, down peak, fire service, emergency power, etc.)
- I. Interactive Features: The control system shall be capable where desired of operating interactive control features provided in the elevator control system. These features may be revised as the requirements of the building change. Some of these interactive controls may include but are not limited to: security floor lockouts, entering car and hall calls, Firefighters' return service, lobby recall, VIP service, up/down peak or hospital Code Blue service. Local codes may affect the availability or operation of these features.

1. Security Access Features: The monitoring system shall be capable of providing security enable/disable of all hall and car calls through on-screen menus at a minimum. The monitoring system shall also be capable of interfacing directly with card readers and security keypads in stand-alone mode, and indirectly through a serial interface with a third party security system. When in stand-alone mode, the monitoring system shall maintain a database of elevator users and security pass codes. When on secure mode the use of each elevator will be recorded in a file together with the time, authorized pass code and destination for each call.
 2. Elevator Control Features: Each elevator shall be capable of being controlled through the monitoring system. All control points shall be capable of seven-day twenty-four hour time clock automatic operation or manual operation from the mouse and keyboard. The control points shall include, but not be limited to, the following (where allowed by local codes):
 - a. Lobby recall
 - b. Car call security lockout
 - c. Hall call security lockout
 - d. Independent service
 3. Paging Feature: The monitoring system shall be capable of paging a service technician or other personnel based on pre-defined parameters of elevator faults or conditions. The paging system shall provide the ability to page multiple numbers determined by the type of event triggering the notification and shall be able to page different numbers based on preset times of day (i.e. different shifts). The system shall be capable of sending text messages to full text pagers in addition to supporting standard DTMF pagers.
 4. Remote Access Feature: The monitoring system shall be capable of allowing approved individuals under multi-level password control to access all system features via the local area network, internet, or via modem over the public telephone network to review the performance of the equipment or to evaluate a fault condition. The remote access feature shall be integrated into the monitoring system and shall not use third party "remote control" software products.
- J. Elevators to be integrated into existing Lift Net monitoring system and communicate to the Central Control room of the facility. Coordinate use of LAN with the Owner. For non LAN functions provide wiring and conduit for all components furnished.
- K. Lift-net system shall be connected to a new USP power back up system furnished fully by Elevator Contractor.

PART 3 – EXECUTION

3.1 SCOPE

- A. Installation shall meet all of the standard requirements of paragraph 1.03 for installation and inspection, tolerances, and qualifications. All work required for completion of a first-class installation is the responsibility of the Contractor, even if not included in this specification.
- B. Performance of the Escalator shall meet requirements outlined in Division 14 documents.
- C. Labeling of disconnects with feed location information and shunt trip locations to be by Escalator contractor.

3.3 PAINTING

- A. All escalator equipment not painted, located within the machine room or hoistway, shall be given a finish coat of paint. Material that has factory finish paint, shall have all scratches or mars re-painted after installation. Any galvanized finishes do not need to be painted.
- B. Finish coat shall have hard, tough semi-gloss surface.
- C. Escalator machine room and pit floors shall be painted with an oil resistant polyurethane high gloss enamel paint or approved equivalent. Color shall be terra cotta (Tough Shield #1231-108) or approved equivalent.

3.4 CLEAN UP

- A. Remove trash daily from hoistways, pits, and machine rooms including all packing material and debris resulting from this work. Leave all Escalator spaces broom clean.

3.5 ACCEPTANCE TESTING

- A. Tests shall be performed by the Escalator Contractor at his expense in the presence of the Owner's representative. The Escalators shall be subjected to the following acceptance inspection and tests.
 - 1. Inspection and tests required by applicable portions the Construction Documents.
 - 2. Inspection and tests required by Federal, State, and Local codes and ordinances.
 - 3. Test safety circuit, loop circuit, and the drive circuits at 500 volts. Minimum resistance to ground shall be one megohm.
 - 4. General riding quality, leveling accuracy, and quietness of operation shall be acceptable to the Owner's representative.
- B. The Escalators shall not be used for construction purposes, or during the period prior to turning over the project to the Owner, without Owner written authorization. Should the Escalators be authorized for temporary use, the following conditions shall apply:
- C. The Escalator Contractor shall provide a temporary acceptance form for the user to sign.
- D. The Warranty period commences upon Substantial Completion, regardless of any temporary use agreement.
- E. The user shall provide, if job conditions require, all temporary enclosures, guards or other project of the hoistway openings, power, signal devices, car lights, protection of any Escalator equipment that is installed.
- F. The user shall return the Escalators in the same condition they were in when placed on temporary service and shall pay the Escalator Contractor for repairs or clean up.
- G. The user shall allow the Escalator Contractor to perform routine maintenance or repairs.
- H. The cost of temporary service shall be worked out between the Escalator Contractor and the user.

- I. As Escalators are completed, the Owner shall have the prerogative of accepting and using them, shutting them down, or accepting them under an interim Service Agreement described below:
 1. The Owner shall have the prerogative of continuing the Interim Service Agreement until all Escalators in the group (or building or APM/ITF Programs) are completed.
 2. The Warranty period commences upon Substantial Completion, regardless of any Interim Use Agreement.
 3. Cost of Interim Service shall not exceed the prorated unit price for Year One included on the Bid Form.

3.6 INSTRUCTIONS TO OWNER

- A. Before final acceptance, Contractor shall instruct Owner's personnel not to use Escalator during automatic operation, independent service, secured mode and fireman's service.

3.7 ACCEPTANCE

- A. Final acceptance of the installation shall be made only after all field inspections and tests are complete, punch list items are complete, all Owner's representative is satisfied that the installation has been satisfactorily completed.

END OF SECTION 14 31 00

SECTION 14 91 82 - TRASH CHUTES

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. Waste chutes.
- B. Related Requirements:
 - 1. Section 05 50 00 "Metal Fabrications" for metal supporting framework at floor penetrations.
 - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for roof-vent flashing.
 - 3. Section 21 13 13 "Wet-Pipe Sprinkler Systems" for fire-suppression water-service connections to automatic sprinklers in the chute.
 - 4. Section 22 11 16 "Domestic Water Piping" for water-service connections to chute-flushing or -sanitizing equipment.

1.3 DEFINITIONS

- A. Chase: The shaft that encloses a chute.
- B. Intake Door: Door or hatch that penetrates the chase wall and chute, and through which materials are fed into the chute.
- C. Discharge Door: Door or hatch at the bottom of a chute, through which materials exit the chute.
- D. Access Door: Door other than an intake or discharge door that penetrates the chase wall for service access to devices in the chase.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 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 chutes.
- B. Sustainable Design Documentation Submittals: Refer to section 01 81 13.14 "Sustainable Design Requirements – LEED V4 BD+C".
 - 1. Product Data: Documentation for Leadership Extraction Practices in the following:

- a. Leadership Extraction Practices for Recycled Content
- 2. Product Certificates: Provide the following:
 - a. Environmental Product Declarations (EPD's)

B.C. Shop Drawings:

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include each type and location of intake, discharge, and access door.
4. Include diagrams for power, signal and control wiring.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Size and construction of chase enclosing each chute; locations for power, signal, and control wiring; and sprinkler-piping and water-service connections.
 2. Chute-discharge locations coordinated with compactor-intake or container locations.
- B. Product Certificates: For each type of chute, from manufacturer.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For chutes to include in operation and maintenance manuals.
 1. Include manufacturer's recycling plan guidelines.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. American Chute Systems, Inc.
 2. Chutes International.
 3. U.S. Chutes; U.S.C. Group.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing and inspecting agency, for fire-protection ratings indicated.
 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
 2. Intake Doors: Labeled, 1-1/2-hour fire-resistance rated with 30-minute temperature rise of 250 deg F.

3. Access Doors: Labeled, 1-1/2-hour fire-resistance rated with 30-minute temperature rise of 250 deg F.
- B. Discharge-Door Assemblies: Labeled, 1-1/2-hour fire-resistance rated according to NFPA 252 or UL 10B requirements for fire-rated door assemblies.
- C. 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.
- D. Standard: Provide chutes complying with NFPA 82.

2.3 CHUTES

- A. Chute Metal: Type 304 stainless steel, ASTM A 240/A 240M.
 1. Thickness: 0.060 inch.
- B. Chute Size: As indicated on Drawings.
- C. External Reinforcing for Offsets: Additional thickness of 0.11-inch-thick chute metal with bracing to structure.
- D. Vent: Full diameter vent of same gauge extending 3 feet (914mm) above roof with metal safety cap, in accordance with NFPA Code 82, 2008 edition.

2.4 DOORS

- A. Intake-Door Assemblies: ASTM A 240/A 240M, Type 304, stainless-steel self-closing units with positive latch and latch handle, with stainless-steel trim; constructed as required for performance requirements indicated; and with frame suitable for the enclosing chase construction.
 1. Door Type: Hopper.
 2. Size: Manufacturer's standard size for door type, chute type, and diameter indicated.
 3. Finish: Manufacturer's standard satin or No. 3 directional polish.
 4. Lockset: T-handle-type cylinder lock that releases latch with key that is removable only when cylinder is locked.
 - a. Lock Cylinder: Cylinders standard with manufacturer.
 - b. Keying: For each chute, key cylinders alike to master key system.
 - c. Keys: Two for each cylinder.
 5. Mechanical Interlocks: Interlock system for system servicing, operated from discharge door to automatically lock intake doors.
 6. Baffles: Rubber backdraft baffles at each intake.
- B. Discharge-Door Assemblies: Aluminum-coated steel; direct vertical-discharge type, inclined, and horizontally closing and latching; constructed as required for performance requirements indicated; and equipped with 165 deg F fusible links that cause doors to close in the event of fire.

- C. Detector System: Heat- and smoke-detecting interlock system with temperature-rise elements that locks chute doors when temperature in chute reaches a predetermined, adjustable temperature.
 - 1. Locate smoke detector outside discharge door with solenoid to close discharge door.
- D. Access-Door Assemblies: Manufacturer's standard ASTM A 240/A 240M, Type 302/304, stainless-steel doors with trim; constructed as required for performance requirements indicated; with frame suitable for the enclosing chase construction; and in satin or No. 3 directional polish finish; equipped with cylinder locks that release latch with keys that are removable only when cylinder is locked.
 - 1. Lock Cylinder: Cylinders standard with manufacturer.
 - 2. Keying: Key access-door cylinders alike to master key system.
 - 3. Keys: Two for each cylinder.

2.5 ACCESSORIES

- A. Chute Fire Sprinklers: NFPA 13; manufacturer's standard, recessed, automatic, NPS 1/2 sprinklers; ready for piping connections.
- B. Flushing Spray Unit: NPS 3/4 spray-head unit located in chute above highest intake door, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- C. Sanitizing Unit: NPS 3/4 disinfecting and sanitizing spray-head unit located in chute above highest intake door, including 1-gal. tank and adjustable proportioning valve with bypass for manual control of sanitizing and flushing operation, ready for hot-water piping connection, and with access door for spray-head and piping maintenance.
- D. Intake-Door Baffles: Rubber baffles, 1/8 inch thick.
- E. Sound Dampening: Manufacturer's standard sound and vibration isolator pads at supporting frame at each floor penetration and sound-insulating wrap around exterior of chute and intake assemblies.

2.6 FABRICATION

- A. General: Factory-assemble chutes to greatest extent practicable with nonleaking, continuously welded or lock-seamed joints without bolts, rivets, or clips projecting into chute interior. Include intake-door assemblies, metal supporting framing at each floor, and chute expansion joints between each support point.
- B. Offsets: Construct offsets where indicated on Drawings. Fabricate so that installed chute is without obstructions that might prevent materials from free falling within chute.
 - 1. Offsets below Intake Doors: Unless otherwise indicated, do not exceed a 15 degree maximum offset angle at any point, or place offset closer than 48 inches to nearest door above offset.

2. Offset above Top Intake Door: Do not exceed a 45 degree maximum offset angle between the highest intake door and the upper termination of chute.
 3. Offsets at Floors: Complete offset between floors by returning chute to plumb before penetrating floors.
 4. External Reinforcing: Externally reinforce impact area of offsets located below top intake door. Install vibration isolators where braced to structure.
- C. Roof Vent: Fabricate vent unit as full-size extension of chute, open to the atmosphere. Extend vent to height above roofing surface as indicated on Drawings. Equip vent with full insect screening and metal explosion-release cap. Fabricate with roof-deck flange, counterflashing, and clamping ring of nonferrous metal compatible with chute metal.
- D. Chute Fire Sprinklers: Install internally within chute, recessed out of the chute area through which material travels, and according to NFPA 13. Locate fire sprinklers at or above the top service opening of chutes, within the chute at alternate floor levels in buildings more than two stories tall, and at the lowest service level.
- E. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and test chutes before installing enclosing chase construction.
- B. Install chutes according to NFPA 82 and manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor chutes securely to supporting structure to withstand impacts and stresses. Install chute and components to maintain fire-resistive performance of chute and the enclosing chase construction.
- C. Install chutes plumb, without obstructions that might prevent materials from free falling within chutes.
- D. Anchor flanges of chute vents to roof curbs before installing roofing and flashing. Install chute-vent counterflashing after roofing and roof-penetration flashing are installed.
- E. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes.
1. Interconnect sanitizer control with door interlock system.
- F. Test and adjust chute components after installation. Operate doors, locks, and interlock systems to demonstrate that hardware operates properly and smoothly and electrical wiring is connected correctly.
- G. Test heat- and smoke-sensing devices for proper operation.

- H. Operate sanitizing unit through one complete cycle of chute use and cleanup, and replenish chemicals or cleaning fluids in unit containers.
- I. Plumbing Access Doors: After construction of chase enclosure, verify that access doors have been correctly located and properly installed for their purpose.

3.2 CLEANING

- A. After completing chase enclosure, clean exposed surfaces of chute system's components. Do not remove labels of testing and inspecting agencies.
- B. Refer to Section 01 35 46 "Indoor Air Quality" and Section 01 74 23 "Final Cleaning" for additional requirements.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain each chute and related equipment.
- B. Demonstrate replenishment of sanitizing-unit chemicals or cleaning fluids.

END OF SECTION 14 91 82

SECTION 21 08 00 - COMMISSIONING OF FIRE SUPPRESSION SYSTEMS

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.
- B. Owner's Project Requirements (OPR) and the Basis of Design (BOD) documentation are included by reference for information only.
- C. Division 01 Section 01 81 13 Sustainable Design Requirements – LEED v4 BD+C for additional LEED v4 requirements related to commissioning.
- D. ASHRAE standard 90.1-2010, ASHRAE Guideline 0-2013 (The Commissioning Process) and ASHRAE Standard 202-2013 Commissioning Process for Buildings and Systems.
- E. NFPA 3 – Recommended Practice for Commissioning of Fire Protection and Life Safety Systems. NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing

1.2 SUMMARY

- A. This section includes commissioning process requirements for Fire Suppression systems, assemblies and equipment.
- B. Related Sections:
 - 1. Section 01 91 13 - "General Commissioning Requirements" for general commissioning process requirements.

1.3 DESCRIPTION

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for the description of commissioning.

1.4 DEFINITIONS

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for definitions.

1.5 SUBMITTALS

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for CxA's role.
- B. Refer to Section "Submittals" for specific requirements. In addition, provide the following:
 - 1. Certificates of readiness

2. Certificates of completion of installation, pre-start, and start-up activities.
3. Test reports
4. O&M manuals

1.6 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the contractor for the equipment being tested. For example, the fire protection contractor shall ultimately be responsible for all standard testing equipment for the fire protection systems under their control. A sufficient quantity of two-way radios shall be provided by each subcontractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.
- E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall

have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing contractors, the CxA will prepare Verification Checklists for all commissioned components, equipment, and systems.
- B. Red-lined Drawings:
 - 1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
 - 2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
 - 3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
 - 4. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data:
 - 1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
 - 2. The CxA will review the O&M literature once for conformance to project requirements.
 - 3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the contractor.
- D. Demonstration and Training:
 - 1. Contractor will provide demonstration and training as required by the specifications.
 - 2. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training.
 - 3. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.
 - 4. The CxA shall be notified at least 72 hours in advance of scheduled pump test so that testing may be observed by the CA and representatives of the Owner. A copy of the test record shall be provided to the CxA, the Owner's Representative and the Engineer-of-Record.
 - 5. Engage a Factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain specialty valves.
 - 6. Engage a Factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain Fire Pump.
 - 7. Train the Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining units.
 - 8. Review data in O&M Manuals.

E. Systems Manual requirements:

1. The Systems Manual is intended to be a usable information resource containing all of the information related to the systems, assemblies, and Commissioning Process in one place with indexes and cross references.
2. The CMAR and subcontractors shall include final approved versions of the following information for the Systems Manual:
 - a. As-Built System Schematics
 - b. Verified Record Drawings
 - c. Test Results (not otherwise included in Cx Record)
 - d. Periodic Maintenance Information for computer maintenance management system
 - e. Recommendations for recalibration frequency of sensors and actuators
 - f. A list of contractors, subcontractors, suppliers, architects, and engineers involved in the project along with their contact information
 - g. Training Records, Information on training provided, attendees list, and any on-going training
 - h. Copy of all related NFPA 20 and NFPA 70 documentation.
3. This information shall be organized and arranged by building system, such as fire alarm, chilled water, air distribution, etc.
4. Information should be provided in an electronic version to the extent possible. Legible, scanned images are acceptable for non-electronic documentation to facilitate this deliverable.

3.2 CMAR and SUBCONTRACTOR'S RESPONSIBILITIES

- A. Fire Protection Contractor. The commissioning responsibilities applicable to the Fire Protection Contractor are as follows (all references apply to commissioned equipment only):
1. Perform commissioning tests at the direction of the CxA.
 2. Attend construction phase coordination meetings.
 3. Participate in Fire Suppression systems, assemblies, equipment, and component maintenance orientation and inspection, as directed by the CxA.
 4. Provide information requested by the CxA for final commissioning documentation.
 5. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
 6. Prepare preliminary schedule for Fire Suppression systems orientations and inspections, operation and maintenance manual submissions, training sessions, flushing and cleaning, equipment start-up, and task completion by Owner. Distribute preliminary schedule to commissioning team members.
 7. Update schedule, as required, throughout the construction period.
 8. During the installation, start-up and initial checkout process, complete the Fire Protection-related portions of the verification (pre-functional) checklists for all commissioned equipment. Note: checklists will be maintained on a cloud-based Cx web application, refer to Section 01 91 13.
 9. Assist the CxA in all verification and functional performance tests.

10. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
 11. Gather operation and maintenance literature on all equipment, and assemble in binders, as required by the specifications. Submit to CxA 45 days after submittal acceptance.
 12. Coordinate with the CxA to provide forty-eight (48) hour advance notice, so the witnessing of equipment and system start-up and testing can begin.
 13. Participate in, and schedule vendors and contractors to participate in, the training sessions.
 14. Provide written notification to the CMAR and the CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems and sub-systems are operating as required:
 - a. Fire suppression equipment, including: pumps, piping, control valves, and all other equipment under their control.
 - b. Automatic sprinkler system
 - c. Fire stopping in fire-rated construction, including caulking, gasketing and sealing of smoke barriers.
- B. The equipment supplier shall document the performance of his equipment.
- C. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
- D. Equipment Suppliers
1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 2. Assist in equipment testing per agreements with contractors.
 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- E. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
- F. Refer to Section 01 91 13 "General Commissioning Requirements" for additional contractor responsibilities.

3.3 OWNER'S RESPONSIBILITIES

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for Owner's Responsibilities.

3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for Design Professional's Responsibilities.

3.5 COMMISSIONING AUTHORITY'S (CxA's) RESPONSIBILITIES

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for CxA's Responsibilities.

3.6 TESTING PREPARATION

- A. Certify in writing to the CxA that Fire Suppression systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify in writing to the CxA that Fire Suppression instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- D. Inspect and verify the position of each device and interlock identified on checklists.
- E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.7 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of Fire Protection testing shall include entire Fire Suppression installation. Testing shall include measuring capacities and effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions.
- D. The Fire Suppression contractor shall prepare detailed testing plans, procedures, and checklists for Fire Suppression systems, subsystems, and equipment and submit to the CxA for review.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Fire Suppression system, document the deficiency and report it to Owner's Representative. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.8 FIRE SUPPRESSION SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual technical sections. Provide submittals, test data, inspector record, and certifications to the CxA.
- B. Fire Suppression Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of sprinkler distribution systems.
- C. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:
 - 1. Fire Suppression Standpipes
 - 2. Wet-Pipe Sprinkler System
 - 3. Centrifugal Fire Pump
 - 4. Pressure maintenance pump

3.9 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.10 APPROVAL

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for approval procedures.

3.11 DEFERRED TESTING

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.12 OPERATION AND MAINTENANCE MANUALS

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.13 TRAINING OF OWNER PERSONNEL

- A. Refer to Section 01 91 13 "General Commissioning Requirements" for requirements pertaining to training.

END OF SECTION 21 08 00

SECTION 211200 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Hose connections.
4. Fire-department connections.
5. Alarm devices.
6. Pressure gages.

B. Related Sections:

1. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
2. Section 211316 "Dry-Pipe Sprinkler Systems" for dry-pipe sprinkler piping.
3. Section 213113 "Electric-Drive, Centrifugal Fire Pumps"

1.2 SYSTEM DESCRIPTIONS

- A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

1.3 PERFORMANCE REQUIREMENTS

- A. Fire-Suppression Standpipe System Component: Listed for 175-psig (1200-kPa) minimum working pressure or 250 psig working pressure where required.
- B. Layout: Layout fire-suppression standpipes using requirements and design criteria indicated. Layout and pipe sizes not to be less than those shown on plan documents.
- C. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.
1. Minimum residual pressure at each hose-connection outlet is as follows:
 - a. NPS 2-1/2 (DN 65) Hose Connections: 100 psig
 2. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:
 - a. NPS 2-1/2 (DN 65) Hose Connections: 175 psig

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Each product shall be FM approved and shall be indicated on the product data submitted.

- B. Shop Drawings: For fire-suppression standpipes. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable. Provide coordination drawings as a separate submittal. Coordination shall be the responsibility of the installing contractor and coordination drawings shall include the verification of coordination by the fire sprinkler contractor, plumbing, HVAC and electrical contractor at a minimum.
- C. Welding certificates.
- D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, coordinating, and installing fire-suppression standpipes. Base calculations on results of fire-hydrant flow test or existing fire pump test report as applicable.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. 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.
- D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14, "Installation of Standpipe and Hose Systems."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 30, Galvanized and Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Standard-Weight, Galvanized and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, seamless steel pipe with threaded ends.
- D. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.
- E. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable- or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME B16.1, Class 125.
- H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
 - 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. Anvil International, Inc.
 - b. Corcoran Piping System Co.
 - c. National Fittings, Inc.
 - d. Shurjoint Piping Products.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
 - 2. Pressure Rating: 250 psig (1725 kPa) minimum as necessary.
 - 3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free.
 - 1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. All equipment shall be FM approved.
2. Minimum Pressure Rating: 175 psig (1200 kPa) or 250 psig where required

B. Check Valves:

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. AFAC Inc.
 - b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - c. Anvil International, Inc.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Crane Valves.
 - f. Crane Co.; Crane Valve Group; Jenkins Valves.
 - g. Crane Co.; Crane Valve Group; Stockham Division.
 - h. Fire-End & Croker Corporation.
 - i. Fire Protection Products, Inc.
 - j. Fivalco Inc.
 - k. Globe Fire Sprinkler Corporation.
 - l. Groeniger & Company.
 - m. Kennedy Valve; a division of McWane, Inc.
 - n. Matco-Norca.
 - o. Metraflex, Inc.
 - p. Milwaukee Valve Company.
 - q. Mueller Co.; Water Products Division.
 - r. NIBCO INC.
 - s. Potter Roemer.
 - t. Reliable Automatic Sprinkler Co., Inc.
 - u. Shurjoint Piping Products.
 - v. Tyco Fire & Building Products LP.
 - w. United Brass Works, Inc.
 - x. Venus Fire Protection Ltd.
 - y. Victaulic Company.
 - z. Viking Corporation.
 - aa. Watts Water Technologies, Inc.
2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

C. Indicating-Type Butterfly Valves:

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. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.

- e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Shurjoint Piping Products.
 - h. Tyco Fire & Building Products LP.
 - i. Victaulic Company.
- 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig (1200 kPa) minimum or 250 psig where required
 - 4. Valves NPS 2 (DN 50) and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
 - 5. Valves NPS 2-1/2 (DN 65) and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
 - 6. Valve Operation: Integral [electrical, 115-V ac, prewired, single-circuit, supervisory switch

2.5 HOSE CONNECTIONS

A. Adjustable-Valve Hose Connections:

- 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. AFAC Inc.
 - b. Elkhart Brass Mfg. Company, Inc.
 - c. Fire-End & Croker Corporation.
 - d. Fire Protection Products, Inc.
 - e. GMR International Equipment Corporation.
 - f. Guardian Fire Equipment, Inc.
 - g. Potter Roemer.
 - h. Tyco Fire & Building Products LP.
 - i. Wilson & Cousins Inc.
 - j. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
- 2. Standard: UL 668 hose valve, with integral UL 1468 reducing or restricting pressure-control device, for connecting fire hose.
- 3. Pressure Rating: 300 psig minimum.
- 4. Material: Brass or bronze.
- 5. Size: NPS 2-1/2 as indicated.
- 6. Inlet: Female pipe threads.
- 7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
- 8. Pattern: Angle or gate.
- 9. Pressure-Control Device Type: Pressure regulating
- 10. Design Outlet Pressure Setting: 175
- 11. Finish: Rough brass or bronze

B. Nonadjustable-Valve Hose Connections:

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. AFAC Inc.
 - b. Elkhart Brass Mfg. Company, Inc.
 - c. Fire-End & Croker Corporation.
 - d. Fire Protection Products, Inc.
 - e. GMR International Equipment Corporation.
 - f. Guardian Fire Equipment, Inc.
 - g. Kennedy Valve; a division of McWane, Inc.
 - h. Mueller Co.; Water Products Division.
 - i. NIBCO INC.
 - j. Potter Roemer.
 - k. Tyco Fire & Building Products LP.
 - l. Wilson & Cousins Inc.
2. Standard: UL 668 hose valve for connecting fire hose.
3. Pressure Rating: 300 psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 2-1/2 as indicated.
6. Inlet: Female pipe threads.
7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
8. Pattern: Angle or gate.
9. Finish: Rough brass or bronze

2.6 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

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. ADT Security Services, Inc.
 - b. McDonnell & Miller; ITT Industries.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
 - e. Viking Corporation.
 - f. Watts Industries (Canada) Inc.
2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig
7. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches:

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. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.7 PRESSURE GAGES

- 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. AMETEK; U.S. Gauge Division.
 2. Ashcroft Inc.
 3. Brecco Corporation.
 4. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- D. Pressure Gage Range: 0 to 250 psig (0 to 1725 kPa) minimum
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

- A. Refer to specification 21 13 13

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
1. Deviations from engineer of record approved working plans for piping require written approval from the EOR. Deviations to be requested prior to shop drawing submittal.

- B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.
- C. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install drain valves on standpipes. Extend drain piping to outside of building or floor drain as applicable.
- E. Install alarm devices in piping systems.
- F. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 and FM data sheets for hanger materials.
- G. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- H. Fill wet-type standpipe system piping with water.
- I. Install sleeves for piping penetrations of walls, ceilings, and floors.
- J. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- K. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section ~~210518 "Escutcheons for Fire-Suppression Piping."~~21 13 13.
- L. All standpipe insulation in the parking garage to be primed and painted.
- M. All floor penetrations of the parking garage to be sleeved and approved by Walker Parking prior to the installation of sleeves. Sleeves to be steel.
- N. Where standpipe piping passes through areas not enclosed with walls, or exposed to outside temperatures below 40 degrees, the piping shall be primed, painted, provided with UL listed heat trace and provided with a weatherproof insulation. This shall include at a minimum all piping at the ground level of the Airside Building.

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

3.5 HOSE-CONNECTION INSTALLATION

- A. Install hose connections on standpipes and fire hose piping at hose stations as indicated.
- B. Install freestanding hose connections for access and minimum passage restriction.
- C. Install NPS 2-1/2 (DN 65) hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 (DN 65 by DN 40) reducer adapter.
- D. Install wall-mounted-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for ~~cabinets in Section 104413~~ "Fire Extinguisher Cabinets. Fire Hose Valve cabinets to match fire extinguisher cabinets and be submitted to and approved by the Architect prior to procurement"
- E. All buildings with standpipe systems, including the open parking garage to be provided with fire hose cabinets. Cabinets to be stainless steel.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Refer to section 21 13 13.

3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.
- B. Identify system components, wiring, cabling, and terminals in accordance with NFPA 70 and NFPA 72.-
~~Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."~~

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Coordinate with fire-pump tests. Operate as required.
 - 7. Verify that equipment hose threads are same as local fire-department equipment.
- C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 PIPING SCHEDULE

- A. Wet-type, fire-suppression standpipe piping, NPS 2 and smaller shall be the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
- B. Wet-type, fire-suppression standpipe piping, NPS 2 ½" and larger shall be the following:
 - 1. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 2. Schedule 40 is permitted for threaded piping.

END OF SECTION 211200

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, Including Contractual Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

- B. Related Sections:

1. Section 21_12_00 "Fire-Suppression Standpipes" for standpipe piping.
2. Section 21_13_16 "Dry-Pipe Sprinkler Systems" for dry-pipe sprinkler piping.
3. Section 21_31_13 "Electric-Drive, Centrifugal Fire Pumps" for fire pumps, pressure-maintenance pumps, and fire-pump controllers.

1.3 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to the water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.4 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.
- B. Delegated Layout: Design sprinkler system(s) using performance requirements and design criteria indicated.
 1. Available fire-hydrant flow test records indicate the following conditions (at the time of the Parking Garage Permit Submittal, an on-site fire hydrant flow test was not available. Calculations for the Garage to be based upon the fire pump test report of the pump installed in Phase 1 of the Garage):
 - a. Date: 06-19-2017
 - b. Time: 9am

- c. Performed by: OUC
 - d. Location of Residual Fire Hydrant R: Hydrant HSE33I01
 - e. Location of Flow Fire Hydrant F: Hydrant HSE 33J01
 - f. Static Pressure at Residual Fire Hydrant R: 68 psig
 - g. Measured Flow at Flow Fire Hydrant F: 984 gpm
 - h. Residual Pressure at Residual Fire Hydrant R: 56 psig
 - 2. A second fire hydrant flow test was taken on site by Farrell Fire Protection, LLC. The following are the results:
 - a. Date: 12-29-2016
 - b. Time: 9:15 am
 - c. Performed by: Farrell Fire Protection
 - d. Location of Residual Fire Hydrant R: See Contract Documents for locations
 - e. Static Pressure at Residual Fire Hydrant R: 65 psig
 - f. Measured Flow at Flow Fire Hydrant F: 1000 gpm
 - g. Residual Pressure at Residual Fire Hydrant R: 53 psig
- C. Sprinkler system design shall be approved by the engineer of record, FM Global, and authorities having jurisdiction prior to installation.
- 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers. The 10 percent shall be at the fire pump discharge.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Automobile Parking Areas: Ordinary Hazard, Group 2 / HC-2
 - b. Building Service Areas: Ordinary Hazard, Group 2 / HC-2
 - c. Passenger Handling Areas: Ordinary Hazard 1
 - d. Electrical, IDF, MDF, Telco, LAN, and similar Rooms: Ordinary Hazard, Group 2 / HC-2
 - e. General Storage Areas: Ordinary Hazard, Group 2 / HC-2
 - f. Mechanical Equipment Rooms: Ordinary Hazard, Group 2 / HC-2
 - g. Retail: Ordinary Hazard Group 2, HC-2
 - h. Trash, Commissary, Tenant Storage, Loading Dock, : Ordinary Hazard, Group-2 / HC-2
 - i. Baggage Handling Areas: Ordinary Hazard Group 2 / HC-2
 - j. Baggage Sortation: Ordinary Hazard Group 2 / HC-2
 - k. Office, corridor, bathrooms, Locker, and similar: Light Hazard / HC-1
 - l. Shell Space: Ordinary Hazard Group 2 / HC-2
 - 3. Minimum Density for Automatic-Sprinkler Piping Design using standard spray sprinklers:
 - a. Light-Hazard Occupancy / HC-1: 0.10 gpm over 1500-sq. ft. area for wet-pipe with ceiling heights less than 30 ft.
 - 1) For ceiling heights 30-60 ft, a 0.20 gpm over 2500 sq.ft. is required. Dry-Pipe to have remote area increased to 3500 sq.ft.
 - 2) For ceiling heights 60 ft to 100 ft, (12) K25.2 sprinklers at 7 psi
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 2500-sq. ft. area.
 - 1) For ceiling heights 30-60 ft, a 0.20 gpm over 2500 sq.ft. is required. Dry-Pipe to have remote area increased to 3500 sq.ft.
 - 2) For ceiling heights 60 ft to 100 ft, (12) K25.2 sprinklers at 7 psi
 - c. Ordinary-Hazard, Group 2 Occupancy / HC-2: 0.20 gpm over 2500-sq. ft. area.
 - 1) For ceiling heights 30-60 ft, a 0.20 gpm over 2500 sq.ft. is required. Dry-Pipe to have remote area increased to 3500 sq.ft.
 - 2) For ceiling heights 60 ft to 100 ft, (12) K25.2 sprinklers at 7 psi (standard spray) or (6) K25.2 extended coverage sprinklers at 27 psi, but not less than the sprinkler manufactures requirements.

- 3) Baggage Handling Areas shall also include a calculation of 10 sprinklers each with a minimum pressure of 14 psi. This calculation is in addition to the .20 / 2500 calculation per FM Global
 - d. Extra-Hazard, Group 1 Occupancy / HC-3: 0.30 gpm over 2500-sq. ft. area for ceiling heights less than 30 ft.
 - e. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
 - f. Special Occupancy Hazard: As determined by FM Global
 - g. Rack storage: In accordance with NFPA 13 and FM Global.
 - h. When two different occupancy hazards are adjacent to each other and are not separated by a wall or draft curtain, extend the design of the sprinkler system protecting the higher-hazard occupancy a minimum of 20ft (6.0m) in all directions beyond the perimeter of the higher-hazard occupancy area. (FM 2-0, 2.1.3.1.3)
4. Maximum Protection Area per Sprinkler: Per UL listing and FM Global
5. Minimum Sprinkler K-factor for standard spray sprinklers:
- a. HC-1 up to 30 ft: 5.6k
 - b. HC-1 for 30-60 ft: 8.0k
 - c. HC-2 up to 60 ft: 8.0k
 - d. HC-3 up to 60 ft.: 11.2k
 - e. HC-1, HC-2, HC-3 over 60 ft: 25.2k
6. Maximum Protection Area per standard spray sprinklers:
- a. HC-1 (up to 30 ft): 225 sq.ft.
 - 1) Minimum spacing of 7 ft.
 - 2) Maximum spacing of 15 ft.
 - 3) Minimum area of 64 sq.ft.
 - b. HC-1 (30-60 ft): 120 sq.ft.
 - 1) Minimum spacing of 8 ft.
 - 2) Maximum spacing of 12 ft.
 - 3) Minimum area of 80 sq.ft.
 - c. HC-2 (up to 30 ft): 130 sq.ft.
 - 1) Minimum spacing of 7 ft.
 - 2) Maximum spacing of 12 ft.
 - 3) Minimum area of 64 sq.ft.
 - 4) Baggage Handling / Sortation: 100 sq.ft. maximum
 - a) Minimum spacing of 8 ft
 - b) Maximum spacing of 10 ft.
 - c) Minimum area of 80 sq.ft.
 - d. HC-2 (30-60ft) 100 sq.ft.
 - 1) Minimum spacing of 8 ft
 - 2) Maximum spacing of 10 ft.
 - 3) Minimum area of 80 sq.ft.
 - e. HC-3 (up to 30 ft): 100 sq.ft.
 - 1) Minimum spacing of 8 ft.
 - 2) Maximum spacing of 12 ft.
 - f. Other Areas: According to FM Global recommendations unless otherwise indicated.
7. Total Combined Inside and Outside Hose-Stream Demand Requirement: According to FM Global unless otherwise indicated:
- a. Light-Hazard Occupancies / HC-1 with sprinklers up to 60ft: 250 gpm
 - b. Light-Hazard Occupancies / HC-1 with sprinklers over 60 ft: 500 gpm

- c. Ordinary-Hazard Occupancies / HC-2 with sprinklers up to 60 ft: 250 gpm
 - d. Ordinary-Hazard Occupancies / HC-2 with sprinklers over 60 ft.: 500 gpm
 - e. Extra-Hazard Occupancies: 500 gpm
8. Inside Hose Allowance: Minimum of 100 gpm at standpipes
- 9.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Provide for each type of product indicated.
 - 2. Submittals to include specific manufactures. Where multiple items are identified on each sheet, it shall be clearly indicated the items proposed to be installed.
 - 3. All equipment shall be FM Global approved.
 - 4. Product data to be submitted at the same time as shop drawings for review.
- B. Shop Drawings: For fire sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
 - 2. Sprinkler layout Only. A submittal shall be provided to the architect indicating the sprinkler layout, its coordination with all other trades, and its type, color and finish. Drawing shall not include the sprinkler piping.
- C.
- D. Qualification Data: For qualified Installer
- E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction (AHJ), including hydraulic calculations. Shop drawings shall be submitted to the engineer of record for review and approval prior to the AHJ. It shall be the installing contractor's responsibility to submit shop drawings after coordination and with sufficient time to allow for a minimum of two reviews prior to fabrication and installation. The engineer of record is not responsible for delays in the project schedule due to insufficient scheduling by the contractor. Each review by the engineer of record to be a minimum of 10 working days. Shop drawings that do not include all required items will be returned Rejected. Resubmittals that do not include a response to each review comment will be returned Rejected.
- F. Welding certificates.
- G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- H. Field quality-control reports.
- I. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, providing layout, procurement, fabricating, and installing sprinkler systems. Base calculations on results of fire-hydrant flow test or annual fire pump test as applicable.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

D. FM Global Data Sheets.

E. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- ### A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- ### A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E. Pipe ends may be factory or field formed to match joining method.
- ### B. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M. Pipe ends to be roll grooved.
- ### C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- ### D. Uncoated, Steel Couplings: ASTM A 865, threaded.
- ### E. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- ### F. Malleable- or Ductile-Iron Unions: UL 860.
- ### G. Cast-Iron Flanges: ASME 16.1, Class 125.
- ### H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- ### I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

J. Grooved-Joint, Steel-Pipe Appurtenances:

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. Anvil International, Inc.
 - b. Corcoran Piping System Co.
 - c. National Fittings, Inc.
 - d. Shurjoint Piping Products.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
2. Pressure Rating: 250 psig minimum.
3. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free.
 1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 1. All equipment shall be FM approved.
 2. Minimum Pressure Rating: 175 psig (1200 kPa) or 250 psi where high pressure required.
- B. Check Valves:
 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. AFAC Inc.
 - b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - c. Anvil International, Inc.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Crane Valves.
 - f. Crane Co.; Crane Valve Group; Jenkins Valves.
 - g. Crane Co.; Crane Valve Group; Stockham Division.

- h. Fire-End & Croker Corporation.
- i. Fire Protection Products, Inc.
- j. Fivalco Inc.
- k. Globe Fire Sprinkler Corporation.
- l. Groeniger & Company.
- m. Kennedy Valve; a division of McWane, Inc.
- n. Matco-Norca.
- o. Metraflex, Inc.
- p. Milwaukee Valve Company.
- q. Mueller Co.; Water Products Division.
- r. NIBCO INC.
- s. Potter Roemer.
- t. Reliable Automatic Sprinkler Co., Inc.
- u. Shurjoint Piping Products.
- v. Tyco Fire & Building Products LP.
- w. United Brass Works, Inc.
- x. Venus Fire Protection Ltd.
- y. Victaulic Company.
- z. Viking Corporation.
- aa. Watts Water Technologies, Inc.

- 2. Standard: UL 312.
- 3. Pressure Rating: 250 psig (1725 kPa) minimum
- 4. Type: Swing check.
- 5. Body Material: Cast iron.
- 6. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

- 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. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. United Brass Works, Inc.
 - f. <Insert manufacturer's name>.
- 2. Standard: UL 262.
- 3. Pressure Rating: 175 psig (1200 kPa) or 250 psig where required
- 4. Body Material: Bronze.
- 5. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

- 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. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - b. American Valve, Inc.
 - c. Clow Valve Company; a division of McWane, Inc.

- d. Crane Co.; Crane Valve Group; Crane Valves.
- e. Crane Co.; Crane Valve Group; Jenkins Valves.
- f. Crane Co.; Crane Valve Group; Stockham Division.
- g. Hammond Valve.
- h. Milwaukee Valve Company.
- i. Mueller Co.; Water Products Division.
- j. NIBCO INC.
- k. Shurjoint Piping Products.
- l. Tyco Fire & Building Products LP.
- m. United Brass Works, Inc.
- n. Watts Water Technologies, Inc.

- 2. Standard: UL 262.
- 3. Pressure Rating: 250 psig (1725 kPa) minimum
- 4. Body Material: Cast or ductile iron.
- 5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

- 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. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Shurjoint Piping Products.
 - h. Tyco Fire & Building Products LP.
 - i. Victaulic Company.
- 2. Standard: UL 1091.
- 3. Pressure Rating: 250 psig minimum.
- 4. Valves NPS 2 (DN 50) and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
- 5. Valves NPS 2-1/2 (DN 65) and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
- 6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig (1200 kPa) or 250 psi where required

B. Ball Valves:

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. Affiliated Distributors.
 - b. Anvil International, Inc.
 - c. Barnett.
 - d. Conbraco Industries, Inc.; Apollo Valves.
 - e. Fire-End & Croker Corporation.
 - f. Fire Protection Products, Inc.
 - g. Flowserve.
 - h. FNW.
 - i. Jomar International, Ltd.
 - j. Kennedy Valve; a division of McWane, Inc.
 - k. Kitz Corporation.
 - l. Legend Valve.
 - m. Metso Automation USA Inc.
 - n. Milwaukee Valve Company.
 - o. NIBCO INC.
 - p. Potter Roemer.
 - q. Red-White Valve Corporation.
 - r. Southern Manufacturing Group.
 - s. Stewart, M. A. and Sons Ltd.
 - t. Tyco Fire & Building Products LP.
 - u. Victaulic Company.
 - v. Watts Water Technologies, Inc.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig (1200 kPa) or 250 psig where required
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic (Ball Drip) Drain Valves:

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. AFAC Inc.

- b. Reliable Automatic Sprinkler Co., Inc.
- c. Tyco Fire & Building Products LP.
- 2. Standard: UL 1726.
- 3. Pressure Rating: 175 psig (1200 kPa) or 250 psig where required
- 4. Type: Automatic draining, ball check.
- 5. Size: NPS 3/4 (DN 20).
- 6. End Connections: Threaded.

2.7 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

- 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. AFAC Inc.
 - b. Elkhart Brass Mfg. Company, Inc.
 - c. GMR International Equipment Corporation.
 - d. Guardian Fire Equipment, Inc.
 - e. Potter Roemer.
- 2. Standard: UL 405.
- 3. Type: Flush, for wall mounting.
- 4. Pressure Rating: 175 psig (1200 kPa) minimum.
- 5. Body Material: Corrosion-resistant metal.
- 6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
- 7. Caps: Brass, lugged type, with gasket and chain.
- 8. Escutcheon Plate: Rectangular, chrome, wall type.
- 9. Outlet: With pipe threads.
- 10. Body Style: Horizontal
- 11. Number of Inlets: Two
- 12. Outlet Location: Back
- 13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE, AUTO SPKR."
- 14. Finish: Polished chrome plated
- 15. Outlet Size: match pipe supplying FDC

B. Free Standing FDC

- 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. AFAC Inc.
 - b. Elkhart Brass Mfg. Company, Inc.
 - c. GMR International Equipment Corporation.
 - d. Guardian Fire Equipment, Inc.
 - e. Potter Roemer.
- 2. Standard: UL 405.

3. Type: Free standing
4. Pressure Rating: 175 psig (1200 kPa) minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, Chrome
9. Outlet: With pipe threads.
10. Body Style: Horizontal
11. Number of Inlets: Two
12. Outlet Location: Back
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE, AUTO SPKR."
14. Finish: Polished chrome plated
15. Outlet Size: match pipe supplying FDC

2.8 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet 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. Anvil International, Inc.
 - b. National Fittings, Inc.
 - c. Shurjoint Piping Products.
 - d. Tyco Fire & Building Products LP.
 - e. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175 psig (1200 kPa) minimum or 300 psig (2070 kPa) as required
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

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. AGF Manufacturing Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
2. Standard: "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig (1200 kPa) minimum or 300 psig (2070 kPa) as required.

4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

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. Elkhart Brass Mfg. Company, Inc.
 - b. Fire-End & Croker Corporation.
 - c. Potter Roemer.
2. Standard: UL 199.
3. Pressure Rating: 175 psig (1200 kPa) minimum.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test 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. AGF Manufacturing Inc.
 - b. Triple R Specialty.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
2. Standard: "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig (1200 kPa) minimum or 300 psig (2070 kPa) as required.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements:
 - a. FlexHead Industries, Inc.
2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175 psig (1200 kPa) minimum or 300 psig (2070 kPa) as required.
5. Size: Same as connected piping, for sprinkler.

2.9 SPRINKLERS

- 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. AFAC Inc.
 2. Globe Fire Sprinkler Corporation.
 3. Reliable Automatic Sprinkler Co., Inc.
 4. Tyco Fire & Building Products LP.
 5. Venus Fire Protection Ltd.
 6. Victaulic Company.
 7. Viking Corporation.
- B. General Requirements:
1. Standard: "Approval Guide," published by FM Global, listing.
 2. Pressure Rating for Automatic Sprinklers: 175 psig (1200 kPa) minimum.
 3. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig (1725 kPa) minimum or 300 psig (2070 kPa) as required
- C. Automatic Sprinklers with Heat-Responsive Element:
1. Early-Suppression, Fast-Response Applications: UL 1767
 2. Nonresidential Applications: UL 199
 3. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- D. Sprinkler Finishes:
1. white
 2. Bronze.
 3. Painted.
 4. Black
 5. Special (as required by the Architect) Contractor to provide a line item cost for each special color.
- E. Special Coatings:
1. ENT (Electroless Nickel PTFE)
- F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Plastic, white finish, one piece, flat.
 2. Sidewall Mounting: Plastic, white finish, one piece, flat.
- G. Sprinkler Guards:
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. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.

- d. Viking Corporation.
- 2. Standard: UL 199.
- 3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Water-Flow Indicators:
 - 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. ADT Security Services, Inc.
 - b. McDonnell & Miller; ITT Industries.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
 - e. Viking Corporation.
 - f. Watts Industries (Canada) Inc.
 - 2. Standard: UL 346.
 - 3. Water-Flow Detector: Electrically supervised.
 - 4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 - 5. Type: Paddle operated.
 - 6. Pressure Rating: 250 psig (1725 kPa).
 - 7. Design Installation: Horizontal or vertical.
- C. Valve Supervisory Switches:
 - 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. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.
 - 2. Standard: UL 346.
 - 3. Type: Electrically supervised.
 - 4. Components: Single-pole, double-throw switch with normally closed contacts.
 - 5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAGES

- 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. AMETEK; U.S. Gauge Division.
 2. Ashcroft, Inc.
 3. Brecco Corporation.
 4. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- D. Pressure Gage Range: 0 to 300 psig (0 to 2070 kPa)
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

- A.
- B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction and Engineer of Record prior to installation and shall be incorporated into the first submission of shop drawings
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13 and as noted on Contract Documents.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage. Drains, including piping, to be installed concealed in "public" spaces. Where necessary to install in public space, drain to be installed concealed and access panel with signage provided by the fire sprinkler contractor.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes. Maintain all code required clearances. Sprinkler

shop drawings shall include specific details to each item noted and clearly indicate dimensions for components.

- I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- J. Install alarm devices in piping systems.
- K. Install hangers and supports for sprinkler system piping according to NFPA 13 and FM Global. Comply with requirements for hanger materials in NFPA 13 and FM Global.
- L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Fill sprinkler system piping with water.
- N. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with manufacture requirements ~~for heating cables in Section 210533 "for UL listed Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."~~
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
- P. Install ductile iron sleeve seals for piping penetrations of concrete walls and slabs.
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors in all locations where this is installed exposed and not above a drop ceiling in a public space. Not required for back of house such as mechanical, electrical or baggage handling spaces.
- R. Where sprinkler piping is installed beneath baggage handling systems, the sprinkler piping shall be supported from the building structure, and not the baggage handling system.

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- K. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- L. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.5 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

- D. Institutional type sprinklers shall be installed in all Holding Cells, Search Rooms, Processing Interview Rooms, and associated Corridor serving such spaces, and the Sterile Corridor,
- E. Upright sprinklers installed in the Landside and Airside Building shall be installed in branchlines with minimum of 1 inch outlets and reducers. The 1 inch outlet along the branchlines is to permit future modifications. This applies throughout all spaces in both buildings.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, or free standing fire-department connections.
- B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping. Labels to identify the piping and indicate flow direction from the water source. All wet-pipe, dry-pipe, bulk supply, and standpipe piping to be provided with labels. Labels to be red with white lettering. Labels to be provided at a maximum of 19 ft. intervals along piping.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in ~~Section 260553 "Identification for Electrical Systems."~~NFPA 70 and 72.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Coordinate with fire-pump tests. Operate as required.
 - 7. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean dirt and debris from sprinklers.

- B. Remove and replace sprinklers with paint or other debris other than factory finish.
- C. Refer to section 01 74_23 ~~FL~~ "Final Cleaning" for additional cleaning requirements.
- D. All piping to be primed and painted shall be prepared such as to remove any rust, grease, cutting oil, etc such that the piped can be properly primed.

3.10 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Wet-pipe sprinkler system, NPS 2 and smaller shall be the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints. Roll grooves are permitted for schedule 40.
- D. Standard-pressure, wet-pipe sprinkler system, NPS 2 1/2 to NPS 6 shall be the following:
 - 1. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 2. Schedule 40 is an acceptable alternative to schedule 10.

3.11 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers
 - 2. Rooms with Suspended Ceilings: Recessed sprinklers. Contractor to provide separate line-item per unit cost to upgrade from Recessed sprinklers to Concealed.
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Upright sprinklers, dry sprinklers.
 - 5. Special Applications: Extended-coverage sprinklers where indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Recessed Sprinklers: white with white escutcheon. Black with black escutcheons where ceiling is painted black.
 - 2. Upright Sprinklers: Brass finish. Dry-Pipe upright sprinklers, sprinklers installed in the EPG and CCP buildings, to have corrosion resistant manufacture applied finish. Sprinklers
 - 3. Institutional as indicated in specification.
 - 4. Specialty colors as indicated by the Architect. Fire Sprinkler contractor shall identify cost per sprinkler of specialty color in contract.

END OF SECTION 211313

SECTION 211316 - DRY-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinkler specialty pipe fittings.
5. Sprinklers.
6. Alarm devices.
7. Pressure gages.

B. Related Sections:

1. Section 21_12_00 "Fire-Suppression Standpipes" for standpipe piping.
2. Section 21_13_13 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
3. Section 21_31_13 "Electric-Drive, Centrifugal Fire Pumps"

1.2 SYSTEM DESCRIPTIONS

- A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from sprinklers that are open.

1.3 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure or 250 psig where required such as, but not limited to, Parking Garage.
- B. Delegated Layout: Design sprinkler system(s) using performance requirements and design criteria indicated.
- C. Sprinkler system design shall be approved by authorities having jurisdiction and engineer of record.
1. Margin of Safety for Available Water Flow and Pressure: 10 percent at the fire pump discharge, including losses through water-service piping, valves, and backflow preventers.
 2. Sprinkler Occupancy Hazard Classifications: Refer to specification 21 13 13
 3. Minimum Density for Automatic-Sprinkler Piping Design: Refer to specification 21 13 13
 4. Maximum Protection Area per Sprinkler: Per FM requirements:
 5. Maximum Protection Area per Sprinkler: Refer to specification 21 13 13

6. Total Combined Hose-Stream Demand Requirement: Refer to specification 21 13 13

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For dry-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work. All pipe elevations shall be included and the pitch of piping shall be included. Low points of system to be identified and required drain.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer
- B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include layout, fabricating, coordinating and installing sprinkler systems. Base calculations on results of fire-hydrant flow test or existing fire pump test report (Parking Garage)
- B. 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.
- C. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
- D. FM Global

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Standard Weight, Schedule 40, Galvanized Black-Steel Pipe: ASTM A 53/A 53M, Type E. Pipe ends may be factory or field formed to match joining method. (Schedule 10 is not permitted).
- B. Steel Pipe Nipples: Galvanized ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Steel Couplings: Galvanized ASTM A 865, threaded.
- D. Gray-Iron Threaded Fittings: Galvanized, ASME B16.4, Class 125, standard pattern.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME B16.1, Class 125.
- G. Grooved-Joint, Steel-Pipe Appurtenances:
 - 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. Anvil International, Inc.
 - b. Corcoran Piping System Co.
 - c. National Fittings, Inc.
 - d. Shurjoint Piping Products.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
 - 2. Pressure Rating: 250 psig minimum.
 - 3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free.
 - 1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. All equipment shall be FM approved.
2. Minimum Pressure Rating: 175 psig (1200 kPa) or 250 psi as required

B. Check Valves:

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. AFAC Inc.
 - b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
 - c. Anvil International, Inc.
 - d. Clow Valve Company; a division of McWane, Inc.
 - e. Crane Co.; Crane Valve Group; Crane Valves.
 - f. Crane Co.; Crane Valve Group; Jenkins Valves.
 - g. Crane Co.; Crane Valve Group; Stockham Division.
 - h. Fire-End & Croker Corporation.
 - i. Fire Protection Products, Inc.
 - j. Fivalco Inc.
 - k. Globe Fire Sprinkler Corporation.
 - l. Groeniger & Company.
 - m. Kennedy Valve; a division of McWane, Inc.
 - n. Matco-Norca.
 - o. Metraflex, Inc.
 - p. Milwaukee Valve Company.
 - q. Mueller Co.; Water Products Division.
 - r. NIBCO INC.
 - s. Potter Roemer.
 - t. Reliable Automatic Sprinkler Co., Inc.
 - u. Shurjoint Piping Products.
 - v. Tyco Fire & Building Products LP.
 - w. United Brass Works, Inc.
 - x. Venus Fire Protection Ltd.
 - y. Victaulic Company.
 - z. Viking Corporation.
 - aa. Watts Water Technologies, Inc.
2. Standard: UL 312
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

C. Indicating-Type Butterfly Valves:

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. Anvil International, Inc.

- b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Shurjoint Piping Products.
 - h. Tyco Fire & Building Products LP.
 - i. Victaulic Company.
- 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig (1200 kPa) minimum.
 - 4. Valves NPS 2 (DN 50) and Smaller:
 - a. Valve Type: butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: threaded or grooved
 - 5. Valves NPS 2-1/2 (DN 65) and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
 - 6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

- 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- 2. Minimum Pressure Rating: 175 psig (1200 kPa).

B. Ball Valves:

- 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. Affiliated Distributors.
 - b. Anvil International, Inc.
 - c. Barnett.
 - d. Conbraco Industries, Inc.; Apollo Valves.
 - e. Fire-End & Croker Corporation.
 - f. Fire Protection Products, Inc.
 - g. Flowserve.
 - h. FNW.
 - i. Jomar International, Ltd.
 - j. Kennedy Valve; a division of McWane, Inc.
 - k. Kitz Corporation.
 - l. Legend Valve.
 - m. Metso Automation USA Inc.
 - n. Milwaukee Valve Company.

- o. NIBCO INC.
- p. Potter Roemer.
- q. Red-White Valve Corporation.
- r. Southern Manufacturing Group.
- s. Stewart, M. A. and Sons Ltd.
- t. Tyco Fire & Building Products LP.
- u. Victaulic Company.
- v. Watts Water Technologies, Inc.

2.6 SPECIALTY VALVES

A. General Requirements:

- 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- 2. Minimum Pressure Rating: 175 psig (1200 kPa) or 250 psig as necessary
- 3. Body Material: Cast or ductile iron.
- 4. Size: Same as connected piping.
- 5. End Connections: Flanged or grooved.

B. Dry-Pipe Valves:

- 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. AFAC Inc.
 - b. Globe Fire Sprinkler Corporation.
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Tyco Fire & Building Products LP.
 - e. Venus Fire Protection Ltd.
 - f. Victaulic Company.
 - g. Viking Corporation.
- 2. Standard: UL 260
- 3. Design: Differential-pressure type.
- 4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
- 5. Air Compressor:
 - 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) Gast Manufacturing Inc.
 - 2) General Air Products, Inc.
 - 3) Viking Corporation.
 - b. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - c. Motor Horsepower: Fractional.
 - d. Power: 120-V ac, 60 Hz, single phase.

2.7 FIRE-DEPARTMENT CONNECTIONS

- A. See 21 13 13.

2.8 SPRINKLER SPECIALTY PIPE FITTINGS

- A. General Requirements for Dry-Pipe-System Fittings: UL listed and FM Global approved for dry-pipe service.
- B. Flow Detection and Test Assemblies:
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. AGF Manufacturing Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 3. Pressure Rating: 175 psig (1200 kPa) minimum or 250 psig as required
 4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 5. Size: Same as connected piping.
 6. Inlet and Outlet: Threaded.
- C. Sprinkler Inspector's Test 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. AGF Manufacturing Inc.
 - b. Triple R Specialty.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - e. Viking Corporation.
 2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 3. Pressure Rating: 175 psig (1200 kPa) minimum or 250 psig as required
 4. Body Material: Cast- or ductile-iron housing with sight glass.
 5. Size: Same as connected piping.
 6. Inlet and Outlet: Threaded.
- D. Flexible, Sprinkler Hose 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. FlexHead Industries, Inc.

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175 psig (1200 kPa) minimum or 250 gpm as required
5. Size: Same as connected piping, for sprinkler.

2.9 SPRINKLERS

- 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. AFAC Inc.
 2. Globe Fire Sprinkler Corporation.
 3. Reliable Automatic Sprinkler Co., Inc.
 4. Tyco Fire & Building Products LP.
 5. Venus Fire Protection Ltd.
 6. Victaulic Company.
 7. Viking Corporation.
- B. General Requirements:
1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 2. Pressure Rating for Automatic Sprinklers: 175 psig or 250 psig as required
 3. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig minimum.
- C. Automatic Sprinklers with Heat-Responsive Element:
1. Nonresidential Applications: UL 199
 2. Characteristics: Nominal 1/2-inch (12.7-mm) orifice with discharge coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application. Refer to 21 13 13 for additional requirements on minimal K-Factor Size based upon FM Global requirements.
- D. Sprinkler Finishes:
1. White
 2. Black
 3. Bronze.
 4. Painted.
- E. Special Coatings:
1. Corrosion-resistant paint.
 2. Victaulic VC-250
 3. Polyester
- F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Plastic, white finish, one piece, flat (Black where black ceilings provided)
2. Sidewall Mounting: Plastic, white finish, one piece, flat.
3. Special Color: Where indicated by the Architect

G. Sprinkler Guards:

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. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

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. Globe Fire Sprinkler Corporation.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
2. Standard: UL 753.
3. Type: Mechanically operated, with Pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 10-inch (250-mm) diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4 (DN 20).
8. Outlet: NPS 1 (DN 25) drain connection.

C. Valve Supervisory Switches:

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. Fire-Lite Alarms; a Honeywell company.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Potter Electric Signal Company.
 - d. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAGES

- 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. AMETEK, Inc.; U.S. Gauge Division.
 2. Ashcroft, Inc.
 3. Brecco Corporation.
 4. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- D. Pressure Gage Range: 0 to 300 psig (0 to 2070 kPa).
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

- A. Refer to 21 13 13.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction and Engineer of Record. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 13 for installation of sprinkler piping.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.

- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage. These shall be identified on the shop drawings.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or to outside building.
- J. Install alarm devices in piping systems.
- K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13 for hanger materials.
- L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Drain dry-pipe sprinkler piping.
- N. Pressurize and check dry-pipe sprinkler system piping and air-pressure maintenance devices, air compressors.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
- P. Install sleeve seals for piping penetrations of concrete walls and slabs.
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- R. All piping to be pitched as required for drainage. Pipe to be pitched a minimum of 1/2" per 10'. Fire Sprinkler shop drawings shall indicate the direction of the pitch, including the maximum high points and low points of the sprinkler dry-pipe system.

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air supply piping.

3.5 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.
- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.
- D. Dry-Pipe sprinkler systems located outside the building, including all at the Airside Concourse Building and Landside Terminal Building (ASC and LST) shall be provided with UL and FM approved corrosion resistant sprinklers. Sprinklers to be of High-Temperature.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Refer to 21 13 16.

3.7 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping. Refer to 21 13 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in ~~Section 260553 "Identification for Electrical Systems."~~NFPA 70 and 72

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.

3.10 PIPING SCHEDULE

- A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- B. Dry-pipe sprinkler system, NPS 2 and smaller shall be the following:
 - 1. Schedule 40, black-steel pipe with cut-grooved ends; grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- C. Dry-pipe sprinkler system, NPS 2-1/2 to NPS 6 shall be the following:

1. Schedule 40, black-steel pipe with cut-grooved ends; grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.11 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers
2. Rooms with Suspended Ceilings: Dry pendent sprinklers, Dry recessed sprinklers
3. Wall Mounting: Dry sidewall sprinklers.

- B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Recessed Sprinklers: white, with white escutcheon.
Upright Sprinklers: white with corrosion resistant covering where installed outside of building.

END OF SECTION 211316

SECTION 212200 - CLEAN-AGENT FIRE-EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

- A. This specification outlines the requirements for a "Total Flood" of Halocarbon Clean Agent Fire Suppression System FK-5-1-12 with automatic detection and control. The work described in this specification includes all engineering, labor, materials, equipment, and service necessary and required, to complete and test the suppression system.

SUMMARY

A. Section Includes:

1. Piping and piping specialties.
2. Extinguishing-agent containers.
3. Extinguishing agent.
4. Detection and alarm devices.
5. Control and alarm panels.
6. Accessories.
7. Connection devices for and wiring between system components.
8. Connection devices for power and integration into building's fire-alarm system.

1.2 APPLICABLE STANDARDS AND PUBLICATIONS

- A. The design, equipment, installation, testing, and maintenance of the Clean Agent Suppression System shall be in accordance with the applicable requirements set forth in the latest edition of the following codes and standards:

1. National Fire Protection Association (NFPA) Standards:
 - a. NFPA 2001: Standard on Clean Agent Fire Extinguishing Systems
 - b. NFPA 70: National Electrical Code
 - c. NFPA 72: National Fire Alarm and Signaling Code
 - d. NFPA 75: Standard for the Fire Protection of Information Technology Equipment
 - e. NFPA 76: Standard for the Fire Protection of Telecommunications Facilities
2. Factory Mutual Systems (FM) Publication
 - a. Factory Mutual Approval Guide
3. Underwriters Laboratories, Inc. (UL) Publication
 - a. UL 217: Standard for Single and Multiple Station Smoke Alarms
 - b. UL 228: Standard for Door Closers-Holders, With or Without Integral Smoke Detectors
 - c. UL 268: Smoke Detectors for Fire Alarm Systems
 - d. UL 268A: Standard for Smoke Detectors for Duct Application
 - e. UL 521: Standard for Heat Detectors for Fire Protective Signaling Systems
 - f. UL 864: Standard for Control Units and Accessories for Fire Alarm Systems
 - g. UL 1638: Standard for Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
 - h. UL 1971: Standard for Signaling Devices for Hearing Impaired
4. Requirements of the Authority Having Jurisdiction (AHJ)

B. RELATED DOCUMENTS

1. Drawings: The contract drawings indicate the general arrangements of the areas to receive detection and FK-5-1-12 protection. Contractor is to review all drawings so that all items affecting the operation of the fire detection/ FK-5-1-12 suppression system (such as equipment location, air diffusers, damper closures, and door openings) are considered in the design of the engineered system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation indicating that clean agents comply.

- C. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a qualified professional engineer.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include design calculations.
3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
4. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. The installing contractor shall submit the following design information and drawings for approval prior to starting work on this project:
1. Permit Approved Drawings: Installation Shop Drawings, prepared according to NFPA 2001 Section 5.1.2.2, that have been approved by authorities having jurisdiction. Field installation shop drawings shall include design calculations and detail the location of all agent storage tanks, nozzles, pipe runs, including pipe sizes and lengths, control panel(s), detectors, manual pull stations, abort stations, audible and visual alarms, etc.
 2. A Complete hydraulic flow calculations, from a UL listed computer program, shall be provided for the engineered clean agent systems design. Flow Calculation sheet(s) must comply with NFPA 2001 Section 5.2. Total agent discharge time and total flooding Quantity must be shown and detailed by each protected area.
 3. Provide calculations for the battery stand-by power supply, taking into consideration the power requirements of all alarms, initiating devices, and auxiliary components under full load conditions.
 4. A complete sequence of operation shall be submitted detailing all alarm devices, shutdown functions, remote signaling, damper operation, time delay, and agent discharge for each protected area or system designed.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. MANUFACTURER:

1. The manufacturer of the suppression system hardware and detection components shall be ISO 9001 registered.
2. All devices, components, and equipment shall be the products of the same manufacturer,
3. 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.
4. All devices, components, and equipment shall be new, standard products of the manufacturer's latest design and suitable to perform the functions intended.
5. Locks for all cabinets shall be keyed alike.
6. All devices and equipment shall be UL listed and/or FM approved.

B. INSTALLER:

1. The installing contractor shall be trained by the supplier to design, install, test, and maintain fire suppression systems.
2. The clean agent contractor must have a minimum of five years' experience in the design, installation, and testing, of clean agent, or similar fire suppression systems, in strict accordance with all applicable codes and standards. The contractor personnel shall be trained and certified by the supplier manufacture and shall have a minimum NICET level III certified designer for Special Hazard, who will be responsible for this project

PART 2 - PRODUCTS

2.1 CLEAN-AGENT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide a Halocarbon Clean Agent FK-5-1-12 as indicated on Drawings. Available manufacturers offering products that may be incorporated into the Scope of Work include, but are not limited to, the following:
1. Ansul Incorporated.
 2. Chemetron Fire Systems; a UTC Fire & Security company.
 3. Fike Corporation.
 4. Pem All Fire Extinguisher Corporation; a division of Pem Systems Inc.
 5. Pyro-Chem.
 6. Siemens Building Technologies, Inc.; Fire Safety Division.
- B. Hazard Design: Halocarbon clean-agent FK-5-1-12 fire-extinguishing system must be design for Class C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas and obtain approval from authorities having jurisdiction.
- C. Performance Requirements: Discharge FK-5-12 within 10 seconds and maintain a minimum 4.5% percent concentration by volume at 70 deg F for 10-minute holding time in hazard areas as defined by NFPA 2001 Chapter 5. The general contractor shall be responsible for sealing and securing the protected spaces against agent loss and/or leakage during the 10-minute "hold" period.
- D. System Operating Sequence:

1. Actuating First Detector: Visual indication at Fire Alarm Control Unit (FACU) as Supervisory Signal. Energize audible and visual alarms (slow pulse horn) and Visual Appliances (If apply), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send Supervisory signal to building main fire-alarm system.
2. Actuating Second Detector: Visual indication at Fire Alarm Control Unit (FACU) as Alarm Signal. Energize audible and visual alarms (Continuous Horn), Close dampers associated with air-conditioning and ventilating systems at the protected area, start time delay countdown for extinguishing-agent discharge for 30 seconds, and send Alarm signal to building main fire-alarm system.
3. After "Time Delay" Cycle Ends: Halocarbon FK-5-1-12 Extinguishing-agent system discharge will operate all audible/visual notification appliances inside and outside the protected area.
4. Manual Release Station shall activate visual indication at Fire Alarm Control Unit (FACU) as Alarm Signal. Energize and operate all audible/visual notification appliances inside and outside the protected area, shut down air-conditioning and ventilating systems serving, Close associated dampers in the protected areas and immediately discharge extinguishing agent and send Alarm signal to building main fire-alarm system.
5. Operating abort switches will delay extinguishing-agent discharge while being activated, and (FACU) must be reset to prevent agent discharge. Release of hand pressure on the switch will cause agent discharge if the time delay has expired and send Supervisory signal to building main fire-alarm system.
6. Operating Maintenance Switches shall activate visual indication at Fire Alarm Control Unit (FACU) as Trouble Signal. Disconnect Clean Agent Release Circuit and send Trouble Signal to building main fire-alarm system.

2.2 PIPING MATERIALS

- A. Distribution piping and fittings shall be installed in accordance with the manufacturer's requirements, NFPA 2001, and approved piping standards and guidelines. All distribution piping shall be installed by NICET qualified individuals using accepted practices and quality procedures. All piping shall be adequately supported and anchored at all directional changes and nozzle locations.
- B. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section 4.2 "Distribution," for charging pressure of system.

2.3 PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Type S, Grade B or ASTM A 106/A 106M, Grade A ; Schedule 40, Schedule 80, and Schedule 160, seamless steel pipe.
 1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
 - c. Fittings Working Pressure: 820 PSI PSI MINIMUM
 - d. Flanged Joints: Class 300 minimum.
 2. Forged-Steel Welding Fittings: ASME B16.11, Class 3000, socket pattern.
 3. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A 47/A 47M malleable iron or ASTM A 536 ductile iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

2.4 VALVES

- A. General Valve Requirements:
 1. UL listed or FM Approved for use in fire-protection systems.
 2. Compatible with type of clean agent used.
- B. Container Valves: With rupture disc or solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.
- C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.
- D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.5 EXTINGUISHING-AGENT CONTAINERS

- A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.
 - 1. Finish: Red enamel or epoxy paint.
 - 2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
 - 3. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
 - 4. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.
 - 5. Liquid Level Indicator: Integral to each tank, to facilitate verification of agent levels.

2.6 FIRE-EXTINGUISHING CLEAN AGENT

- A. FK-5-1-12 Clean Agent: Dodecafluoro-2-methypentan-3-one
 - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ansul, Inc.
 - b. Chemetron Fire Systems.
 - c. Kidde Fire Systems
 - d. Pyro-Chem
 - e. Siemens Industry, Inc.
 - f. Viking Corp.

2.7 DISCHARGE NOZZLES

- A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application. Nozzles must comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

2.8 CONTROL PANELS

- A. Description: UL Listed , FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.
- B. Power Requirements: 120/240-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.
- C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.
 - 1. Mounting: Surface mounted.
- D. Supervised Circuits: Separate circuits for each independent hazard area.
 - 1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
 - 2. Manual pull-station circuit.
 - 3. Alarm circuit.
 - 4. Release circuit.
 - 5. Abort circuit.
 - 6. EPO circuit.
- E. Control-Panel Features:
 - 1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
 - 2. Automatic switchover to standby power at loss of primary power.
 - 3. Storage container, low-pressure indicator.
 - 4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.
- F. Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and abort, EPO, and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless-steel or aluminum enclosure.
- G. Standby Power: Sealed lead calcium batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged.

2.9 DETECTION DEVICES

- A. General Requirements for Detection Devices:

1. Comply with NFPA 2001, NFPA 72, and UL 268.
 2. 24-V dc, nominal.
- B. Ionization Detectors: Dual-chamber type, having sampling and referencing chambers, with smoke-sensing element.
- C. Photoelectric Detectors: LED light source and silicon photodiode receiving element.
- D. Signals to the Central Fire Alarm Control Panel: Any type of local system trouble is reported to the building fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the building fire alarm control panel as separately identified zones.

2.10 MANUAL STATIONS

- A. General Description: Surface FM Approved or NRTL listed, with clear plastic hinged cover, low voltage compatible with Fire Alarm Controls Units. Include contacts for connection to control panel.
- B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Abort Switch: "ABORT" caption, momentary contact, with green finish.
- D. EPO Switch: "EPO" caption, with yellow finish.

2.11 SWITCHES

- A. Description: FM Approved or NRTL listed, where available, 120V AC or low voltage compatible with Fire Alarm Control Unit. Include contacts for connection to control panel.
1. Low-Agent Pressure Switches: Pneumatic operation.
 2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.
 3. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

2.12 ALARM DEVICES

- A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Section 28_31_0011 ~~"Digital, Addressable Fire Detection and Alarm System" or Section 283112 "Zoned (DC Loop) Fire Alarm System"~~ for alarm and monitoring devices.
- B. Bells: Minimum 6-inch diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installing Contractor present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 FK-5-1-12 agent PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
- B. NPS 2 (DN 50) and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.
- C. NPS 2-1/2 (DN 65) and Larger: Schedule 40, steel pipe; forged-steel welding fittings; and welded joints

3.3 CLEAN-AGENT PIPING INSTALLATION

- A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.
- B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.
- C. Install extinguishing-agent containers anchored to substrate.
- D. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution."
1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.
 2. Support piping using supports and methods according to NFPA 13.

3. Install seismic restraints for extinguishing-agent containers and piping systems.
4. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.
- E. Drawings indicate general arrangement of piping, fittings, and specialties.
- F. Where installing piping adjacent to equipment, allow space for service and maintenance.
- G. Connect electrical devices to Fire Alarm control unit (Releasing Panel) and to building's main fire-alarm system.
- H. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.
- I. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.
- J. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing
- B. Perform field-acceptance tests of each clean-agent extinguishing system when installation is complete. Perform system testing only after hazard-area enclosure construction has been completed and openings sealed. Comply with operating instructions and procedures of NFPA 2001, Section "Approval of Installations
- C. Tests and Inspections:
 1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.
 3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Units will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 CLEANING

- A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices

3.6 SYSTEM FILLING

- A. Preparation:
 1. Verify that piping system installation is completed and cleaned.
 2. Check for complete enclosure integrity.
 3. Check operation of ventilation and exhaust systems.
- B. Filling Procedures:
 1. Fill extinguishing-agent containers with extinguishing agent, and pressurize to indicated charging pressure.
 2. Install filled extinguishing-agent containers.
 3. Energize circuits.
 4. Adjust operating controls.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fire-extinguishing systems.

END OF SECTION 212200

SECTION 213113 - ELECTRIC-DRIVE, CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Horizontal Split-case fire pumps.
 - 2. Fire-pump accessories and specialties.

1.2 PERFORMANCE REQUIREMENTS

- A. Pump Equipment, Accessory, and Specialty Pressure Rating: 250 psig minimum unless higher pressure rating is indicated. Note, discharge from each fire pump is in excess of 175 psi.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Certificates: For fire pumps, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Product Certificates: For each fire pump, from manufacturer.
- C. Source quality-control reports.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 20, "Installation of Stationary Pumps for Fire Protection."
- C. FM Global

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

- A. Description: Factory-assembled and -tested fire-pump and driver unit.
- B. Base: Fabricated and attached to fire-pump and driver unit with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.
- C. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

2.2 HORIZONTALLY MOUNTED, SINGLE-STAGE, SPLIT-CASE FIRE PUMPS

- 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:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or one of the following:
 - 1. A-C Fire Pump Systems; a business of ITT Industries.
 - 2. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.
 - 3. PACO Pumps; Grundfos Pumps Corporation, U.S.A.
 - 4. Peerless Pump, Inc.
 - 5. Pentair Pump Group; Aurora Pump.
 - 6. S.A. Armstrong Limited.
- C. Pump:
 - 1. Standard: UL 448 for split-case pumps for fire service.
 - 2. FM GLOBAL approved
 - 3. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
 - 4. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
 - 5. Wear Rings: Replaceable bronze.
 - 6. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.

- b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
- 7. Mounting: Pump and driver shafts are horizontal, with pump and driver on same base.
- D. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
- E. Driver:
 - 1. Standard: UL 1004A
 - 2. Type: Electric motor; NEMA MG 1, polyphase Design B.
- F. Landside Fire Pump: Capacities and Characteristics:
 - 1. Rated Capacity: 1500 gpm
 - 2. Total Rated Head: 150 psi
 - 3. Inlet Flange: Class 125
 - 4. Outlet Flange: Class 250
 - 5. Motor Horsepower: 200
 - 6. Electrical Characteristics:
 - a. Volts: 460.
 - b. Phase: Three.
 - c. Hertz: 60.
- G. Airside Fire Pump: Capacities and Characteristics:
 - 1. Rated Capacity: 1500 gpm
 - 2. Total Rated Head: 150 psi
 - 3. Inlet Flange: Class 125
 - 4. Outlet Flange: Class 250
 - 5. Motor Horsepower: 200
 - 6. Electrical Characteristics:
 - a. Volts: 460.
 - b. Phase: Three.
 - c. Hertz: 60.

2.3 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Automatic Air-Release Valves: Comply with NFPA 20 for installation in fire-pump casing.
- B. Circulation Relief Valves: UL 1478, brass, spring loaded; for installation in pump discharge piping.
- C. Relief Valves: Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.
- D. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.
- E. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.

- F. Variable speed controller with automatic transfer switch to be provided at both the Landside and Airside.
- G. Discharge Cone: Closed or open type.
- H. Hose Valve Manifold Assembly:
 - 1. Standard: Comply with requirements in NFPA 20.
 - 2. Header Pipe: ASTM A 53/A 53M, Schedule 40, galvanized steel with ends threaded according to ASME B1.20.1.
 - 3. Header Pipe Fittings: ASME B16.4, galvanized cast-iron threaded fittings.
 - 4. Automatic Drain Valve: UL 1726.
 - 5. Manifold:
 - a. Test Connections: Comply with UL 405 except provide outlets without clappers instead of inlets.
 - b. Body: Exposed type, brass, with number of outlets required by NFPA 20.
 - c. Escutcheon Plate: Brass or bronze; round.
 - d. Hose Valves: UL 668, bronze, with outlet threaded according to NFPA 1963 and matching local fire-department threads. Include caps and chains.
 - e. Exposed Parts Finish: chrome plated.
 - f. Escutcheon Plate Marking: Equivalent to "FIRE PUMP TEST."

2.4 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink and recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect fire pumps according to UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1. Verification of Performance: Rate fire pumps according to UL 448.
- B. Fire pumps will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fire-Pump Installation Standard: Comply with NFPA 20 and FM Global for installation of fire pumps, relief valves, and related components.
- B. Equipment Mounting: Install fire pumps on concrete bases. Comply with requirements for concrete bases specified in 033053 "Miscellaneous Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20 and FM Global.
- D. Support piping and pumps separately so weight of piping does not rest on pumps.
- E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 21_13_13 "Wet-Pipe Sprinkler Systems."
- F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified Section 21_13_13 "Wet-Pipe Sprinkler Systems."
- G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20 and FM Global.
- H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.
- I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- J. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Factory authorized service representative shall be contracted by the fire sprinkler contractor at a minimum for fire pump pre-testing and final testing with the Authority Having Jurisdiction. All items found not in compliance during pre-testing shall be corrected during pre-testing.

3.3 ALIGNMENT

- A. Align split-case pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.
- B. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

- A. Comply with requirements for piping and valves specified in Section 21_13_13 "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect relief-valve discharge to drainage piping or point of discharge.
- D. Connect fire pumps to their controllers.

3.5 IDENTIFICATION

- A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.6 FIELD QUALITY CONTROL

- A. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers per the manufacture.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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. All fire pumps shall be pretested with the manufacture's field agent

21 31 13 - 2

and determined to be acceptable prior to final commissioning. Fire pump field agent shall also be engaged for final commissioning with the fire marshall. Fire Sprinkler contractor shall include in base bid. All retesting necessary shall include the manufactures agent at no addental cost to the owner.

D. Tests and Inspections:

1. After installing components, assemblies, and equipment including controller, test for compliance with requirements.
2. Test according to NFPA 20 for acceptance and performance testing.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

G. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only and do not convey to Owner.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps.

END OF SECTION 213113