

# **IN128 JAMES T. MORRIS ARENA –**

## **ADDENDUM-01**

**IU PROJECT #** 20240127

**RATIO PROJECT** 23112. IUI ATHLETICS AND CONVOCATION CENTER

**DATE** January 27, 2025

**SUBJECT** ADDENDUM-01

Below is a list of the changes included in the attached Addendum:

### Project Manual

- **SECTION 055000 – METAL FABRICATIONS**
  - Insert Article 2.15 ABRASIVE METAL NOSINGS, TREADS, AND THRESHOLDS
  - Delete item 2.15.A.5.a and insert item 2.15.A.5.a as follows:
  - “a. Basis of Design: Balco, T-213 Single Component Stair Nosing, 2 inch width.”
  - Delete item 2.15.A.5.c
- **SECTION 078123 – INTUMESCENT FIRE PROTECTION**
  - Modify item 1.2.A.1 as follows:
  - “1. Mastic and intumescent fire-resistive coatings, exterior and interior.”
  - Insert item 2.2.A.2.b as follows:
  - “b. Designated for "exterior" use by a qualified testing agency acceptable to authorities having jurisdiction.”
- **SECTION 085653 – SECURITY WINDOWS**
  - Insert Section 085653 Security Windows into the Project Manual.
- **SECTION 087100 – DOOR HARDWARE**
  - Removed and replace with revised Section 087100 Door Hardware into the Project Manual.
- **SECTION 116623.13 – BASKETBALL EQUIPMENT**
  - Insert Section 116623.13 Basketball Equipment into the Project Manual.
- **SECTION 118129 – FACILITY FALL PROTECTION**
  - Insert item 2.2.A.1 as follows:
  - “1. Fall Arrest Anchors Basis of Design: Pro-Bel Enterprises, PBE75 or approved equivalent.”
  - Insert item 2.2.A.2 as follows:

- “2. Horizontal Lifeline System Assembly Basis of Design: Pro-Bel HLL-DL3-PB or approved equivalent.”
- Delete Article 2.5 ELECTRICAL REQUIREMENTS in its entirety.
- **SECTION 126100 – FIXED AUDIENCE SEATING**
  - Modify paragraph 1.2.A as follows:
  - “A. Section includes fixed, chair-type seating and bench type seating with backs with the following:”
  - Delete item 1.2.A.2
  - Delete item 1.2.A.3
  - Delete item 1.4.E.3
  - Delete item 1.4.E.6
  - Delete item 1.4.E.7
  - Delete item 1.4.E.9
  - Delete paragraph 2.2.A in its entirety.
  - Modify item 2.3.A.1 as follows:
  - “1. Basis-of-Design Product: Subject to compliance with requirements, provide Hussey, Camatic Quantum SQ and Hussey XCS12 with backrest or comparable product by one of the following:”
  - Delete item 2.3.B.2
  - Delete paragraph 2.3.D
  - Modify paragraph 2.3.E as follows:
  - “E. Chairs:”
  - Modify item 2.3.E.1 as follows:
  - “1. Back: Injection molded co-polymer polypropylene. Extends below the seating surface to provide foot protection.”
  - Delete item 2.3.E.1.a
  - Delete item 2.3.E.1.b
  - Delete item 2.3.E.1.c
  - Modify item 2.3.E.2 as follows:
  - “2. Injection molded co-polymer polypropylene. “
  - Delete item 2.3.E.2.a
  - Delete item 2.3.E.2.b
  - Delete item 2.3.E.3
  - Modify paragraph 2.3.J as follows:
  - “J. Armrests/ Side Supports: Injection molded glass reinforced polyamide, black in color.”
  - Delete Article 2.4 UPHOLSTERED CHAIRS in its entirety.
  - Delete paragraph 2.5.A in its entirety.
  - Delete paragraph 2.5.C in its entirety.
  - Delete paragraph 2.5.D
  - Delete paragraph 2.6.B
  - Delete paragraph 2.6.C in its entirety.
  - Delete paragraph 3.4.F
- **SECTION 126600 – TELESCOPING STANDS**
  - Modify item 2.2.B.1 as follows:
  - “1. Basis-of-Design Product: Subject to compliance with requirements, provide Hussey Maxim Plus and Courtside XCS12 or comparable product by one of the following:”
  - Insert item 2.2.B.1.b as follows:
  - “b. Hussey Seating Company.”
  - Modify item 2.2.B.2 as follows:
  - “2. Row Spacing: As indicated on Drawings.”
  - Modify paragraph 2.3.A as follows:

- “A. Benches: Seats and skirts with back rest.”
  - Insert item 2.3.A.4 as follows:
  - “4. Color: As selected by Architect from manufacturer’s full range.”
  - Delete item 2.4.C.2 in its entirety.
  - Delete paragraph 2.4.D
- SECTION 210500 – COMMON WORK RESULTS FOR FIRE SUPPRESSION
  - Part 1.2: Add B. Sustainable Design Submittals
  - Part1.2: Add C. LEED Requirements
  - Part 1.3: Add B. Laboratory Test Reports
- SECTION 210523 – GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING
  - Added in its entirety.
- SECTION 210529 – HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING
  - Added in its entirety.
- SECTION 210548 – VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT
  - Added in its entirety.
- SECTION 210553 – IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT
  - Added in its entirety.
- SECTION 211000 – WATER-BASED FIRE-SUPPRESION SYSTEMS
  - Added in its entirety.
- SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING
  - Part 1.2: Add C. Sustainable Design Submittals
  - Part 1.2: Add D. LEED Requirements
  - Part 1.3: Add C. Laboratory Test Reports
  - Part 2.4: Add F. Silicone Sealants
- SECTION 220719 – PLUMBING PIPING INSULATION
  - Part 1.2: Add B. Sustainable Design Submittals:
  - Part 1.3: Add D. Laboratory Test Reports:
  - Part 1.4: Add C. LEED Requirements:
  - Part 2.3B: Add note 6.
  - Part 2.3C: Add note 2.
  - Part 2.3D: Add note 2.
  - Part 2.4B: Add note 5.
  - Part 2.5A: Add note 5.
  - Part 2.6B: Add note 5.
  - Part 2.6C: Add note 5.
  - Part 2.6D: Add note 5.
- SECTION 223500 – DOMESTIC-WATER HEAT EXCHANGERS
  - Part 2.2.A: Add “d. Patterson Kelley”
- SECTION 224200 – COMMERCIAL PLUMBING FIXTURES
  - Part 2.2: Add “3. Lavatories, Wall Mounted Trough”
- SECTION 274116 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT
  - Issue new section to the Project Manual.
- See attached Mechanical and Electrical Narratives for additional information on Project Manual changes.

## General

- G-002 – SHEET INDEX AND PROJECT LOCATION
  - Remove duplicative QF / Food Service sheets from index.
  - Add A-531 Ceiling Details to index
  - Add A-604 INTERIOR STOREFRONT ELEVATIONS to index
  - Add S-577 CLADDING BACKUP CONNECTION DETAILS to index
- G-005 - LIFE SAFETY PLANS
  - Add keynote schedule to sheet.
  - Adjust location of AED cabinet and fire extinguisher, see drawing.
- G-006 - LIFE SAFETY PLANS
  - Add keynote schedule to sheet.
- G-007 - LIFE SAFETY PLANS
  - Add keynote schedule to sheet.
  - Re-issue life safety plan, see drawing.

## Civil

- C001 – TITLE SHEET
  - Re-issue sheet
- C002 – GENERAL NOTES
  - Re-issue sheet
- C100 – OVERALL EXISTING TOPOGRAPHY
  - Re-issue sheet
- C111 – DEMOLITION PLAN
  - Re-issue sheet
- C112 – DEMOLITION PLAN
  - Re-issue sheet
- C120 – EXCAVATION PLAN
  - Re-issue sheet
- C200 OVERALL SITE PLAN
  - Re-issue sheet
- C210 ROAD PLAN AND PROFILE
  - Re-issue sheet
- C300 OVERALL GRADING PLAN
  - Re-issue sheet
- C301 GRADING PLAN
  - Re-issue sheet
- C302 GRADING PLAN
  - Re-issue sheet
- C303 GRADING PLAN ENLARGEMENTS
  - Re-issue sheet
- C304 GRADING PLAN ENLARGEMENTS
  - Re-issue sheet
- C400 OVERALL UTILITY PLAN
  - Re-issue sheet
- C401 UTILITY PLAN
  - Re-issue sheet
- C402 UTILITY PLAN
  - Re-issue sheet
- C403 UTILITY ENLARGEMENTS

- Re-issue sheet
- C404 STRUCTURE DATA TABLES
  - Re-issue sheet
- C405 DUCT BANK CROSSINGS
  - Issue new sheet.
- C406 DUCT BANK CROSSINGS
  - Issue new sheet
- C410 STORM SEWER PLAN & PROFILES
  - Re-issue sheet
- C411 STORM SEWER PLAN & PROFILES
  - Re-issue sheet
- C412 STORM SEWER PLAN & PROFILES
  - Re-issue sheet
- C413 STORM SEWER PLAN & PROFILES
  - Re-issue sheet
- C414 STORM SEWER PLAN & PROFILES
  - Re-issue sheet
- C415 STORM SEWER PLAN & PROFILES
  - Re-issue sheet
- C420 SANITARY SEWER PLAN & PROFILE
  - Re-issue sheet
- C500 OVERALL EROSION CONTROL PLAN
  - Re-issue sheet
- C501 CONTRUCTION EROSION CONTROL PLAN
  - Re-issue sheet
- C502 CONTRUCTION EROSION CONTROL PLAN
  - Re-issue sheet
- C511 POST-CONTRUCTION EROSION CONTROL PLAN
  - Re-issue sheet
- C512 POST-CONTRUCTION EROSION CONTROL PLAN
  - Re-issue sheet
- C520 SWPPP
  - Re-issue sheet
- C521 WETLANDS MAP
  - Re-issue sheet
- C530 EROSION CONTROL DETAILS
  - Re-issue sheet
- C531 EROSION CONTROL SPECIFICATIONS
  - Re-issue sheet
- C600 SITE DETAILS
  - Re-issue sheet
- C601 SITE DETAILS
  - Re-issue sheet
- C602 SITE DETAILS
  - Re-issue sheet
- C603 SITE DETAILS
  - Re-issue sheet
- C604 SITE DETAILS
  - Re-issue sheet
- C605 SITE DETAILS
  - Issue new sheet
- C610 WATER DETAILS

- Re-issue sheet
- C620 SANITARY SEWER DETAILS
  - Re-issue sheet
- C621 SANITARY SEWER DETAILS
  - Re-issue sheet

### Landscape Architecture

- L-201– SITE FEATURES PLAN
  - Adjusted light pole locations, added EV charging station callout (26-56-EV)
- L-621 – PLAN ENLARGEMENTS – SITE FEATURES
  - Added EV charging station callout (26-56-EV)

### Structural

- S-006 – CLADDING DESIGN CRITERIA ELEVATIONS
  - Added/updated cladding deflections.
- S-007 – CLADDING DESIGN CRITERIA ELEVATIONS
  - Added/updated cladding deflections.
- S-101A – EVENT LEVEL FOUNDATION PLAN – UNIT A
  - Adjusted areaway dimensions.
  - Adjusted footing elevations at ramp to coordinate with final grades.
- S-102A – CONCOURSE LEVEL PLAN – UNIT A
  - Adjusted areaway dimensions.
  - Clarified perimeter ledge elevations.
- S-102C – CONCOURSE LEVEL PLAN – UNIT C
  - Clarified perimeter ledge elevations.
  - Adjusted framing and edge of slab at SE stair.
  - Adjusted foundation wall at office along grid L and 11.S.
- S-102D – CONCOURSE LEVEL PLAN – UNIT D
  - Clarified perimeter ledge elevations.
  - Adjusted foundation wall at office along grid L.
  - Adjusted edge of slab along grid L.
- S-103A – UPPER LEVEL PLAN – UNIT A
  - Added callout for detail at floor sink.
  - Added floor penetration for mechanical piping.
- S-103B – UPPER LEVEL PLAN – UNIT B
  - Adjusted edge of slabs and perimeter conditions.
  - Added callout for detail at floor sink.
- S-103C – UPPER LEVEL PLAN – UNIT C
  - Adjusted framing and edge of slab at SE stair.
  - Adjusted edge of slab along grid L.
- S-103D – UPPER LEVEL PLAN – UNIT D
  - Added callout for detail at floor sink.
  - Adjusted edge of slab along grid L.
- S-104A – LOW ROOF PLAN – UNIT A
  - Added roof anchors at NW corner.
  - Added roof penetrations for mechanical ducts.
- S-104B – LOW ROOF PLAN – UNIT B
  - Hanger and kicker added for new cladding steel at top of curtain wall.
  - Added roof penetrations for mechanical ducts.

- S-104C – LOW ROOF PLAN – UNIT C
  - Hanger and kicker added for new cladding steel at top of curtain wall.
  - Added roof penetrations for mechanical ducts.
  - Adjusted edge of deck along grid L.
  - Added detail 9/S-533 to capture support for parapet stud wall where curtain wall runs below
- S-104D – LOW ROOF PLAN – UNIT D
  - Added roof penetrations for mechanical ducts.
  - Adjusted edge of deck along grid L.
  - Added hoist beam at elevator shaft.
  - Added detail 9/S-533 to capture support for parapet stud wall where curtain wall runs below.
- S-105A – HIGH ROOF PLAN – UNIT A
  - Added roof anchor at NW corner.
  - Removed sports lighting supports between grids B and C.
  - Dimensioned thermal break connections.
- S-105B – HIGH ROOF PLAN – UNIT B
  - Hanger and its support beam added for new cladding steel at top of curtain wall.
  - Removed roof drain frame at NE corner.
  - Removed sports lighting supports between grids B and C.
  - Dimensioned thermal break connections.
  - Added new beams and hangers for support of Auxiliary Gym basketball hoop.
- S-105C – HIGH ROOF PLAN – UNIT C
  - Hanger and its support beam added for new cladding steel at top of curtain wall.
  - Removed roof drain at SE corner.
  - Removed sports lighting supports between grids H and J.
  - Dimensioned thermal break connections.
  - Added new beams and hangers for support of Auxiliary Gym basketball hoop
- S-105D – HIGH ROOF PLAN – UNIT D
  - Added roof anchor at SW corner.
  - Removed sports lighting supports between grids H and J.
  - Dimensioned thermal break connections.
- S-110 – ENLARGED FOUNDATION PLAN
  - Plan 1 - Noted electrical ductbank that passes below the retaining wall. Updated retaining wall footing dimensions.
- S-111 – ENLARGED FRAMING PLANS
  - Plan 5 – Added hoist beam to elevator shaft.
- S-112 – PRECAST PLAN
  - Removed bottom precast tread at NE vomitory.
- S-120 – MECHANICAL PLATFORM PLANS
  - Added information on mechanical platforms.
- S-303 – TYPICAL FOUNDATION DETAILS
  - Section 10 – Updated detail.
  - Section 11 – Updated detail.
  - Section 12 – Updated detail.
- S-310 – CONCRETE PIER AND COLUMN DETAILS
  - Detail 12 – Updated for new areaway dimensions.
- S-321 – TYPICAL CONCRETE BASEMENT WALL SECTIONS
  - Section 2 – Updated edge of slab.

- Section 4 – Updated dimensions.
- S-322 – TYPICAL CONCRETE BASEMENT WALL SECTIONS
  - Section 2 – Updated ledge elevation.
  - Section 4 – Updated areaway dimensions.
- S-323 – TYPICAL CONCRETE BASEMENT WALL SECTIONS
  - Elevation 3 – Updated wall rough opening for door.
  - Elevation 6 – Clarified top of wall elevation.
- S-325 – LOADING DOCK SECTIONS & DETAILS
  - Section 10 and 11 – Adjusted footing dimensions.
- S-400 – TYPICAL MASONRY DETAILS
  - Section 1 – Added note clarifying rebar.
- S-401 – TYPICAL CMU WALL ATTACHMENT DETAILS
  - Section 7 – Adjusted grouting to accommodate bleacher anchorage.
  - Section 12 – Added elevation of wall behind bleachers.
- S-512 – STRUCTURAL STEEL FLOOR FRAMING DETAILS
  - Section 11-13 - Added sections for mechanical platforms.
  - Section 14 - Added floor sink detail.
- S-532 – ROOF FRAMING DETAILS
  - Section 6 and 7 - Updated edge angle configuration.
- S-533 – ROOF FRAMING DETAILS
  - Section 3 – Clarified weld requirements.
  - Section 5 – Updated dimension for thermal break.
  - Section 7 and 8 – Added sections for basketball hoop support.
  - Section 9 – Added section for framing above office curtainwall.
- S-534 – ROOF FRAMING DETAILS
  - Section 3 - Updated section that did not print correctly.
  - Section 4 and 5 – Updated plate thickness.
- S-570 – CLADDING BACKUP ELEVATIONS
  - Elevation 7 – Updated location of cladding steel relative to grid.
- S-571 – CLADDING BACKUP ELEVATIONS
  - Elevation 2 and 3 – Added steel at top of curtainwall.
  - Elevation 5 and 7 – Steel tube size increased from HSS12x8x1/4 to HSS12x10x1/4.
- S-573 – CLADDING BACKUP CONNECTION DETAILS
  - Section 1 – Clarified elevation of column penetration.
  - Section 4 – Clarified plate thickness.
  - Section 9 – Clarified plate height and weld.
  - Section 10 – Clarified elevation of column penetration.
  - Section 11 – Clarified plate thickness.
- S-575 – CLADDING BACKUP CONNECTION DETAILS
  - Section 7 – Updated weld symbol to connection.
- S-576 – CLADDING BACKUP CONNECTION DETAILS
  - Section 7 – Clarified post size.
  - Section 11 – Added new section.
- S-577 – CLADDING BACKUP CONNECTION DETAILS
  - Added new sheet with cladding details.

## Architecture

- A-101A - EVENT FLOOR PLAN - AREA A
  - Revise walls and dimensions. Show mechanical access platform and ship's ladder. See drawing.



- A-101D – EVENT FLOOR PLAN – AREA D
  - Revise interior elevations, see drawing.
- A-102A – CONCOURSE FLOOR PLAN – AREA A
  - Add wall sections A3 and A5/A-323. Revise walls and dimensions as shown. Add keynotes. Revise plan details as shown.
- A-102B – CONCOURSE FLOOR PLAN – AREA B
  - Add keynotes. Revise plan details as shown. Revise basketball goal to a ceiling / roof mounting type.
- A-102C – CONCOURSE FLOOR PLAN – AREA C
  - Add keynotes. Revise interior elevations as shown.
- A-102D – CONCOURSE FLOOR PLAN – AREA D
  - Revise walls and dimensions. Add keynotes. Revise interior elevations as shown.
- A-103C – UPPER FLOOR PLAN – AREA C
  - Revise interior elevations as shown. Revise dimensions.
- A-103D – UPPER FLOOR PLAN – AREA D
  - Revise interior elevations as shown.
- A-105 – ROOF PLAN
  - Revise fall protection layout. Add notes on roofing insulation requirements.
- A-105A – ROOF PLAN – AREA A
  - Revise fall protection layout.
- A-105B – ROOF PLAN – AREA B
  - Revise fall protection layout.
- A-105C – ROOF PLAN – AREA C
  - Revise fall protection layout.
- A-105D – ROOF PLAN – AREA D
  - Revise fall protection layout.
- A-131A – EVENT FLOOR REFLECTED CEILING PLAN – AREA A
  - Re-issue sheet. Add keynotes regarding access panels.
- A-131C – EVENT FLOOR REFLECTED CEILING PLAN – AREA C
  - Re-issue sheet. Add keynotes regarding access panels.
- A-131D – EVENT FLOOR REFLECTED CEILING PLAN – AREA D
  - Re-issue sheet. Add keynotes regarding access panels.
- A-132A – CONCOURSE REFLECTED CEILING PLAN – AREA A
  - Re-issue sheet. Add keynotes regarding access panels.
  - Revised Dimensions.
- A-132B – CONCOURSE REFLECTED CEILING PLAN – AREA B
  - Re-issue sheet. Add keynotes regarding access panels.
- A-132C – CONCOURSE REFLECTED CEILING PLAN – AREA C
  - Re-issue sheet. Add keynotes regarding access panels.
- A-132D – CONCOURSE REFLECTED CEILING PLAN – AREA D
  - Re-issue sheet. Add keynotes regarding access panels.
  - Added details.
- A-133A – UPPER FLOOR REFLECTED CEILING PLAN – AREA A
  - Added detail.
- A-133B – UPPER FLOOR REFLECTED CEILING PLAN – AREA B
  - Added note.
- A-133C – UPPER FLOOR REFLECTED CEILING PLAN – AREA C
  - Added details.
  - Modified ceiling material.
- A-133D – UPPER FLOOR REFLECTED CEILING PLAN – AREA D

- Added details.
  - Modified ceiling material.
- A-151A – EVENT FLOOR FINISH PLAN – AREA A
  - Finish tags added.
  - Finish tags modified.
  - CT-01 tags added to clarify elevations.
- A-151D – EVENT FLOOR FINISH PLAN – AREA D
  - Finish tags modified.
  - Finish note added to clarify door paint.
  - Finish tags added.
- A-152A – CONCOURSE FINISH PLAN – AREA A
  - Finish tags modified.
  - Finish tags added.
- A-152C – CONCOURSE FINISH PLAN – AREA C
  - Finish tags modified.
  - Finish tags added. WC-01 WC-04 and WC-05
- A-152D – CONCOURSE FINISH PLAN – AREA D
  - Finish tags modified.
  - Finish tags added.
- A-153C – UPPER FLOOR FINISH PLAN – AREA C
  - Finish tags modified.
  - Finish tags added; WC-01 WC-04 and WC-05
  - Note added.
- A-153D – UPPER FLOOR FINISH PLAN – AREA D
  - Finish tags modified.
  - Finish tags added.
  - Note added to IDF 207.
- A-301-BUILDING SECTIONS
  - D1: Revise assembly notes
- A-321-WALL SECTIONS
  - Drawing A1 revised.
  - A4: Issue new detail showing curtain wall connection to steel beam
  - A6: Remove detail A1
- A-322-WALL SECTIONS
  - A1: New detail A4/A-357 and C6/A-357, Material keynote added
  - A4: Revise detail A4/321 to F1/A-352, Issue new detail F3/A-355
  - A5: Remove from sheet
  - B7: Topography adjusted in detail F3/A-353
- A-323-WALL SECTIONS
  - E4: Add note for cast junction
  - A1: Dimension added, F1 detail
  - D1: Rename drawing to A2
  - A6: Re-issue drawing. See drawing.
  - A7: Re-issue drawing. See drawing.
- A-324-WALL SECTIONS
  - A5: Re-issue drawing. See drawing.
  - A6: Re-issue drawing. See drawing.
- A-325-WALL SECTIONS
  - A3: Issue new detail.
  - A5: Issue new detail.
- A-351– EXTERIOR DETAILS
  - A1: Dimensions added.
  - A4: Dimensions and notes added.

- A6: revised to show full extent of bulkhead condition.
  - C6: Dimensions added.
  - D4: Drawing revised.
  - D6: Dimensions and notes added.
- A-352 – EXTERIOR DETAILS
  - F3: Dimensions added.
  - E5: Dimensions added.
  - E3: Issue new detail.
  - A1: Revise Soffit panels to orient East to West.
  - A4: Dimensions added.
  - A6: Revised keynote leaders
- A-353– EXTERIOR DETAILS
  - A1: Drawing revised.
  - C1: Drawing revised.
  - C3: Drawing revised.
  - C8: Drawing revised.
  - F1: Drawing revised.
  - F3: Drawing revised.
- A-354 – EXTERIOR DETAILS
  - C1: Re-issue drawing.
  - A1: Re-issue drawing.
  - A4: Re-issue drawing.
  - C4: Curtainwall moved. Dimensions revised. Exterior stone panel shape changed.
  - C6: Curtainwall moved. Dimensions revised. Downspouts moved inside stud wall.
  - F4: Curtainwall moved. Dimensions revised. Exterior stone panel shape changed.
- A-355 – EXTERIOR DETAILS
  - F1: Re-issue drawing.
  - F3: Issue new detail
  - F5: Issue new detail
  - C1: Re-issue drawing.
  - C5: Re-issue drawing.
  - A1: Re-issue drawing.
- A-356 – EXTERIOR DETAILS
  - A1: Curtainwall moved. Column insulation added.
  - A4: Curtainwall moved.
  - A7: Curtainwall moved.
  - C1: Curtainwall moved. Dimensions revised.
  - D4: Curtainwall moved.
  - D6: Curtainwall moved. The interior wall finishes changed.
  - F1: Curtainwall moved.
  - F3: Curtainwall moved. Dimensions revised.
  - F6: Curtainwall moved. Dimensions revised.
- A-357 – EXTERIOR DETAILS
  - A1: Dimensions and notes added.
  - A3: Dimensions and notes added. Renamed from A4.
  - A4: Issue new detail.
  - A6: notes added.
  - C1: Dimensions and notes added.
  - C4: Renamed from D6. Dimensions and notes added.
  - C6: Issue new detail.

- D1: Issue new detail.
  - D5: Issue new detail.
  - F1: Renamed from E1.
  - F3: Renamed from E3.
  - F4: Renamed from E5. Dimensions and notes added.
  - F6: Renamed from E6. Dimensions and notes added.
- A-370 – EXTERIOR 3D DIAGRAMS
  - Update ledge elevations as shown
- A-371 – EXTERIOR 3D DIAGRAMS
  - Update ledge elevations as shown
- A-401 - ENLARGED PLANS & ELEVATIONS
  - G5: Modified door opening note.
  - F6: Added equipment note. Added finish note.
  - D6: Detail added; Note added regarding access panels. Finish note added.
  - C5: Keynote added regarding access panels. Door Frame note added.
  - B5: Equipment added.
- A-402 - ENLARGED PLANS & ELEVATIONS
  - C4: Note added regarding access panels. Detail added.
  - A7: Elevation modified.
- A-403 - ENLARGED PLANS & ELEVATIONS
  - D3: Equipment added. Finish note changed.
  - 1: Elevation added.
- A-404 - ENLARGED PLANS & ELEVATIONS
  - B3: Note added regarding access panels. Detail added.
  - 1: Elevation added.
- A-405 - ENLARGED PLANS & ELEVATIONS
  - B3: Note added regarding access panels. Detail added.
  - D1: Elevation modified.
- A-407 - ENLARGED PLANS & ELEVATIONS
  - G4: Elevation modified. Equipment location moved and added.
  - F4: Elevation modified. Sink and equipment added. Finish note modified.
  - F7: Details modified.
  - 1: Elevation added. Trash Location/millwork modified.
- A-408 - ENLARGED PLANS & ELEVATIONS
  - B3: Note added regarding access panels. Detail added.
- A-411 - ENLARGED RESTROOM PLANS
  - E1: Detail added; Keynote added regarding access panels
  - E3: Detail added; Keynote added regarding access panels
  - D6: Finish location modified to accommodate structure, keynoted added
  - B6: Detail added; Keynote added regarding access panels
  - A5: Detail added; Keynote added regarding access panels
- A-412 - ENLARGED RESTROOM PLANS
  - F5: Drawing revised with finishes.
  - E1: Detail added; Keynote added regarding access panels
  - E5: Detail added; Keynote added regarding access panels
  - CF: Detail added; Keynote added regarding access panels
  - C1: (2) Toilet Stalls removed. New partition wall added.
  - B1: Toilet Stall removed. Detail added; Keynote added regarding access panels

- B4: Drawing revised, added note.
  - A1: Toilet Stall removed. Keynote added regarding access panels.
- A-413 - ENLARGED RESTROOM PLANS
  - D4: Detail added; Keynote added regarding access panels
  - C3: Detail added; Keynote added regarding access panels
  - 1: Elevation added
  - 2: Elevation added.
  - 3: Elevation added.
  - 4: Elevation added.
- A-422 STAIR AND ELEVATOR PLANS AND SECTIONS
  - Add general stair notes.
- A-423 STAIR AND ELEVATOR PLANS AND SECTIONS
  - A5: Note added.
- A-424 STAIR PLANS AND SECTIONS
  - A1: ADD KEYNOTE FOR CANE RAIL. REVISE STAIR AND RAILINGS AS SHOWN. SEE DRAWING
  - A3: ADD KEYNOTE FOR CANE RAIL. REVISE STAIR AND RAILINGS AS SHOWN. SEE DRAWING
  - C6: REVISE AND ADD DIMENSIONS. ADD ANNOTATIONS AS SHOWN, SEE DRAWING.
  - E1: REVISE DIMENSION AS SHOWN.
  - E4: Revise stair landing as shown. Add detailed callouts for A1 and A3/A-602. Add partition wall as shown. See drawing.
  - E6: Revise dimensions, see drawing.
- A-426 MONUMENTAL STAIR SECTIONS & DETAILS
  - E1: Update detail as shown.
- A-503 – INTERIOR ELEVATIONS
  - D1: Elevation and dimensions modified.
  - D5: Elevation modified. Details and finishes added.
  - D7: Access panels and finish note added. Finish note modified.
- A-504 – INTERIOR ELEVATIONS
  - D1: Elevation modified. Finish and keynote added.
- A-521 – INTERIOR DETAILS
  - E5: Detail modified. Keynotes and finish notes added.
  - E2: Issue new detail.
  - A4: Issue new detail.
  - A5: Detail modified
  - A6: Detail modified
- A-522 – INTERIOR DETAILS
  - F7: Detail re-numbered and modified.
  - D6: Noted modified.
  - A5: Dimension and detail modified.
  - A7: Detail added
  - C6: Noted added.
- A-523 – INTERIOR DETAILS
  - F1: Issue new detail
  - D1: Issue new detail
- A-530 – CEILING DETAILS
  - G5 – Detail modified
- A-531 – CEILING DETAILS
  - Issue new sheet.
  - F1: Issue new detail.
  - F3: Issue new detail.

- A1: Issue new detail
  - A3: Issue new detail
- A-601 – DOOR SCHEDULE AND DETAILS
  - DOOR SCHEDULE: Revise information for doors 003-1, 004, 005, 006, 016B, 026B, 107D, 115-2, 115-3
- A-602 – DOOR DETAILS
  - A1: Re-issue drawing. Rename drawing to JAMB DETAIL – DOOR WITH EXT. COMPOSITE CLADDING
  - A3: Re-issue drawing. Rename drawing to HEAD DETAIL – DOOR WITH EXT. COMPOSITE CLADDING
- A-603 – DOOR DETAILS
  - A5: Re-issue detail.
  - A6: Issue new detail.
  - C6: Issue new detail.
  - D6: Issue new detail.
- A-604 – INTERIOR STOREFRONT ELEVATIONS
  - Issue new sheet.
- A-621 – GLAZING ELEVATIONS AND PLANS
  - Add GLAZING SCHEDULE to sheet.
  - A7: Dimensions updated.
  - C2: Add wall section callouts A3/A-325 and A5/A-325. Update dimensions. Update wall types. See drawing.
  - E7: Dimensions updated.
  - W01: Dimensions updated.
- A-622 – GLAZING ELEVATIONS AND PLANS
  - W02, W03, W04, W05, W06: Dimensions updated.
  - E5: Dimensions updated.
- A-623 – GLAZING ELEVATIONS AND PLANS
  - Add GLAZING SCHEDULE to sheet.
  - A1: Dimensions updated.
  - A3: Dimensions updated.
  - A6: Mullion details updated.
  - W09, W07: Dimensions updated.
  - W11, W10: Re-issue detail.
- A-624 – GLAZING ELEVATIONS AND PLANS
  - Add GLAZING SCHEDULE to sheet.
  - A1: Curtainwall moved.
- A-630 – LOUVER ELEVATIONS
  - C6: Update louver, dimensions, and notes. See drawing.
- A-902 – DIMENSIONED SEATING BOWL PLAN
  - A1: Add annotations, see drawing.
- A-910 – ENLARGED SEATING BOWL SECTIONS
  - Revise “BOWL RAIL TYPE DESCRIPTION” notes.
  - A1: Add callout for new typical detail G1/A-910. Remove dimensions.
  - A4: Remove dimensions.
  - C1: Remove dimensions.
  - E3: Re-issue revised drawing.
  - C4: Remove dimensions.
  - G1: Issue new detail
- A-911 – RAIL DETAILS
  - Revise “BOWL RAIL TYPE DESCRIPTION” notes.
  - C1: Re-issue detail
  - C3: Revise notes and attachment detail. See drawing.

- C4: Revise notes and attachment detail. See drawing.
- C6: Revise notes and attachment detail. See drawing.
- E1: Revise notes and attachment detail. See drawing.
- E6: Revise notes and attachment detail. See drawing.
- E7: Issue new detail.
- A-912 – WALL MOCKUP
  - Re-issue sheet.
  - Issue drawing B2, B5, E1, E3, E4, and E6

## Plumbing

- FP-201D – EVENT LEVEL – AREA D
  - Fire Protection main to serve Vest 100 added.
- FP-202A – MAIN CONCOURSE LEVEL – AREA A
  - Fire Protection main serving Vest 100 and Ticketing 101 added in its entirety.
  - Refer to added Fire Protection piping to serve column sprinkler.
- FP-202D – MAIN CONCOURSE LEVEL – AREA D
  - Fire Protection main serving Vest 100 added in its entirety.
  - Refer to added Fire Protection piping to serve column sprinkler.
- FP-203A – UPPER LEVEL – AREA A
  - Refer to advised fire protection main routing.
  - Keynote 211330 added.
  - Keynote 211331 added.
- FP-203B – UPPER LEVEL – AREA B
  - Refer to advised fire protection main routing.
  - Keynote 211330 added.
  - Keynote 211332 added.
  - Keynote 211333 added.
- FP-203C – UPPER LEVEL – AREA C
  - Refer to advised fire protection main routing.
  - Keynote 211330 added.
  - Keynote 211332 added.
  - Keynote 211333 added.
- FP-203D – UPPER LEVEL – AREA D
  - Refer to advised fire protection main routing.
  - Keynote 211330 added.
  - Keynote 211331 added.
- FP-401 – FIRE PROTECTION DETAILS
  - Refer to added main to serve Vest 100 and Ticketing 101.
- P-201A – EVENT LEVEL – AREA A
  - Refer to new location of a HWR modulating valve in AUX LKR SHOWER/GROOM 005A.
  - Refer to new location of a HWR modulating valve in HOME COACH LKR RM 014.
  - Shutoff valves added on DSCW and DHW-130 serving laundry.
  - Refer to revised locations of water hammer arrestors.
  - Refer to revised GW and DCW piping.
  - Refer to revised Sanitary, Storm, and Sump Pump Discharge exits invert elevation changes.
  - Revise storm piping in TICKETING 101 as shown.

- Additional annotations added for clarity.
- P-201B – EVENT LEVEL – AREA B
  - Shutoffs on DSCW and DHW-130 removed on mains serving restrooms above kitchen. Valves to be installed on level above.
- P-201C – EVENT LEVEL – AREA C
  - Provide shutoffs as shown on DSCW and DHW-110 serving Individual lockers.
  - Revise 8" storm exit as shown.
  - Keynote 221132 added.
  - Keynote 221133 added.
  - Refer to revised Sanitary and Vent piping.
  - Additional annotations added for clarity.
- P-201D – EVENT LEVEL – AREA D
  - Refer to revised locations of water hammer arrestors.
  - Revise storm piping routing as shown.
  - Garbage disposal added to S-1 in NUTRITION ZONE 029.
  - 3/4" DSCW branch serving dishwasher added and keynoted 221136.
  - IMB-1 shown in WVB LOCKER 026.
  - Refer to revised GW and DCW piping.
  - Shutoff added to DSCW in WVB GROOM 026C.
  - Refer to revised Sanitary and Vent piping.
  - Additional annotations added for clarity.
- P-202A – MAIN CONCOURSE LEVEL – AREA A
  - Refer to revised locations of water hammer arrestors.
  - Water hammer arrestors added to domestic piping in Kitchen 102.
  - Sanitary piping added serving floor sink on floor above, keynoted 221308.
  - Revise storm piping in TICKETING 101 as shown.
  - Provide shutoffs as shown on DHW-110 as shown.
  - DSCW serving EWC-1 added.
  - Additional annotations added for clarity.
- P-202B – MAIN CONCOURSE LEVEL – AREA B
  - Keynote 221135 added.
- P-202C – MAIN CONCOURSE LEVEL – AREA C
  - Refer to revised locations of water hammer arrestor.
  - Refer to revised DSCW branch serving MEN 114 sinks.
  - Provide shutoffs as shown on DSCW and DHW-130.
  - Refer to revised Plumbing work associated with layout change in FAMILY 114A
  - Refer to revised Plumbing work associated with addition of Sink in WELLNESS 110.
  - Revise 8" storm piping as shown.
- P-202D – MAIN CONCOURSE LEVEL – AREA D
  - Water hammer arrestors added to domestic piping in Kitchen 104.
  - Revise storm piping routing as shown.
  - Provide shutoffs as shown on DSCW, DHW-110, and DHW-130
  - Refer adjustment of Plumbing work with removal of two west Water Closets in WOMEN 105.
  - Additional annotations added for clarity.
- P-203A – UPPER LEVEL – AREA A
  - Refer to new location of FS-1.
  - Revise storm piping as shown.
- P-203B – UPPER LEVEL – AREA B



- Revise storm piping as shown.
- P-203D – UPPER LEVEL AREA D
  - Revise storm piping as shown.
- P-303 – SANITARY RISER DIAGRAM EVENT LEVEL II
  - Revise vent piping as shown.
- P-305 – SANITARY RISER DIAGRAM EVENT LEVEL III
  - Garbage disposal added to S-1.
- P-307 – SANITARY RISER DIAGRAM CONCOURSE AND UPPER LEVEL I
  - Detail 1: Refer to added and revised sanitary piping.
  - Detail 2: Refer to added and revised sanitary and vent piping.
- P-308 – SANITARY RISER DIAGRAM CONCOURSE AND UPPER LEVEL II
  - Detail 1: Refer adjustment of sanitary piping with removal of two west Water Closets in WOMEN 105.
  - Detail 1: Refer to revised Sanitary and Vent piping.
- P-309 – SANITARY RISER DIAGRAM CONCOURSE LEVEL CONCESSIONS
  - Detail 1: Refer to added sanitary piping and floor sink.
  - Detail 2: Revise GW piping as shown.
- P-402 – ENLARGED PLUMBING PLAN I
  - Detail 2: Refer to new location of a HWR modulating valve in AUX LKR SHOWER/GROOM 005A.
  - Detail 2: Shutoff valves added on DSCW and DHW-130 serving laundry.
- P-403 – ENLARGED PLUMBING PLANS II
  - Provide shutoffs as shown on DSCW and DHW-110 serving Individual lockers.
  - Revise 8" storm exit as shown.
  - Refer to revised Sanitary and Vent piping.
  - Additional annotations added for clarity.
- P-404 – ENLARGED PLUMBING PLANS III
  - Refer to new location of a HWR modulating valve in HOME COACH LKR RM 014.
  - Refer to revised locations of water hammer arrestors.
  - Revise storm piping as shown.
  - Trench drains made visible in VISITOR SHOWER 006C.
- P-405 – ENLARGED PLUMBING PLANS IV
  - Detail 1: Refer to revised locations of water hammer arrestors.
  - Detail 1: IMB-1 shown in WVB LOCKER 026.
  - Detail 1: Refer to revised GW and DCW piping.
  - Detail 1: Shutoff added to DSCW in WVB GROOM 026C.
  - Detail 2: Shutoffs on DSCW and DHW-130 removed on mains serving restrooms above kitchen. To be installed on risers accessed from level above, further addressed in this addendum.
- P-406 – ENLARGED PLUMBING PLANS V
  - Detail 1: Provide shutoffs as shown on DHW-110 as shown.
  - Detail 1: DSCW serving EWC-1 added.
  - Detail 1: Refer to revised locations of water hammer arrestors.
  - Detail 1: Keynote 221135 added.
  - Detail 1: Sanitary piping added.
- P-407 – ENLARGED PLUMBING PLANS VI
  - Detail 1: Provide shutoffs as shown on DSCW, DHW-110 and DHW-130.

- Detail 1: Revise 8" storm piping as shown.
- Detail 1: Keynote 221134 added.
- Detail 1: Refer to revised plumbing work with removal of two west Water Closets in WOMEN 105.
- Detail 2: Refer to revised plumbing work associated with Family 114A.
- Detail 2: Provide shutoffs as shown on DSCW, DHW-110 and DHW-130.
- Detail 2: Refer to revised DSCW branch serving MEN 114 sinks.
- Detail 2: Refer to revised locations of water hammer arrestor.
- P-601 PLUMBING FIXTURE
  - Note added to description "watersense certified" to LAV-1,2,3; SH-1,2; UR-1; and WC-1,2.
  - LAV-1 faucet basis of design Sloan SF-2900.
  - LAV-2 faucet basis of design Chicago Faucets – EQ-A11C-33ABCP.
  - LAV-3 Custom Trough "TSL.MON.A.CUSTOM" added to basis of design.
- P-602 PLUMBING EQUIPMENT
  - GD-4 added to plumbing equipment schedule.
  - DWBP-1 description updated.
  - IBP-1 description updated.
  - WH-1 and WH-2 description updated.
  - WS-1 description updated.
  - TMV-1,2,3,5 description updated.

#### Mechanical

- See attached Mechanical narrative

#### Electrical

- See attached Electrical narrative

#### AV

- AV-000 - GENERAL NOTES AND LEGENDS
  - Edit symbol legend
- AV-090 - AUDIO VIDEO EQUIPMENT DETAILS
  - Edit display Schedule
- AV-091 - LOUDSPEAKER SCHEDULE AND DETAILS
  - Sheet Added
- AV-101D - EVENT FLOOR PLAN – AREA D
  - Room #016 edit TP location
  - Room #016 delete DB
  - Room #022 delete DB
  - Room #026 delete DB
  - Room #030 edit TP location
- AV-102C – CONCOURSE FLOOR PLAN – AREA C
  - Room #109D delete VC
- AV-103C – UPPER FLOOR PLAN – AREA C
  - Room #201-3 change CP location
- AV-201 – AV ELEVATIONS
  - 7: Add conduit
- AV-202 – AV ELEVATIONS

- 5: Delete DB
- AV-203 – AV ELEVATIONS
  - 4: Delete VC and add Video bar
  - 5: Add conduit tag
  - 3: Add conduit
  - 6: Add CP
- AV-1110 – AUDIO CONTROL ROOM DIAGRAM
  - Distribution Amplifiers omitted
- AV-1120 - AUDIO VISUAL FUNCTIONAL DIAGRAMS
  - 3: Edit functional diagram
  - 6: Edit functional diagram
- AV-1121 – AUDIO VISUAL FUNCTIONAL DIAGRAMS
  - 2: Add functional diagram
  - 3: Add functional diagram
- AV-1170 – PLATE AND PANEL DETAILS
  - 1: Edit plates
  - 4: Edit detail
- AV-1180 – AV EQUIPMENT RACK ELEVATIONS
  - 1: Edit rack details

## ES

- ES-000 – GENERAL NOTES AND LEGENDS
  - Edit structured cable symbol legend
- ES-101A - EVENT FLOOR PLAN – AREA A
  - Delete TP outlets
- ES-101D - EVENT FLOOR PLAN – AREA D
  - Delete DB outlets
  - Delete TP outlets
- ES-102A - CONCOURSE FLOOR PLAN – AREA A
  - Added/revised Food Service POS locations
- ES-102C - CONCOURSE FLOOR PLAN – AREA C
  - Delete CP outlets
  - Delete VC outlets
- ES-102D - CONCOURSE FLOOR PLAN – AREA D
  - Added/revised Food Service POS locations
  - Delete TP outlet
- ES-132C – CONCOURSE REFLECTED CEILING PLAN – AREA C
  - Delete CM outlet
- ES-132D CONCOURSE REFLECTED CEILING PLAN – AREA D
  - Delete CM outlet

## Attachments:

- SECTION 055000 – METAL FABRICATIONS
- SECTION 078123 – INTUMESCENT FIRE PROTECTION
- SECTION 085653 – SECURITY WINDOWS
- SECTION 087100 – DOOR HARDWARE
- SECTION 116623.13 – BASKETBALL EQUIPMENT
- SECTION 118129 – FACILITY FALL PROTECTION
- SECTION 126100 – FIXED AUDIENCE SEATING
- SECTION 126600 – TELESCOPING STANDS

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- SECTION 210500 – COMMON WORK RESULTS FOR FIRE SUPPRESSION
- SECTION 210523 – GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING
- SECTION 210529 – HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING
- SECTION 210548 – VIBRATION CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT
- SECTION 210553 – IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT
- SECTION 211000 – WATER-BASED FIRE-SUPPRESSION SYSTEMS
- SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING
- SECTION 220719 – PLUMBING PIPING INSULATION
- SECTION 223500 – DOMESTIC-WATER HEAT EXCHANGERS
- SECTION 224200 – COMMERCIAL PLUMBING FIXTURES
- SECTION 274116 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT
- See mechanical and electrical narratives for additional information on changes to the project manual.

- G-002 – SHEET INDEX AND PROJECT LOCATION
- G-005 - LIFE SAFETY PLANS
- G-006 - LIFE SAFETY PLANS
- G-007 - LIFE SAFETY PLANS

- L-201– SITE FEATURES PLAN
- L-621 – PLAN ENLARGEMENTS – SITE FEATURES

- C001 – TITLE SHEET
- C002 – GENERAL NOTES
- C100 – OVERALL EXISTING TOPOGRAPHY
- C111 – DEMOLITION PLAN
- C112 – DEMOLITION PLAN
- C120 – EXCAVATION PLAN
- C200 OVERALL SITE PLAN
- C210 ROAD PLAN AND PROFILE
- C300 OVERALL GRADING PLAN
- C301 GRADING PLAN
- C302 GRADING PLAN
- C303 GRADING PLAN ENLARGEMENTS
- C304 GRADING PLAN ENLARGEMENTS
- C400 OVERALL UTILITY PLAN
- C401 UTILITY PLAN
- C402 UTILITY PLAN
- C403 UTILITY ENLARGEMENTS
- C404 STRUCTURE DATA TABLES
- C405 DUCT BANK CROSSINGS
- C406 DUCT BANK CROSSINGS
- C410 STORM SEWER PLAN & PROFILES

- C411 STORM SEWER PLAN & PROFILES
- C412 STORM SEWER PLAN & PROFILES
- C413 STORM SEWER PLAN & PROFILES
- C414 STORM SEWER PLAN & PROFILES
- C415 STORM SEWER PLAN & PROFILES
- C420 SANITARY SEWER PLAN & PROFILE
- C500 OVERALL EROSION CONTROL PLAN
- C501 CONTRUCTION EROSION CONTROL PLAN
- C502 CONTRUCTION EROSION CONTROL PLAN
- C511 POST-CONSTRUCTION EROSION CONTROL PLAN
- C512 POST-CONSTRUCTION EROSION CONTROL PLAN
- C520 SWPPP
- C521 WETLANDS MAP
- C530 EROSION CONTROL DETAILS
- C531 EROSION CONTROL SPECIFICATIONS
- C600 SITE DETAILS
- C601 SITE DETAILS
- C602 SITE DETAILS
- C603 SITE DETAILS
- C604 SITE DETAILS
- C605 SITE DETAILS
- C610 WATER DETAILS
- C620 SANITARY SEWER DETAILS
- C621 SANITARY SEWER DETAILS
  
- S-006 – CLADDING DESIGN CRITERIA ELEVATIONS
- S-007 – CLADDING DESIGN CRITERIA ELEVATIONS
- S-101A – EVENT LEVEL FOUNDATION PLAN – UNIT A
- S-102A – CONCOURSE LEVEL PLAN – UNIT A
- S-102C – CONCOURSE LEVEL PLAN – UNIT C
- S-102D – CONCOURSE LEVEL PLAN – UNIT D
- S-103A – UPPER LEVEL PLAN – UNIT A
- S-103B – UPPER LEVEL PLAN – UNIT B
- S-103C – UPPER LEVEL PLAN – UNIT C
- S-103D – UPPER LEVEL PLAN – UNIT D
- S-104A – LOW ROOF PLAN – UNIT A
- S-104B – LOW ROOF PLAN – UNIT B
- S-104C – LOW ROOF PLAN – UNIT C
- S-104D – LOW ROOF PLAN – UNIT D
- S-105A – HIGH ROOF PLAN – UNIT A
- S-105B – HIGH ROOF PLAN – UNIT B
- S-105C – HIGH ROOF PLAN – UNIT C
- S-105D – HIGH ROOF PLAN – UNIT D
- S-110 – ENLARGED FOUNDATION PLAN
- S-111 – ENLARGED FRAMING PLANS
- S-112 – PRECAST PLAN
- S-120 – MECHANICAL PLATFORM PLANS
- S-303 – TYPICAL FOUNDATION DETAILS
- S-310 – CONCRETE PIER AND COLUMN DETAILS
- S-321 – TYPICAL CONCRETE BASEMENT WALL SECTIONS
- S-322 – TYPICAL CONCRETE BASEMENT WALL SECTIONS

- S-323 – TYPICAL CONCRETE BASEMENT WALL SECTIONS
- S-325 – LOADING DOCK SECTIONS & DETAILS
- S-400 – TYPICAL MASONRY DETAILS
- S-401 – TYPICAL CMU WALL ATTACHMENT DETAILS
- S-512 – STRUCTURAL STEEL FLOOR FRAMING DETAILS
- S-532 – ROOF FRAMING DETAILS
- S-533 – ROOF FRAMING DETAILS
- S-534 – ROOF FRAMING DETAILS
- S-570 – CLADDING BACKUP ELEVATIONS
- S-571 – CLADDING BACKUP ELEVATIONS
- S-573 – CLADDING BACKUP CONNECTION DETAILS
- S-575 – CLADDING BACKUP CONNECTION DETAILS
- S-576 – CLADDING BACKUP CONNECTION DETAILS
- S-577 – CLADDING BACKUP CONNECTION DETAILS
  
- A-101A - EVENT FLOOR PLAN - AREA A
- A-101D – EVENT FLOOR PLAN – AREA D
- A-102A – CONCOURSE FLOOR PLAN – AREA A
- A-102B – CONCOURSE FLOOR PLAN – AREA B
- A-102C – CONCOURSE FLOOR PLAN – AREA C
- A-102D – CONCOURSE FLOOR PLAN – AREA D
- A-103C – UPPER FLOOR PLAN – AREA C
- A-103D – UPPER FLOOR PLAN – AREA D
- A-105 – ROOF PLAN
- A-105A – ROOF PLAN – AREA A
- A-105B – ROOF PLAN – AREA B
- A-105C – ROOF PLAN – AREA C
- A-105D – ROOF PLAN – AREA D
- A-131A – EVENT FLOOR REFLECTED CEILING PLAN – AREA A
- A-131C – EVENT FLOOR REFLECTED CEILING PLAN – AREA C
- A-131D – EVENT FLOOR REFLECTED CEILING PLAN – AREA D
- A-132A – CONCOURSE REFLECTED CEILING PLAN – AREA A
- A-132B – CONCOURSE REFLECTED CEILING PLAN – AREA B
- A-132C – CONCOURSE REFLECTED CEILING PLAN – AREA C
- A-132D – CONCOURSE REFLECTED CEILING PLAN – AREA D
- A-133A – UPPER FLOOR REFLECTED CEILING PLAN – AREA A
- A-133B – UPPER FLOOR REFLECTED CEILING PLAN – AREA B
- A-133C – UPPER FLOOR REFLECTED CEILING PLAN – AREA C
- A-133D – UPPER FLOOR REFLECTED CEILING PLAN – AREA D
- A-151A – EVENT FLOOR FINISH PLAN – AREA A
- A-151D – EVENT FLOOR FINISH PLAN – AREA D
- A-152A – CONCOURSE FINISH PLAN – AREA A
- A-152C – CONCOURSE FINISH PLAN – AREA C
- A-152C – CONCOURSE FINISH PLAN – AREA C
- A-152D – CONCOURSE FINISH PLAN – AREA D
- A-153C – UPPER FLOOR FINISH PLAN – AREA C
- A-153D – UPPER FLOOR FINISH PLAN – AREA D
- A-301-BUILDING SECTIONS
- A-321-WALL SECTIONS
- A-322-WALL SECTIONS
- A-323-WALL SECTIONS

- A-324-WALL SECTIONS
- A-325-WALL SECTIONS
- A-351– EXTERIOR DETAILS
- A-352 – EXTERIOR DETAILS
- A-353– EXTERIOR DETAILS
- A-354 – EXTERIOR DETAILS
- A-355 – EXTERIOR DETAILS
- A-356 – EXTERIOR DETAILS
- A-357 – EXTERIOR DETAILS
- A-370 – EXTERIOR 3D DIAGRAMS
- A-371 – EXTERIOR 3D DIAGRAMS
- A-401 - ENLARGED PLANS & ELEVATIONS
- A-402 - ENLARGED PLANS & ELEVATIONS
- A-403 - ENLARGED PLANS & ELEVATIONS
- A-404 - ENLARGED PLANS & ELEVATIONS
- A-405 - ENLARGED PLANS & ELEVATIONS
- A-407 - ENLARGED PLANS & ELEVATIONS
- A-408 - ENLARGED PLANS & ELEVATIONS
- A-411 - ENLARGED RESTROOM PLANS
- A-412 - ENLARGED RESTROOM PLANS
- A-413 - ENLARGED RESTROOM PLANS
- A-423 - STAIR AND ELEVATOR PLANS AND SECTIONS
- A-424 - STAIR PLANS AND SECTIONS
- A-503 – INTERIOR ELEVATIONS
- A-503 – INTERIOR ELEVATIONS
- A-521 – INTERIOR DETAILS
- A-522 – INTERIOR DETAILS
- A-523 – INTERIOR DETAILS
- A-530 – CEILING DETAILS
- A-531 – CEILING DETAILS
- A-601 – DOOR SCHEDULE AND DETAILS
- A-602 – DOOR DETAILS
- A-603 – DOOR DETAILS
- A-604 – INTERIOR STOREFRONT ELEVATIONS
- A-621 – GLAZING ELEVATIONS AND PLANS
- A-622 – GLAZING ELEVATIONS AND PLANS
- A-623 – GLAZING ELEVATIONS AND PLANS
- A-624 – GLAZING ELEVATIONS AND PLANS
- A-630 – LOUVER ELEVATIONS
- A-902 – DIMENSIONED SEATING BOWL PLAN
- A-910 – ENLARGED SEATING BOWL SECTIONS
- A-911 – RAIL DETAILS
- A-912 – WALL MOCKUP
  
- FP-201D – EVENT LEVEL – AREA D
- FP-202A – MAIN CONCOURSE LEVEL – AREA A
- FP-202D – MAIN CONCOURSE LEVEL – AREA D
- FP-203A – UPPER LEVEL – AREA A
- FP-203B – UPPER LEVEL – AREA B
- FP-203C – UPPER LEVEL – AREA C
- FP-203D – UPPER LEVEL – AREA D

- FP-401 – FIRE PROTECTION DETAILS
  - P-201A – EVENT LEVEL – AREA A
  - P-201B – EVENT LEVEL – AREA B
  - P-201C – EVENT LEVEL – AREA C
  - P-201D – EVENT LEVEL – AREA D
  - P-202A – MAIN CONCOURSE LEVEL – AREA A
  - P-202B – MAIN CONCOURSE LEVEL – AREA B
  - P-202C – MAIN CONCOURSE LEVEL – AREA C
  - P-202D – MAIN CONCOURSE LEVEL – AREA D
  - P-203A – UPPER LEVEL – AREA A
  - P-203B – UPPER LEVEL – AREA B
  - P-203D – UPPER LEVEL – AREA D
  - P-303 – SANITARY RISER DIAGRAM EVENT LEVEL II
  - P-305 – SANITARY RISER DIAGRAM EVENT LEVEL III
  - P-307 – SANITARY RISER DIAGRAM CONCOURSE AND UPPER LEVEL I
  - P-308 – SANITARY RISER DIAGRAM CONCOURSE AND UPPER LEVEL II
  - P-309 – SANITARY RISER DIAGRAM CONCOURSE LEVEL CONCESSIONS
  - P-402 – ENLARGED PLUMBING PLAN I
  - P-403 – ENLARGED PLUMBING PLANS II
  - P-404 – ENLARGED PLUMBING PLANS III
  - P-405 – ENLARGED PLUMBING PLANS IV
  - P-406 – ENLARGED PLUMBING PLANS V
  - P-407 – ENLARGED PLUMBING PLANS VI
  - P-601 PLUMBING FIXTURE
  - P-602 PLUMBING EQUIPMENT
- 
- M-Series Sheets (see attached Mech. narrative)
  - E-Series Sheets (see attached Elec. narrative)
- 
- AV-000 - GENERAL NOTES AND LEGENDS
  - AV-090 - AUDIO VIDEO EQUIPMENT DETAILS
  - AV-091 - LOUDSPEAKER SCHEDULE AND DETAILS
  - AV-101D - EVENT FLOOR PLAN – AREA D
  - AV-102C – CONCOURSE FLOOR PLAN – AREA C
  - AV-103C – UPPER FLOOR PLAN – AREA C
  - AV-201 – AV ELEVATIONS
  - AV-202 – AV ELEVATIONS
  - AV-203 – AV ELEVATIONS
  - AV-1110 – AUDIO CONTROL ROOM DIAGRAM
  - AV-1120 - AUDIO VISUAL FUNCTIONAL DIAGRAMS
  - AV-1121 – AUDIO VISUAL FUNCTIONAL DIAGRAMS
  - AV-1170 – PLATE AND PANEL DETAILS
  - AV-1180 – AV EQUIPMENT RACK ELEVATIONS
- 
- ES-000 – GENERAL NOTES AND LEGENDS
  - ES-101A - EVENT FLOOR PLAN – AREA A
  - ES-101D – EVENT FLOOR PLAN – AREA D



- ES-102A – CONCOURSE FLOOR PLAN – AREA A
- ES-102C - CONCOURSE FLOOR PLAN – AREA C
- ES-102D - CONCOURSE FLOOR PLAN – AREA D
- ES-132C – CONCOURSE REFLECTED CEILING PLAN – AREA C
- ES-132D - CONCOURSE REFLECTED CEILING PLAN – AREA D

Respectfully submitted,

Kevin Stewart, AIA

CC: File 23112.

# Addendum #1

Owner Information	IU Indianapolis
DATE	January 27, 2025
PROJECT NAME	IN128 James T. Morris Arena
PROJECT #	12176
DISTRIBUTION	Ratio
ADDENDUM CONSIST OF	( X ) 30x42 FULL-SIZE SHEETS

The following additions, revisions, and modifications are part of the contract documents, which shall be amended accordingly. Acknowledge receipt of addenda on the bid form. Failure to acknowledge receipt of this addendum may result in the rejection of your offer.

## SPECIFICATIONS

**1. Specification Section 237313 AIR-HANDLING UNITS:**

- a. Replace subparagraph 2.10 to as follows:

**2.10 DEHUMIDIFICATION WRAP-AROUND HEAT PIPE COILS**

- A. Refer to 237216 "Heat Pipe Air-to-Air Energy Recovery Units" for specification regarding heat pipe coils.

**2. Specification Section 23 00 00 HVAC General Requirements:**

- a. Added LEED language

## DRAWINGS

**1. Sheet M-001 "MECHANICAL LEGEND, ABBREVIATIONS, AND GEN. NOTES":**

- a. Clarified annotation.

**2. Sheet M-002 "CHW DIAGRAM":**

- a. Updated Details A, B, and C to remove PICVs.
- b. Removed pump isolation and control valves.

**3. Sheet M-003 "HHW DIAGRAM":**

- a. Updated Details A, B, and C to remove PICVs.

**4. Sheet M-004 "HHW DIAGRAM":**

- a. Updated Details A, B, and C to remove PICVs.

**5. Sheet M-006 "CHILLED BEAMS DIAGRAM":**

- a. Chilled beams total number, gpm, and layout updated to match floor plan changes.
- 6. Sheet M-007 "CHILLED BEAMS DIAGRAM":**
  - a. Chilled beams total number, gpm, and layout updated to match floor plan changes.
- 7. Sheet M-101A "EVENT FLOOR PLAN – AREA A - HVAC":**
  - a. Changed configuration of transfer boot.
- 8. Sheet M-101B "EVENT FLOOR PLAN – AREA B - HVAC":**
  - a. Added transfer boot annotations.
  - b. Changed size of transfer grille and boot.
  - c. Added sheet note to provide clarity for the mounting of the VAV boxes serving the court from the NE vomitory.
- 9. Sheet M-101C "EVENT FLOOR PLAN – AREA C - HVAC":**
  - a. Transfer grilles were swapped for wire mesh screens for transfer boots that are located above ceilings.
  - b. Size and routing for OA duct serving AHU 00-01 was changed to coordinate with plumbing.
  - c. Return duct airflow updated for AHU 00-01.
- 10. Sheet M-101D "EVENT FLOOR PLAN – AREA D - HVAC":**
  - a. Square diffusers changed to slot diffusers above athletes' lounge.
  - b. Exhaust air slot diffusers serving hydrotherapy were rotated.
  - c. The numbering for sheet notes was updated.
- 11. Sheet M-102B "CONCOURSE FLOOR PLAN – AREA B - HVAC":**
  - a. Updated airflow to the Grab N' Go space.
  - b. Added return slot above the egress space in the aux gym.
- 12. Sheet M-102C "CONCOURSE FLOOR PLAN – AREA C - HVAC":**
  - a. Changed fire-smoke dampers to fire dampers.
  - b. Updated airflow to the Grab N' Go space.
  - c. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized ductwork to accommodate new layout.
  - d. Clarified presence of REA dampers
- 13. Sheet M-102D "CONCOURSE FLOOR PLAN – AREA D - HVAC":**
  - a. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized ductwork to accommodate new layout.
  - b. Clarified presence of REA damper
- 14. Sheet M-103A "UPPER FLOOR PLAN – AREA A - HVAC":**
  - a. Included sheet notes to provide clarity for remote access cables to balance diffusers.
- 15. Sheet M-103B "UPPER FLOOR PLAN – AREA B - HVAC":**
  - a. Included sheet notes to provide clarity for remote access cables to balance diffusers.
  - b. Rerouted relief air duct to accommodate louver location at request of architect.
- 16. Sheet M-103C "UPPER FLOOR PLAN – AREA C - HVAC":**
  - a. Included sheet notes to provide clarity for remote access cables to balance diffusers.

- b. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized ductwork to accommodate new layout.
  - c. Changed location and size of DS 02-09.
- 17. Sheet M-103D "UPPER FLOOR PLAN – AREA D - HVAC":**
- a. Included sheet notes to provide clarity for remote access cables to balance diffusers.
  - b. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns.
- 18. Sheet M-201D "EVENT FLOOR PLAN – AREA D - PIPING":**
- a. Shifted piping in corridor for coordination and to resolve conflicts with ductwork.
- 19. Sheet M-202C "CONCOURSE FLOOR PLAN – AREA C - PIPING":**
- a. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized piping to accommodate new layout.
  - b. Removed redundant HHW piping near the SE stair that had no end user.
- 20. Sheet M-202D "CONCOURSE FLOOR PLAN – AREA D - PIPING":**
- a. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized piping to accommodate new layout.
  - b. Rerouted piping to HWC 01-01.
- 21. Sheet M-203C "UPPER FLOOR PLAN – AREA C - PIPING":**
- a. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized piping to accommodate new layout.
- 22. Sheet M-203D "UPPER FLOOR PLAN – AREA D - PIPING":**
- a. Updated the sizes and layouts for some of the chilled beams in the tenant offices for architectural coordination and/or more idealized airflow patterns. Moved/resized piping to accommodate new layout.
- 23. Sheet M-401A "ENLARGED PLAN - HX/CHW 068A":**
- a. Changed the fire-smoke damper on the outside air ductwork to a fire damper.
- 24. Sheet M-401B "EVENT LEVEL ENLARGED PLAN - DOAS, AHU, LAUNDRY ROOMS":**
- a. Changed the fire-smoke dampers for the supply runs from AHU 00-02 to fire dampers and added an annotation for the fire-smoke damper on the outside air ductwork running to the laundry.
- 25. Sheet M-402 "ENLARGED PLANS - PRACTICE GYM":**
- a. Changed the fire-smoke damper on the supply run of AHU 01-01 to a fire damper.
  - b. Added the geometry and annotations for DS 02-09.
  - c. Updated routing for RAFA-01-01.
- 26. Sheet M-403 "ENLARGED PLAN - FAN ROOM 209":**
- a. Changed the fire-smoke damper in the supply run of AHU 02-01 to a fire damper.
- 27. Sheet M-404 "ENLARGED PLAN - FAN ROOM 210":**
- a. Changed the fire-smoke damper in the supply run of AHU 02-02 to a fire damper.
- 28. Sheet M-407 "ENLARGED PLAN - MECHANICAL ROOM 208":**

- a. Changed the fire-smoke dampers in the supply and relief air runs of AHU 02-02 to fire dampers.
- 29. Sheet M-505 "MECHANICAL DETAILS - STEAM AND PIPING":**
  - a. Added a detail for pipe guides
- 30. Sheet M-602 "MECHANICAL SCHEDULES – AHU":**
  - a. A note was added to provide clarity for the peak airflows expected from AHU 00-01 in the AHU schedule.
  - b. ERW schedule updated to reflect realistic winter temperatures and performance.
- 31. Sheet M-604 "MECHANICAL SCHEDULES – VAV":**
  - a. Airflow for EAVAV 00-14 updated in the exhaust VAV schedule.
- 32. Sheet M-605 "MECHANICAL SCHEDULES – FAN":**
  - a. Updated intake hood data in the schedule.
- 33. Sheet M-607 "MECHANICAL SCHEDULES - ACTIVE CHILLED BEAMS":**
  - a. Updated size, performance, and quantity of chilled beams in the chilled beam schedule.
- 34. Sheet M-700 "MECHANICAL ZONING PLAN - EVENT LEVEL":**
  - a. Updated the name of zone S14.
  - b. Added zones S16 and S17 and the TH sensors for the HWC's serving those zones.
- 35. Sheet M-701 "MECHANICAL ZONING PLAN - CONCOURSE LEVEL":**
  - a. Added a sheet note and annotations for placement of the manufacture's controller to control the HVLS fans in the W concourse.
  - b. Added a sheet note and annotations for placement of the manufacture's controller to control the HVLS fans in the Aux gym.
  - c. Added a temperature sensor to the storage room being served by AHU 01-01.
  - d. Added unique zones and hatch patterns to the zones in the tenant office.
  - e. Added TH and CO2 sensors to the tenant office.
- 36. Sheet M-702 "MECHANICAL ZONING PLAN – UPPER FLOOR":**
  - a. Added ambient temperature, humidity, and pressure sensor to the north wall above the low roof.
  - b. Added unique zones and hatch patterns to the zones in the tenant office.
  - c. Added TH and CO2 sensors to the tenant office.
- 37. All series M-7## sheets starting with M-703:**
  - a. **Typical for all Control Sequence Sheets:**
    - i. Addition to General Controls Notes
    - ii. Removal of feedback control point on valves, dampers, ECM controllers, and VFDs.
    - iii. Updated points list to reflect changes in control point additions/ subtractions
    - iv. Removed filter status control point in favor of local gauges.
- 38. Sheet M-703 "MECHANICAL CONTROLS – AHU-00-01":**
  - a. Clarified quantity of fans when multiple fans are present.
  - b. Changed Dewpoint sensors to RH sensors.
  - c. Moved condensate overflow device to exterior of unit.
  - d. Updated AFMS type to Piezio AFMS on the fan bells where possible.
  - e. Removed supply-mounted smoke detectors.
  - f. Relocated return air smoke detector to return air stream from mixed air stream.

- g. Clarified ducted connection to RAFA
- h. Removed reference to zone controls for VAVs

**39. Sheet M-704 "MECHANICAL CONTROLS – AHU-00-02":**

- a. Clarified quantity of fans when multiple fans are present.
- b. Changed Dewpoint sensors to RH sensors.
- c. Moved condensate overflow device to exterior of unit.
- d. Updated AFMS type to Piezio AFMS on the fan bells where possible.
- e. Removed supply-mounted smoke detectors.
- f. Relocated return air smoke detector to return air stream from mixed air stream.
- g. Clarified ducted connection to RAFA
- h. Removed reference to zone controls for VAVs

**40. Sheet M-705 "MECHANICAL CONTROLS – AHU-00-03":**

- a. Clarified quantity of fans when multiple fans are present.
- b. Changed Dewpoint sensors to RH sensors.
- c. Moved condensate overflow device to exterior of unit.
- d. Added off-HC temperature sensor
- e. Updated AFMS type to Piezio AFMS on the fan bells where possible.
- f. Removed supply-mounted smoke detectors.
- g. Relocated return air smoke detector to return air stream from mixed air stream.
- h. Clarified that RAFA has an ECM Controller rather than a VFD.
- i. Clarified ducted connection to RAFA
- j. Removed reference to zone controls for VAVs

**41. Sheet M-706 "MECHANICAL CONTROLS – AHU-01-01":**

- a. Clarified quantity of fans when multiple fans are present.
- b. Changed Dewpoint sensors to RH sensors.
- c. Moved condensate overflow device to exterior of unit.
- d. Updated AFMS type to Piezio AFMS on the fan bells where possible.
- e. Removed supply-mounted smoke detectors.
- f. Relocated return air smoke detector to return air stream from mixed air stream.
- g. Clarified that RAFA has an ECM Controller rather than a VFD.

**42. Sheet M-707 "MECHANICAL CONTROLS – AHU-02-01":**

- a. Clarified quantity of fans when multiple fans are present.
- b. Changed Dewpoint sensors to RH sensors.
- c. Moved condensate overflow device to exterior of unit.
- d. Added off-HC temperature sensor
- e. Updated AFMS type to Piezio AFMS on the fan bells where possible.
- f. Removed supply-mounted smoke detectors.
- g. Relocated return air smoke detector to return air stream from mixed air stream.
- h. Clarified that RAFA has an ECM Controller rather than a VFD.

**43. Sheet M-708 "MECHANICAL CONTROLS – AHU-02-02":**

- a. Clarified quantity of fans when multiple fans are present.
- b. Changed Dewpoint sensors to RH sensors.
- c. Moved condensate overflow device to exterior of unit.
- d. Added off-HC temperature sensor

- e. Updated AFMS type to Piezio AFMS on the fan bells where possible.
- f. Removed supply-mounted smoke detectors.
- g. Relocated return air smoke detector to return air stream from mixed air stream.
- h. Clarified that RAFA has an ECM Controller rather than a VFD.

**44. Sheet M-709 "MECHANICAL CONTROLS – AHU-02-03":**

- a. Clarified quantity of fans when multiple fans are present.
- b. Changed Dewpoint sensors to RH sensors.
- c. Moved condensate overflow device to exterior of unit.
- d. Added off-HC temperature sensor
- e. Updated AFMS type to Piezio AFMS on the fan bells where possible.
- f. Removed supply-mounted smoke detectors.
- g. Removed references to zone control for CB zones

**45. Sheet M-710 "MECHANICAL CONTROLS – CHW PUMPS":**

- a. Removed CHW isolation and bypass valves.
- b. Updated sequence to reflect removal of pump isolation valve.
- c. Removed data points associated with BTU meter, clarified direction on feed to ION Meter.
- d. Added CHW S/R temperature sensors not associated with BTU meter.

**46. Sheet M-711 "MECHANICAL CONTROLS – HHW AND STEAM PLANT":**

- a. Removed control points of BTU meter and clarified notes to ION meter.
- b. Replaced 3 way valves with 2 way valves on HEXs.

**47. Sheet M-712 "MECHANICAL CONTROLS – TERMINAL UNITS":**

- a. EAVAV
  - i. Clarified intent of interlocked operation on EAVAV.
  - ii. Corrected out-of-date tagging nomenclature on EAVAV SOO title.
- b. Constant Volume VAV
  - i. Removed occupancy override input.
  - ii. Added humidity input.
  - iii. Changed heating LAT from a comparative range to a high-limit.
- c. Variable volume VAV
  - i. Clarified intent of dry contact use from lighting occupancy sensors
  - ii. Removed the requirement for manual reset on alarm conditions.
  - iii. Changed heating LAT from a comparative range to a high-limit.
  - iv. Added language for coordinating cleaning schedules for after-hours occupancy triggers.
  - v. Removed occupancy override and setpoint adjustment.
  - vi. Added Humidity input.
- d. OAVAV
  - i. Clarified intent of dry contact use from lighting occupancy sensors.
  - ii. Removed the requirement for manual reset on alarm conditions.
  - iii. Changed heating LAT from a comparative range to a high-limit.
  - iv. Added language for coordinating cleaning schedules for after-hours occupancy triggers.
  - v. Removed occupancy override and setpoint adjustment
  - vi. Added Humidity input.

**48. Sheet M-713 "MECHANICAL CONTROLS – FANS":**

- a. Removed control points to condensate pumps. Condensate pumps hardwired to unit operation. Change was made for HWC and FCU.
- b. Removed zone setpoint adjustment and occupancy override on FCU.
- c. Removed dedicated isolation valves on the supply piping serving HWC.
- d. Updated HVLS controls and language to reflect manufacturer's non-networked controller.
- e. Updated Kitchen component control diagrams and verbiage based on early feedback from owner. Further clarification and updated to be provided in Addendum 2.

**49. Sheet M-714 "MECHANICAL CONTROLS – CHILLED BEAM SYSTEM":**

- a. Removed Occupancy override control point
- b. Removed BTU meter and associated control points for billing.
- c. Annotative correction on piping break point.

SIGNATURE Christopher Hawk





# Addendum #1

Owner Information	IU Indianapolis
DATE	January 27, 2025
PROJECT NAME	IN128 James T. Morris Arena
PROJECT #	12176
DISTRIBUTION	Ratio
ADDENDUM CONSIST OF	( 21 ) 30x42 FULL-SIZE SHEETS

The following additions, revisions, and modifications are part of the contract documents, which shall be amended accordingly. Acknowledge receipt of addenda on the bid form. Failure to acknowledge receipt of this addendum may result in the rejection of your offer.


## SPECIFICATIONS

1. **Specification Section 26 00 10 Supplemental Requirements for Electrical**
  - a. Added LEED language

## DRAWINGS

1. **Sheet E-009 ELECTRICAL CONNECTION SCHEDULES**
  - a. Updated plumbing equipment connection schedule. Added six connections to plumbing equipment.
2. **Sheet E-101A PARTIAL SITE PLAN -ELECTRICAL AREA A**
  - a. Updated site lighting locations
  - b. Added connection to Lift Station 1
3. **Sheet E-101B PARTIAL SITE PLAN -ELECTRICAL AREA B**
  - a. Updated site lighting locations
  - b. Added connection to Lift Station 2
4. **Sheet E-101C PARTIAL SITE PLAN -ELECTRICAL AREA C**
  - a. Updated site lighting locations
5. **Sheet E-101D PARTIAL SITE PLAN -ELECTRICAL AREA D**
  - a. Updated site lighting locations
6. **Sheet EP-101A EVENT FLOOR PLAN- AREA A -POWER**

- a. Added connections to retractable seating
- 7. Sheet EP-101B EVENT FLOOR PLAN- AREA B -POWER**
  - a. Added connections to retractable seating
- 8. Sheet EP-101C EVENT FLOOR PLAN- AREA C -POWER**
  - a. Added connections to retractable seating
- 9. Sheet EP-101D EVENT FLOOR PLAN- AREA D -POWER**
  - a. Added connections to retractable seating
  - b. Coordinated door hold open devices
  - c. Added connections to plumbing equipment.
- 10. Sheet EP-103A UPPER FLOOR PLAN- AREA A - POWER**
  - a. Added connections to heat trace
- 11. Sheet EP-103B UPPER FLOOR PLAN- AREA B - POWER**
  - a. Added connections to heat trace
  - b. Adjusted connection for HVLS
- 12. Sheet EP-103C UPPER FLOOR PLAN- AREA C - POWER**
  - a. Updated office receptacle layout
  - b. Adjusted connection for HVLS
- 13. Sheet EP-103D UPPER FLOOR PLAN- AREA D - POWER**
  - a. Added connections to heat trace
  - b. Adjusted connection for HVLS
  - c. Updated office receptacle layout
- 14. Sheet EP-402 ENLARGED PLANS -POWER**
  - a. Added connections to plumbing equipment
  - b. Added receptacles
- 15. Sheet EP-403 ENLARGED PLANS -POWER**
  - a. Added connections to coiling doors over concession
  - b. Added receptacles
- 16. Sheet EP-600 PANEL SCHEDULES**
  - a. Updated panel schedules
- 17. Sheet EP-601 PANEL SCHEDULES**
  - a. Updated panel schedules
- 18. Sheet EP-607 PANEL SCHEDULES**
  - a. Updated panel schedules
- 19. Sheet EL-103A UPPER FLOOR PLAN- AREA A – LIGHTING LAYOUT**
  - a. Updated mechanical room lighting
- 20. Sheet EL-103B UPPER FLOOR PLAN- AREA B – LIGHTING LAYOUT**
  - a. Adjusted practice gym lighting
- 21. Sheet EL-103C UPPER FLOOR PLAN- AREA c – LIGHTING LAYOUT**
  - a. Adjusted practice gym lighting

SIGNATURE Christopher Hawk 

## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for overhead doors and grilles.
2. Steel framing and supports for countertops.
3. Steel tube reinforcement for low partitions.
4. Steel framing and supports for mechanical and electrical equipment.
5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
6. Elevator machine beams, hoist beams,.
7. Steel shapes for supporting elevator door sills.
8. Slotted channel framing.
9. Shelf angles.
10. Metal ladders.
11. Mobile stair and landing.
12. Ladder safety cages.
13. Elevator pit sump covers.
14. Metal bollards.
15. Decorative bollards for power actuators.
16. Abrasive metal nosings.
17. Loose bearing and leveling plates for applications where they are not specified in other Sections.

- B. Related Requirements:

1. Section 018113 "Sustainable Design Requirements – LEEDv4HC" for sustainable design requirements applicable to this project.

- C. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  1. Nonslip aggregates and nonslip-aggregate surface finishes.
  2. Fasteners.
  3. Shrinkage-resisting grout.
  4. Slotted channel framing.
  5. Manufactured metal ladders.
  6. Metal bollards.
  7. Abrasive metal nosings.
- B. Sustainable Design Submittals: Refer to Division 01 Sections for sustainable design requirements for LEED documentation required under this section.
- C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  1. Steel framing and supports for overhead doors.
  2. Steel framing and supports for countertops.
  3. Steel tube reinforcement for low partitions.
  4. Steel framing and supports for mechanical and electrical equipment.
  5. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  6. Elevator machine beams, hoist beams, and divider beams.
  7. Steel shapes for supporting elevator door sills.
  8. Shelf angles.
  9. Metal ladders.
  10. Elevator pit sump covers.
  11. Metal bollards.
  12. Loose steel lintels.

- D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.
- B. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research Reports: For post-installed anchors.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Structural Performance of Aluminum Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

- C. Structural Performance of Alternating Tread Devices: Alternating tread devices shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft..
  2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
  3. Uniform and concentrated loads need not be assumed to act concurrently.
  4. Comply with applicable railing loadings in Section 055213 "Pipe and Tube Railings."
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
1. Size of Channels: As indicated.
  2. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B; 0.0966-inch minimum thickness; unfinished.
- F. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

## 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening stainless steel.
  2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- D. Post-Installed Anchors: .
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
- E. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

## **2.4 MISCELLANEOUS MATERIALS**

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.



**2.5 FABRICATION, GENERAL**

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

**2.6 MISCELLANEOUS FRAMING AND SUPPORTS**

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Galvanize miscellaneous framing and supports where indicated.
- E. Prime miscellaneous framing and supports with primer specified in Section 099600 "High-Performance Coatings" where indicated.

**2.7 COUNTERTOP SUPPORTS**

- A. Where indicated on drawings, provide countertop supports sized to support countertop depths shown.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Exposed Units Basis of Design: Rakks EH Countertop Support Bracket; Rangine Corporation.
    - a. Substitutions: Substitutions will be considered. Reference Section 016000 "Product Requirements" for requirements and procedures.
  - 2. Concealed Units Basis of Design: Rakks Concealed EH Countertop Support Bracket; Rangine Corporation
    - a. Substitutions: Substitutions will be considered. Reference Section 016000 "Product Requirements" for requirements and procedures.
  - 3. Finish: Factory applied in color selected by Architect from Manufacturer's full range of color options.

**2.8 SHELF ANGLES**

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

**2.9 METAL STAIR AND LANDING**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ...
- B. Source Limitations: Obtain aluminum ladders from single source from single manufacturer.

**2.10 METAL LADDERS**

- A. General:
  - 1. Comply with ANSI A14.3, except for elevator pit ladders.
  - 2. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders for Interior Installations:
  - 1. Space siderails apart unless otherwise indicated.
  - 2. Siderails: Continuous, steel flat bars, with eased edges.
  - 3. Rungs: , steel bars.
  - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
  - 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallicity bonded to rung.
7. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize and prime ladders, including brackets.
11. Prime exterior ladders, including brackets and fasteners, with primer specified in Section 099600 "High-Performance Coatings."

C. Aluminum Ladders for Exterior Installations:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. O'Keeffe's Inc.
  - b. Precision Ladders, LLC.
  - c. Thompson Fabricating, LLC.
2. Source Limitations: Obtain aluminum ladders from single source from single manufacturer.
3. Space siderails 18 inches apart unless otherwise indicated.
4. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
5. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
6. Fit rungs in centerline of siderails; fasten by welding or with stainless steel fasteners or brackets and aluminum rivets.
7. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 3/4 inch in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
9. Provide minimum 72-inch-high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.11 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.

3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless steel fasteners unless otherwise indicated.

**B. Steel Ladder Safety Cages:**

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
4. Prime ladder safety cages, including brackets and fasteners, with zinc-rich primer.

**2.12 ELEVATOR PIT SUMP COVERS**

- A. Fabricate from 3/16-inch rolled-steel floor plate with four 1-inch- diameter holes for water drainage and for lifting.
- B. Provide steel angle supports unless otherwise indicated.

**2.13 MISCELLANEOUS STEEL TRIM**

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

**2.14 METAL BOLLARDS**

- A. Fabricate metal bollards from Schedule 40 steel pipe.
  1. Cap bollards with 1/4-inch- thick, steel plate with domed top.
  2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
  3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

- B. Fabricate bollards with 3/8-inch- thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
  - 1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.
- C. Prime steel bollards with primer specified in Section 099600 "High-Performance Coatings."

## 2.15 ABRASIVE METAL NOSINGS, TREADS, AND THRESHOLDS

- A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Safety Tread Co., Inc.
    - b. Amstep Products.
    - c. Balco, Inc.
    - d. Nystrom, Inc.
    - e. Wooster Products Inc.
  - 2. Source Limitations: Obtain units from single source from single manufacturer.
  - 3. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
  - 4. Provide solid-abrasive-type units without ribs.
  - 5. Nosings:
    - a. **Basis of Design: Balco, T-213 Single Component Stair Nosing, 2 inch width.**
      - a. ~~Square back units, 3 inches wide, for casting into concrete steps.~~
      - b. Beveled-back units, 3 inches wide with 1-3/8-inch lip, for surface mounting on existing stairs.
      - c. ~~Two piece units, 3 inches wide, with subchannel for casting into concrete steps.~~
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.
  - 1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.

- D. Apply bituminous paint to concealed surfaces of cast-metal units.
- E. Apply clear lacquer to concealed surfaces of extruded units.

## 1.2 DECORATIVE METAL BOLLARDS

- A. Basis of Design: Disability Systems, 628 Bollard, 5 inch square dual switch.
  - 1. Material: 1/8 inch wall thickness, tubular steel.
  - 2. Color: Dark bronze.
  - 3. Cap: Marine Board (flat) cap.
  - 4. Locations: As indicated on Drawings or as directed by Architect where needed for accessible entrance operators.

## 1.3 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize bearing and leveling plates.
- C. Prime plates with primer specified in Section 099600 "High-Performance Coatings."

## 1.4 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

## 1.5 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

## 1.6 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 1.7 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer unless primers specified in Section 099600 "High-Performance Coatings" are indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 2 - EXECUTION

### 2.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.



- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.

## **2.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS**

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for operable partitions overhead doors overhead grilles securely to, and rigidly brace from, building structure.
- C. Anchor shelf angles securely to existing construction with .
- D. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
  - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

- E. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.
  - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

## 2.3 INSTALLATION OF COUNTERTOP SUPPORTS

- A. Install support brackets in accordance with reviewed shop drawings and manufacturer's installation instructions.
- B. Install brackets at locations and heights indicated on Drawings. Verify locations in field with Architect.
- C. Install brackets rigidly to metal studs so that they are secure, plumb, and aligned.
- D. Install with fasteners of type, size, and quantity as supplied or recommended by bracket manufacturer for type of application and substrate.

## 2.4 INSTALLATION OF METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards in concrete in formed or core-drilled holes not less than 42 inches deep and 3/4 inch larger than OD of bollard. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.

## 2.5 INSTALLATION OF BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

## 2.6 REPAIRS

### A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "High Performance Coatings."

### B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

**END OF SECTION 055000**

## SECTION 078123 - INTUMESCENT FIRE 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, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Mastic and intumescent fire-resistive coatings, **exterior and interior**.
- B. Related Requirements:
  - 1. Section 018113 "Sustainable Design Requirements – LEEDv4HC" for sustainable design requirements applicable to this project.
  - 2. Section 078100 "Applied Fire Protection" for sprayed fire-resistive materials (SFRM).

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Mastic and intumescent fire-resistive coatings.
  - 2. Substrate primers.
  - 3. Reinforcing fabric.
  - 4. Reinforcing mesh.
  - 5. Topcoat.
- B. Sustainable Design Submittals: Refer to Division 01 Sections for sustainable design requirements for LEED documentation required under this section.
- C. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fire protection for each construction and fire-resistance rating.
  2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
  3. Minimum mastic and intumescent fire-resistive coating thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
  4. Treatment of mastic and intumescent fire-resistive coating after application.
- D. Samples: For each exposed product and for each color and texture specified, 4 inches square in size.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of mastic and intumescent fire-resistive coating.
- C. Evaluation Reports: For mastic and intumescent fire-resistive coating, from ICC-ES.
- D. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by mastic and intumescent fire-resistive coating manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups to set quality standards for materials and execution.
  1. Build mockup of each type of fire protection and different substrate as shown on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. 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. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fire protection, providing complete air exchanges according to manufacturer's written instructions. Use

natural means or, if they are inadequate, forced-air circulation until fire protection dries thoroughly.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fire protection for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: For field applications, verify coatings comply with VOC content limits of authorities having jurisdiction and the SCAQMD Rule 1113 content limits:
  - 1. Fire Coatings:-Proofing Coatings: 150 g/L.
- E. Asbestos: Provide products containing no detectable asbestos.

### 2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation, and complying with indicated fire-resistance design.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Albi Manufacturing; a division of StanChem, Inc.
    - b. Carboline Company; a subsidiary of RPM International.
    - c. Contego International Inc.
    - d. FlameOff Coatings, Inc.
    - e. Hilti, Inc.
    - f. Isolatek International.
  - 2. Application:
    - a. Designated for "interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
    - b. **Designated for "exterior" use by a qualified testing agency acceptable to authorities having jurisdiction.**

3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - a. Flame-Spread Index: 25 or less.
  - b. Smoke-Developed Index: 450 or less.
5. Hardness: Not less than 65, Type D durometer, according to ASTM D2240.
6. Finish: As selected by Architect from manufacturer's standard finishes.
  - a. Color and Gloss: As indicated by manufacturer's designations.

### 2.3 AUXILIARY MATERIALS

- A. Provide auxiliary materials that are compatible with mastic and intumescent fire-resistive coating and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by mastic and intumescent fire-resistive coating manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by mastic and intumescent fire-resistive coating manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by mastic and intumescent fire-resistive coating manufacturer. Include pins and attachment.
- E. Topcoat: Suitable for application over mastic and intumescent fire-resistive coating; of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer for each fire-resistance design.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
  1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and

- encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
  3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.
- B. Conduct tests according to mastic and intumescent fire-resistive coating manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- 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 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.
- B. Clean substrates of substances that could impair bond of fire protection.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by mastic and intumescent fire-resistive coating manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire protection. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

### 3.3 APPLICATION

- A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fire protection Work.
- B. Comply with mastic and intumescent fire-resistive coating manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.



1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
  2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and mastic and intumescent fire-resistive coating manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer.
- E. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by mastic and intumescent fire-resistive coating manufacturer.
- F. Extend fire protection in full thickness over entire area of each substrate to be protected.
- G. Install body of fire protection in a single course unless otherwise recommended in writing by mastic and intumescent fire-resistive coating manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.
- I. Cure fire protection according to mastic and intumescent fire-resistive coating manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fire protection to produce the following finishes:
1. Non-Exposed Areas - Spray-Textured Finish: Finish left as spray applied with no further treatment.
  2. Exposed Areas: Over spray application with sanded finish coat to smooth surface while maintaining required thickness for required fire protection.

### **3.4 FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Test and inspect as required by the IBC, Subsection 1705.14, "Mastic and Intumescent Fire-Resistant Coatings."
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for

previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

- C. Fire protection will be considered defective if it does not pass tests and inspections.
  - 1. Remove and replace fire protection that does not pass tests and inspections, and retest.
  - 2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

## 3.5 CLEANING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

## 3.6 PROTECTION

- A. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

## 3.7 REPAIRS

- A. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.
- B. Repair fire protection damaged by other work before concealing it with other construction.
- C. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

**END OF SECTION 078123**

## SECTION 085653 - SECURITY WINDOWS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Fixed, transaction security windows.
  - a. Interior use.
  - b. Exterior use.

#### 1.2 COORDINATION

- A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction.

#### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachment details.
2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
3. Location of weep holes.
4. Glazing details.
5. Details of deal tray and speaking aperture.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Framing: 12-inch-long sections of frame members.

D. Delegated Design Submittal: For security windows indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each type of security window and accessory indicated as forced-entry resistant, for tests performed by a qualified testing agency.
- D. Configuration Disclosure Drawing: For each type of forced-entry-resistant security window, complying with ASTM F1233.
- E. Examination reports documenting inspections of substrates, areas, and conditions.
- F. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- G. Field quality-control reports documenting inspections of installed products.
  - 1. Field quality-control certification signed by Contractor.
- H. Sample Warranty: For special warranty.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.
- B. Label security window packaging with drawing designation.
- C. Store crated security windows on raised blocks to prevent moisture damage.

## 1.7 FIELD CONDITIONS

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

## 1.8 SEQUENCING

- A. Field Painting: Except where security windows have been preglazed before installation, complete field painting of security windows before glazing installation.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including deflections exceeding 1/4 inch.
    - b. Failure of welds.
    - c. Excessive air leakage.
    - d. Faulty operation of sliding window hardware.
    - e. Faulty operation of transaction drawers.
    - f. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Three years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 INATERIOR FIXED, TRANSACTION SECURITY WINDOWS

- A. Provide fixed, transaction security windows with operable sash or ventilator capable of allowing transfer of currency and documents.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C.R. Laurence Co., Inc.; CRH Americas, Inc.
    - b. Krieger Specialty Products Company.
    - c. Overly Door Company.
    - d. Quikserv, Inc.
    - e. Ready Access.
  - 2. Basis of Design: Quikserv, T1-24365 with natural speak-thru for interior use.
- B. Configuration: As indicated on Drawings.
- C. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:
  - 1. Profile: Narrow.

2. Depth: 12 inches.
  3. Size: 36 by 36 inches, unless noted otherwise on Drawings.
- D. Head and Jamb Framing: Designed for sealant glazing.
- E. Channel-Frame Sill: Formed from stainless steel and designed for sealant glazing.
- F. Glazing and Glazing Materials: Bullet Resistant: Level 3.
- G. Glazing Meeting Edges: Polished glazing.
- H. Voice-Communication-Type: Natural speak through, formed from stainless steel and designed to allow passage of speech at normal speaking volume without distortion.
1. Sill Depth: 12 inches (305 mm) deep.
  2. Transaction Counter: Stainless steel, 12 inches (305 mm) deep by width of security window, with integral deal tray centered in opening.
  3. Integral Transaction-Drawer Sill: Formed from stainless steel; with transaction drawer integrated into framing and contained in a stainless steel housing that forms a transaction counter on both sides of opening. Drawer front is flush with housing when drawer is closed.
- I. Materials:
1. Aluminum Extrusions: ASTM B221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength.
  2. Aluminum Sheet and Plate: ASTM B209.

## 2.2 EXTERIOR FIXED, TRANSACTION SECURITY WINDOWS

- A. Provide fixed, transaction security windows with operable sash or ventilator capable of allowing transfer of currency and documents.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C.R. Laurence Co., Inc.; CRH Americas, Inc.
    - b. Krieger Specialty Products Company.
    - c. Overly Door Company.
    - d. Quikserv, Inc.
    - e. Ready Access.
  2. Basis of Design: Quikserv, T1-24365 with amplified speak-thru and slider window for exterior use.
- B. Configuration: As indicated on Drawings.
- C. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:

1. Profile: Narrow.
  2. Depth: 12 inches.
  3. Size: 36 by 36 inches, unless noted otherwise on Drawings.
  4. Provide thermally broken construction for aluminum framing.
- D. Head and Jamb Framing: Designed for sealant glazing.
- E. Channel-Frame Sill: Formed from stainless steel and designed for sealant glazing.
1. Transaction Counter: Stainless steel, 12 inches (305 mm) deep by width of security window, with integral deal tray centered in opening.
- F. Glazing and Glazing Materials: Insulated, Bullet Resistant: Level 3.
- G. Glazing Meeting Edges: Polished glazing.
- H. Voice-Communication-Type: Amplified speak through, formed from stainless steel and designed to allow passage of speech at normal speaking volume without distortion.
- I. Materials:
1. Aluminum Extrusions: ASTM B221. Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength.

## 2.3 FABRICATION

- A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.
1. Provide units that are reglazable from the secure side without dismantling the attack side of framing.
  2. Prepare security windows for field glazing unless preglazing at the factory is indicated.
- B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.
1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.
- C. Glazing Stops: Finish glazing stops to match security window framing.
1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
  2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.
- D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion

or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

- E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- F. Factory-cut openings in glazing for speaking apertures.
- G. Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated. Installation orientation of glazing to meet performance requirements. Comply with requirements in Section 088853 "Security Glazing."

## **2.4 GENERAL FINISH REQUIREMENTS**

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## **2.5 ALUMINUM FINISHES**

- A. Interior Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Exterior Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Color and Gloss: Custom color to match curtainwall finish.

## **2.6 ACCESSORIES**

- A. Recessed Deal Trays for Interior Windows: Formed from stainless steel; fabricated in curved shape with exposed flanges for recessed installation into horizontal surface.
  - 1. Clear Opening Size: 11-1/2 inches wide by 8 inches deep by 1-1/2 inches high.
- B. Ticket Slider Window for Exterior Windows: Stainless Steel with no recessed deal tray.
- C. Speaking Apertures: Fabricate from stainless steel, designed to allow passage of speech at normal speaking volume without distortion.
  - 1. Shape: Circular.



2. Listed and labeled as bullet resisting in accordance with UL 752.
- D. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- E. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- F. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.
  1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
  2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
  3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
  4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- G. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.
- H. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant remains permanently elastic, nonshrinking, and nonmigrating.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security windows.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.
- D. Inspect built-in and cast-in anchor installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.
  1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.

2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.
- E. For factory-installed glazing materials whose orientation (secure or attack side) is critical for performance, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security window anchors whose installation is specified in other Sections.
  1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
  2. Coordinate with countertop material indicated for installation.

### 3.3 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.
  1. Install an attached or integral flange to secure side of security windows extending over rough-in opening gap so that gap has same forced-entry-resistance performance as security window.
- B. Voice-Communication-Type Framing: Attach removable glass spacers to jambs and head of glazing, located not more than 6 inches from each corner and spaced not more than 12 inches o.c.
- C. Removable Glazing Stops and Trim: Fasten components with security fasteners.
- D. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials.
- E. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.
  1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
  2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.
- F. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact

concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

## 3.4 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

## 3.5 ADJUSTING

- A. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

## 3.6 CLEANING AND PROTECTION

- A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.
- B. Clean glass of preglazed security windows promptly after installation.
- C. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

**END OF SECTION 085653**

## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

##### B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

##### C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
  - a. "Metal Doors and Frames"
  - b. "Flush Wood Doors"
  - c. "Aluminum-Framed Entrances and Storefronts"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

#### 1.02 REFERENCES

##### A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

##### B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule

2. Recommended Locations for Builders Hardware
  3. Keying Systems and Nomenclature
  4. Installation Guide for Doors and Hardware
- C. NFPA – National Fire Protection Association
1. NFPA 70 – National Electric Code
  2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
  3. NFPA 101 – Life Safety Code
  4. NFPA 105 – Smoke and Draft Control Door Assemblies
  5. NFPA 252 – Fire Tests of Door Assemblies
- D. ANSI - American National Standards Institute
1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
  2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
  3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
  4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
  5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

## 1.03 SUBMITTALS

### A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
  - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
  - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

### B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
  - a. Wiring Diagrams: For power, signal, and control wiring and including:
    - 1) Details of interface of electrified door hardware and building safety and security systems.
    - 2) Schematic diagram of systems that interface with electrified door hardware.
    - 3) Point-to-point wiring.
    - 4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
  - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
  - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
  - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
  - c. Indicate complete designations of each item required for each opening, include:
    - 1) Door Index: door number, heading number, and Architect's hardware set number.
    - 2) Quantity, type, style, function, size, and finish of each hardware item.
    - 3) Name and manufacturer of each item.
    - 4) Fastenings and other pertinent information.
    - 5) Location of each hardware set cross-referenced to indications on Drawings.
    - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    - 7) Mounting locations for hardware.
    - 8) Door and frame sizes and materials.
    - 9) Degree of door swing and handing.
    - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
  - a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

**C. Informational Submittals:**

- 1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
- 2. Provide Product Data:
  - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
  - b. Include warranties for specified door hardware.

**D. Closeout Submittals:**

- 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
  - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
  - b. Catalog pages for each product.
  - c. Final approved hardware schedule edited to reflect conditions as installed.
  - d. Final keying schedule
  - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
  - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

**E. Inspection and Testing:**

- 1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
  - a. Fire door assemblies, in compliance with NFPA 80.
  - b. Required egress door assemblies, in compliance with NFPA 101.

**1.04 QUALITY ASSURANCE**

**A. Qualifications and Responsibilities:**

- 1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
- 2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
    - a. For door hardware: DHI certified AHC or DHC.
    - b. Can provide installation and technical data to Architect and other related subcontractors.
    - c. Can inspect and verify components are in working order upon completion of installation.
    - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
  4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- B. Certifications:
1. Fire-Rated Door Openings:
    - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
  2. Smoke and Draft Control Door Assemblies:
    - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
  3. Electrified Door Hardware
    - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
  4. Accessibility Requirements:
    - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
1. Keying Conference
    - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.



- 2) Preliminary key system schematic diagram.
  - 3) Requirements for key control system.
  - 4) Requirements for access control.
  - 5) Address for delivery of keys.
2. Pre-installation Conference
    - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Inspect and discuss preparatory work performed by other trades.
    - c. Inspect and discuss electrical roughing-in for electrified door hardware.
    - d. Review sequence of operation for each type of electrified door hardware.
    - e. Review required testing, inspecting, and certifying procedures.
    - f. Review questions or concerns related to proper installation and adjustment of door hardware.
  3. Electrified Hardware Coordination Conference:
    - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### **1.06 COORDINATION**

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

#### 1.07 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
  - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
  - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    - a. Mechanical Warranty
      - 1) Locks: 10 Years
      - 2) Exit Devices: 10 Years
      - 3) Closers: 30 Years
    - b. Electrical Warranty
      - 1) Locks: 3 Years
      - 2) Exit Devices: 3 Years
      - 3) Automatic Operators: 2 Years

#### 1.08 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

## **2.02 MATERIALS**

- A. Fabrication
  - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
  - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
  - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
  - 2. For closers and panic devices: Verify with Architect and/or Owner if thru-bolts are required at specific door materials.

## **2.03 HINGES**

- A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Ives 5BB series
2. Acceptable Manufacturers and Products:
  - a. Hager BB series
  - b. McKinney TB series
  - c. Stanley (Best/Dormakaba) FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. Hinge Height:
  - a. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide: 4-1/2 inches (114 mm) high
  - b. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide: 5 inches (127 mm) high
  - c. 2 inches or thicker doors: 5 inches (127 mm) high, regardless of door width
4. Hinge Width: 4-1/2 inches (114 mm) wide typical. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
5. Hinge quantity: Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
7. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

## 2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Select
  - b. Pemko

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.
8. Adjust hinge model/width as required for door thickness or construction.

## **2.05 INVISIBLE HINGE**

### **A. Manufacturers:**

1. Scheduled Manufacturer:
  - a. Soss
2. Acceptable Manufacturers:
  - a. No Substitute

### **B. Requirements**

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide steel-based hinges at fire rated openings.
3. Provide hinges completely mortised in door and jamb such that hinge is concealed when door is closed and allows 180 degrees opening.
4. Adjust hinge size and type for door dimensions, weight, and conditions.

## **2.06 ELECTRIC POWER TRANSFER**

### **A. Manufacturers:**

1. Scheduled Manufacturer and Product:
  - a. Von Duprin EPT-10
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### **B. Requirements:**

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.07 FLUSH BOLTS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood
  - b. Trimco

### B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.08 COORDINATORS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood
  - b. Trimco

### B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

## 2.09 MORTISE LOCKS AND DEADBOLTS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Best 45H series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
6. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
7. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
  - a. Lever Design: Best 79H.

## 2.10 TWO-POINT LOCK

A. Manufacturer and Product:

1. Scheduled Manufacturer and Product:
  - a. Schlage LM9200
2. Acceptable Manufacturers and Products:
  - a. No Substitute

B. Requirements:

1. Provide concealed two-point locking system for use in pair wood door applications manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2. Concealed Vertical Locking Devices: Vertical latch system in two-point for non-rated or fire rated wood doors up to a 45-minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20-minute rating.
3. Provide electrified lockset functions as scheduled in the hardware sets.

4. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses or escutcheon as scheduled and external lever spring cages. Provide escutcheon trim which does not require the use of a backer plate in wood door applications. Provide thru-bolted levers with 2-piece spindles.
  - a. Lever Design: Schlage M51B.

## **2.11 EXIT DEVICES**

### **A. Manufacturers and Products:**

1. Scheduled Manufacturer and Product:
  - a. Von Duprin 99/33A series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### **B. Requirements:**

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide grooved touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder where specified at non fire-rated openings.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled.
14. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
15. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.



**2.12 POWER SUPPLIES****A. Manufacturers and Products:**

1. Scheduled Manufacturer and Product:
  - a. Schlage/Von Duprin PS900 Series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

**B. Requirements:**

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
  - a. 12/24 VDC Output, field selectable.
  - b. Class 2 Rated power limited output.
  - c. Universal 120-240 VAC input.
  - d. Low voltage DC, regulated and filtered.
  - e. Polarized connector for distribution boards.
  - f. Fused primary input.
  - g. AC input and DC output monitoring circuit w/LED indicators.
  - h. Cover mounted AC Input indication.
  - i. Tested and certified to meet UL294.
  - j. NEMA 1 enclosure.
  - k. Hinged cover w/lock down screws.
  - l. High voltage protective cover.

**2.13 CYLINDERS****A. Manufacturers:**

1. Scheduled Manufacturer and Product:
  - a. Best
2. Acceptable Manufacturers and Products:
  - a. No Substitute

**B. Requirements:**

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
  - a. Match owner's existing system.
  - b. Cylinder/Core Type:
    - 1) Small Format Interchangeable Core (SFIC)
3. Replaceable Construction Cores.
  - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
    - 1) 3 construction control keys
    - 2) 12 construction change (day) keys.
4. Verify with Owner where permanent cores are to be shipped to.

#### 2.14 KEYING

- A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Requirements:
  1. Provide keying system capable of multiplex masterkeying.
  2. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    - a. Master Keying system as directed by the Owner.
    - b. Match Owner's existing system.
    - c. (Great)Grand Master Key System: Cylinders/cores operated by change(day) keys and subsequent masters (including grand/great grand) keys.
  3. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  4. Provide keys with the following features:
    - a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
  5. Identification:
    - a. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    - b. Identification stamping provisions must be approved by the Architect and Owner.
    - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE".
    - d. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
  6. Quantity: Furnish in the following quantities.
    - a. Change (Day) Keys: 3 per cylinder/core.
    - b. Permanent Control Keys: 3 (only applicable to interchangeable core).

- c. Master Keys: 6/ea (per master).
  - d. Unused balance of key blanks shall be provided to Owner with cut keys.
7. Verify with Owner where permanent keys are to be shipped to.

**2.15 KEY CONTROL SYSTEM****A. Manufacturers:**

- 1. Scheduled Manufacturer:
  - a. Telkee
- 2. Acceptable Manufacturers:
  - a. HPC
  - b. Lund

**B. Requirements:**

- 1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
  - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
  - b. Provide hinged-panel type cabinet for wall mounting.

**2.16 DOOR CLOSERS****A. Manufacturers and Products:**

- 1. Scheduled Manufacturer and Product:
  - a. LCN 4040XP series
- 2. Acceptable Manufacturers and Products:
  - a. No Substitute

**B. Requirements:**

- 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
- 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
- 3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
- 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.

5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## **2.17 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS**

### **A. Manufacturers and Products:**

1. Scheduled Manufacturer and Product:
  - a. LCN 4600 series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

### **B. Requirements:**

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide drop plates, brackets, and adapters for arms as required for details.
6. Provide actuator switches and receivers for operation as specified.
7. Provide weather-resistant actuators at exterior applications.
8. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.

9. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
10. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

**2.18 DOOR TRIM****A. Manufacturers:**

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood
  - c. Hager

**B. Requirements:**

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

**2.19 PROTECTION PLATES****A. Manufacturers:**

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood
  - c. Hager

**B. Requirements:**

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes kick and armor plates 1 1/2 inches (51 mm) less width of door on single doors, and 1 inch (25 mm) less width of door on pairs. Adjust width at doors with mullions, edge guards, gasketing or other conflicting hardware.
3. Size mop plates 1" less width of door. Adjust width as needed for edge guards or other conflicting hardware.

4. At fire rated doors, provide protection plates over 16 inches high with UL label.

## **2.20 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS**

### **A. Manufacturers:**

1. Scheduled Manufacturers:
  - a. Glynn-Johnson
2. Acceptable Manufacturers:
  - a. No Substitute

### **B. Requirements:**

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

## **2.21 DOOR STOPS AND HOLDERS**

### **A. Manufacturers:**

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Rockwood

### **B. Provide door stops at each door leaf:**

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

## **2.22 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING**

### **A. Manufacturers:**

1. Scheduled Manufacturer:
  - a. Zero International
2. Acceptable Manufacturers:
  - a. National Guard

- b. Reese
- c. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

## 2.23 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood
  - b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

## 2.24 ROLLER LATCHES

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Rockwood
  - b. Trimco

B. Requirements:

1. Provide roller latches with 4-7/8 inches (124 mm) strike at single doors to fit ANSI frame prep. If dummy levers are used in conjunction with roller latch mount roller latch at a height as to not interfere with proper mounting and height of dummy lever.
2. Provide roller latches with 2-1/4 inches (57 mm) full lip strike at pair doors. Mount roller in top rail of each leaf per manufacturer's template.

## 2.25 MAGNETIC HOLDERS

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. LCN
2. Acceptable Manufacturers:
  - a. No Substitute

### B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

## 2.26 DOOR POSITION SWITCHES

### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Schlage
2. Acceptable Manufacturers:
  - a. George Risk Industries, Inc.

### B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

## 2.27 FINISHES

- A. Provide finish for each item as indicated in the sets.

## PART 3 - EXECUTION



**3.01 EXAMINATION**

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
  - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
  - 1. Install construction cores to secure building and areas during construction period.

2. Replace construction cores with permanent cores as indicated in keying section.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
  1. Conduit, junction boxes and wire pulls.
  2. Connections to and from power supplies to electrified hardware.
  3. Connections to fire/smoke alarm system and smoke evacuation system.
  4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  5. Connections to panel interface modules, controllers, and gateways.
  6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

### **3.04 CLEANING AND PROTECTION**

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### **3.05 DOOR HARDWARE SCHEDULE**

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

121857 OPT0395851

V2 12/4/2024 vs. V4 1/16/2025

Hardware Group No. 01

For use on Door #(s):

100-14          112-1          117-3

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY (OR 027XY AS REQ'D FOR DR THK)	628	IVE
1	EA	DUMMY PUSH BAR	330	626	VON
1	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630- 316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	689	LCN

BOTH AUTO OPERATOR ACTUATORS ENABLED AT ALL TIMES. PUSHING EITHER  
ACTUATOR SIGNALS AUTO OPERATOR TO OPEN DOOR. FREE EGRESS AT ALL TIMES.

Hardware Group No. 02

For use on Door #(s):

100-10          100-11          100-12          100-13          100-8          100-9  
112-3          117-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY (OR 027XY AS REQ'D FOR DR THK)	628	IVE
1	EA	DUMMY PUSH BAR	330	626	VON
1	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630- 316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN

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Hardware Group No. 03

For use on Door #(s):

112-2          115-2          117-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY (OR 027XY AS REQ'D FOR DR THK)	628	IVE
2	EA	DUMMY PUSH BAR	330	626	VON
2	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630- 316	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN

Hardware Group No. 04

For use on Door #(s):

107-3          107-4          ~~107-5~~          ~~107-6~~          201-2          201-4

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<del>8</del> (6)	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
2	EA	DUMMY TRIM	45H-0-1DT-79H	626	BES
2	EA	ROLLER LATCH	RL30	626	IVE
2	EA	OH STOP	450S	652	GLY
2	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 05

For use on Door #(s):

005                      006                      014                      016                      022

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
<u>1</u>	<u>EA</u>	<u>DEADLOCK</u>	<u>48H-7-K</u>	<u>626</u>	<u>BES</u>
<del>4</del>	<del>EA</del>	<del>DEADLOCK,</del> <del>CLASSROOM</del>	<del>48H-7-R</del>	<del>626</del>	<del>BES</del>
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	MOP PLATE	8400 4"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 05A

For use on Door #(s):

103                      105

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>3</u>	<u>EA</u>	<u>HINGE</u>	<u>5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)</u>	<u>652</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>PUSH PLATE</u>	<u>8200 4" X 16"</u> <u>(EXIT ONLY)</u>	<u>630</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>SURFACE CLOSER</u>	<u>4040XP REG</u>	<u>689</u>	<u>LCN</u>
<u>1</u>	<u>EA</u>	<u>KICK PLATE</u>	<u>8400 10"H X WIDTH AS REQ'D B-CS</u>	<u>630</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>WALL STOP</u>	<u>WS406/407CVX</u>	<u>630</u>	<u>IVE</u>
<u>3</u>	<u>EA</u>	<u>SILENCER</u>	<u>SR64</u>	<u>GRY</u>	<u>IVE</u>

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Hardware Group No. 06A

For use on Door #(s):

045

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>3</u>	<u>EA</u>	<u>HINGE</u>	<u>5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)</u>	<u>652</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>PRIVACY LOCK (W/ OCC IND)</u>	<u>45H-0-LT-79H-VIN</u>	<u>626</u>	<u>BES</u>
<u>1</u>	<u>EA</u>	<u>SURFACE CLOSER (W/ DEAD STOP)</u>	<u>4040XP CUSH</u>	<u>689</u>	<u>LCN</u>
<u>1</u>	<u>EA</u>	<u>KICK PLATE</u>	<u>8400 10"H X WIDTH AS REQ'D B-CS</u>	<u>630</u>	<u>IVE</u>
<u>3</u>	<u>EA</u>	<u>SILENCER</u>	<u>SR64</u>	<u>GRY</u>	<u>IVE</u>

Hardware Group No. 07

For use on Door #(s):

014-2      014-3      014A      030C      205

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	PRIVACY LOCK (W/ OCC IND)	45H-0-LT-79H-VIN	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	MOP PLATE	8400 4"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 08

For use on Door #(s):

108A

108B

109E

~~109E~~

109F

~~109F-2~~

201W

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	OFFICE/ENTRANCE LOCK	45H-7-AT-79H	626	BES
1	EA	OH STOP	410S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 09

For use on Door #(s):

201R

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	OFFICE/ENTRANCE LOCK	45H-7-AT-79H	626	BES
1	EA	FLOOR STOP	FS439	630	IVE
3	EA	SILENCER	SR64	GRY	IVE



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Hardware Group No. 10

For use on Door #(s):

030D	036	<u>036A</u>	<u>037</u>	038	<u>039</u>
040	042				

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	OFFICE/ENTRANCE LOCK	45H-7-AT-79H	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 11

For use on Door #(s):

011	013	015	017	018	019
020	023	024	025	<b>036A</b>	<b>037</b>
038A	<b>039</b>	040A	042A	107A	107B
107C	107E	107F	107G	107H	109C
109D	201A	201B	201C	201D	201E
201F	201G	201H	201I	201J	201K
201L	201M	201N	201O	201P	201Q
201S	201T	201U	201V		

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	OFFICE/ENTRANCE LOCK	45H-7-AT-79H	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 12

For use on Door #(s):

114A 119A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	DORMITORY LOCK (W/ INDICATOR)	45H-7-T-79H-VIN	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	MOP PLATE	8400 4"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 13

For use on Door #(s):

051 052 053 [110](#)

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	DORMITORY LOCK (W/ INDICATOR)	45H-7-T-79H-VIN	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	MOP PLATE	8400 4"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 14

For use on Door #(s):  
032-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	COMMUNICATING LOCK	45H-7-G-79H	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 16

For use on Door #(s):  
043

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<del>3</del> (4)	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CLASSROOM LOCK	45H-7-R-79H	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 17

For use on Door #(s):  
109-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CLASSROOM LOCK	45H-7-R-79H	626	BES
1	EA	OH STOP	410S	652	GLY
1	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
1	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 20

For use on Door #(s):  
102A 104A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	OH STOP	410S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 21

For use on Door #(s):

016B 022-1 026B 104B ~~108AB~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 23

For use on Door #(s):

007 016A ~~016B~~ 022A 058-1 102B  
200A 204 ~~206~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 24

For use on Door #(s):

026A 115H 206

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 25

For use on Door #(s):

~~005~~ 208

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	OH STOP	410S	652	GLY
1	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
1	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902 120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 26

For use on Door #(s):  
030

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY (OR 027XY AS REQ'D FOR DR THK)	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	OH STOP	410S	652	GLY
1	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
1	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL</u> <u>INTEGRATOR</u> <del>(PS902-120/240</del> <del>VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 27

For use on Door #(s):

029 101 113 ~~115BB~~ 118

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	OH STOP	410S	652	GLY
1	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
1	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.



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Hardware Group No. 28

For use on Door #(s):

009	010	049	055-2	057	058
200	203				

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 29

For use on Door #(s):  
030A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<del>4</del>	<del>EA</del>	<del>CONT. HINGE</del>	<del>112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)</del>	<del>628</del>	<del>IVE</del>
<u>1</u>	<u>EA</u>	<u>CONT. HINGE</u>	<u>112XY (OR 027XY AS REQ'D FOR DR THK)</u>	<u>628</u>	<u>IVE</u>
<del>4</del>	<del>EA</del>	<del>POWER TRANSFER</del>	<del>EPT10</del>	<del>689</del>	<del>VON</del>
<del>4</del>	<del>EA</del>	<del>ELEC LOCK (W/ RX)</del>	<del>45HW-7DEU-79H-RQE</del>	<del>630</del>	<del>BES</del>
<u>1</u>	<u>EA</u>	<u>DEADBOLT</u>	<u>MS1850S</u>	<u>628</u>	<u>ADA</u>
<u>1</u>	<u>EA</u>	<u>MORTISE ADA THUMBTURN, AR CAM</u>	<u>09-907 NH 118 XB11-720 L583-446 B220-050</u>	<u>626</u>	<u>SCH</u>
<u>1</u>	<u>EA</u>	<u>MORTISE CYLINDER</u>	<u>MATCH OWNER'S EXISTING SYSTEM</u>	<u>626</u>	<u>BES</u>
<u>1</u>	<u>EA</u>	<u>PUSH/PULL BAR</u>	<u>9190EZHD-10"-NO</u>	<u>630-316</u>	<u>IVE</u>
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
<del>4</del>	<del>EA</del>	<del>CREDENTIAL READER</del>	<del>MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)</del>	<del>BLK</del>	<del>SCE</del>
<del>4</del>	<del>EA</del>	<del>DOOR CONTACT</del>	<del>679 SERIES</del>	<del>BLK</del>	<del>SCE</del>
<del>4</del>	<del>EA</del>	<del>POWER SUPPLY</del>	<del>PS902-120/240-VAC</del>	<del>LGR</del>	<del>SCE</del>

~~(DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.)~~

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Hardware Group No. 30

For use on Door #(s):

107-2      108-1      108-4      109-3      ~~115C~~      115F

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 31

For use on Door #(s):

032A

047

054

064

065

~~104~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 32

For use on Door #(s):

028                      034                      ~~102~~                      102-1                      104-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 33

For use on Door #(s):  
056

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	SET	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL</u> <u>INTEGRATOR</u> -(PS902-120/240 VAC)	-(LGR)	<u>B/O</u> <u>(SCE)</u>
1	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> -(679-SERIES)	-(BLK)	<u>B/O</u> <u>(SCE)</u>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 34

For use on Door #(s):

105A                  107D                  207

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 35

For use on Door #(s):  
026

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	OH STOP	410S	652	GLY
1	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
1	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 36

For use on Door #(s):

~~030B~~      ~~063A~~      068A      208A      209A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE



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Hardware Group No. 36A

For use on Door #(s):

030B

063A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>3</u>	<u>EA</u>	<u>HINGE</u>	<u>5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)</u>	<u>652</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>STOREROOM LOCK</u>	<u>45H-7-D-79H</u>	<u>626</u>	<u>BES</u>
<u>1</u>	<u>EA</u>	<u>SURFACE CLOSER (W/ DEAD STOP)</u>	<u>4040XP CUSH</u>	<u>689</u>	<u>LCN</u>
<u>1</u>	<u>EA</u>	<u>KICK PLATE</u>	<u>8400 10"H X WIDTH AS REQ'D B-CS</u>	<u>630</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>GASKETING</u>	<u>488SBK PSA</u>	<u>BK</u>	<u>ZER</u>

Hardware Group No. 37

For use on Door #(s):

102-2

~~102C~~

115A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 38

For use on Door #(s):

004

041

114B

119B

202

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 39

For use on Door #(s):

~~004~~

012

~~041~~

109A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 40

For use on Door #(s):

002A 048-6 060-3

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	630	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

Hardware Group No. 41

For use on Door #(s):

210A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

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Hardware Group No. 42

For use on Door #(s):  
060-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 43

For use on Door #(s):  
055A

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CONST LATCHING BOLT	FB51T/FB61T (AS REQ'D)	630	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
2	EA	OH STOP	90S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 44

For use on Door #(s):

~~115B~~

115C

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CONST LATCHING BOLT	FB51T/FB61T (AS REQ'D)	630	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
2	EA	OH STOP	90S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

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Hardware Group No. 45

For use on Door #(s):

032-3                      063                      068

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	630	IVE
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 46

For use on Door #(s):

~~115D~~

115G

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	630	IVE
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 47

For use on Door #(s):  
002E

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	630	IVE
1	EA	ELEC LOCK (W/ RX)	45HW-7DEU-79H-RQE	626	BES
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER (W/ DEAD STOP & HO)	4040XP HCUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.



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Hardware Group No. 48

For use on Door #(s):  
055-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	630	IVE
1	EA	STOREROOM LOCK	45H-7-D-79H	626	BES
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. [49](#)

For use on Door #(s):  
[115B](#)      [115D](#)

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<a href="#">8</a>	<a href="#">EA</a>	<a href="#">HINGE</a>	<a href="#">5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)</a>	<a href="#">652</a>	<a href="#">IVE</a>
<a href="#">1</a>	<a href="#">EA</a>	<a href="#">AUTO FLUSH BOLT</a>	<a href="#">FB31T/FB41T (AS REQ'D)</a>	<a href="#">630</a>	<a href="#">IVE</a>
<a href="#">1</a>	<a href="#">EA</a>	<a href="#">STOREROOM LOCK</a>	<a href="#">45H-7-D-79H</a>	<a href="#">626</a>	<a href="#">BES</a>
<a href="#">1</a>	<a href="#">EA</a>	<a href="#">COORDINATOR</a>	<a href="#">COR X FL (MB AS REQ'D)</a>	<a href="#">628</a>	<a href="#">IVE</a>
<a href="#">2</a>	<a href="#">EA</a>	<a href="#">SURFACE CLOSER (W/ DEAD STOP)</a>	<a href="#">4040XP CUSH</a>	<a href="#">689</a>	<a href="#">LCN</a>
<a href="#">2</a>	<a href="#">EA</a>	<a href="#">KICK PLATE</a>	<a href="#">8400 10"H X WIDTH AS REQ'D B-CS</a>	<a href="#">630</a>	<a href="#">IVE</a>
<a href="#">2</a>	<a href="#">EA</a>	<a href="#">SILENCER</a>	<a href="#">SR64</a>	<a href="#">GRY</a>	<a href="#">IVE</a>

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Hardware Group No. ~~49-Not Used~~

For use on Door #(s):

~~059~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<del>3</del>	<del>EA</del>	<del>HINGE</del>	<del>5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)</del>	<del>652</del>	<del>IVE</del>
<del>4</del>	<del>EA</del>	<del>POWER TRANSFER</del>	<del>EPT10</del>	<del>689</del>	<del>VON</del>
<del>4</del>	<del>EA</del>	<del>ELEC PANIC HARDWARE</del>	<del>LD-RX-99-L-M996-M51-FSE</del>	<del>626</del>	<del>VON</del>
<del>4</del>	<del>EA</del>	<del>RIM CYLINDER</del>	<del>MATCH OWNER'S EXISTING SYSTEM</del>	<del>626</del>	<del>BES</del>
<del>4</del>	<del>EA</del>	<del>SURFACE CLOSER (W/ DEAD STOP)</del>	<del>4040XP CUSH</del>	<del>689</del>	<del>LCN</del>
<del>4</del>	<del>EA</del>	<del>KICK PLATE</del>	<del>8400 10"H X WIDTH AS REQ'D B-CS</del>	<del>630</del>	<del>IVE</del>
<del>3</del>	<del>EA</del>	<del>SILENCER</del>	<del>SR64</del>	<del>GRY</del>	<del>IVE</del>
<del>4</del>	<del>EA</del>	<del>CREDENTIAL READER</del>	<del>MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)</del>	<del>BLK</del>	<del>SCE</del>
<del>4</del>	<del>EA</del>	<del>DOOR CONTACT</del>	<del>679 SERIES</del>	<del>BLK</del>	<del>SCE</del>
<del>4</del>	<del>EA</del>	<del>POWER SUPPLY</del>	<del>PS902 120/240 VAC</del>	<del>LGR</del>	<del>SCE</del>

~~DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.~~

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Hardware Group No. 50

For use on Door #(s):

100-7          111-1          116-3

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-99-NL-OP-110MD 24 VDC	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
1	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	689	LCN
1	EA	WEATHER RING	8310-801		LCN
1	EA	ACTUATOR	8310-853T (EXTERIOR, WALL MOUNT)	630	LCN
1	EA	DUAL ACTUATOR	8310-855 (VESTIBULE, WALL MOUNT)	630	LCN
2	EA	MOUNT BOX	8310-867S		LCN
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-900-4RL 120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR(S) NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH AND ENABLES EXTERIOR ACTUATOR. PUSHING ENABLED EXTERIOR ACTUATOR SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING INTERIOR ACTUATOR RETRACTS LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 51

For use on Door #(s):

100-1	100-2	100-3	100-4	100-5	100-6
111-3	116-1				

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-EO 24 VDC	626	VON
1	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-900-2RS 120/240 VAC)</del>		<u>B/O</u> <del>(VON)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

EXIT DEVICE LATCH CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 52

For use on Door #(s):

008 050 059

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-99-L-F-M996-M51-FSE	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL</u> <u>INTEGRATOR</u> <del>(PS902-120/240</del> <del>VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 53

For use on Door #(s):  
048-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-99-L-F-M996-M51-FSE	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO  
READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS  
LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 54

For use on Door #(s):

027 [201-1](#)

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	RX-99-L-F-M996-M51-FSE	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL</u> <u>INTEGRATOR</u> <del>(PS902-120/240</del> <del>VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
1	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> <del>(679-SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 57

For use on Door #(s):

048-3              048-4

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	INVISIBLE HINGE	218	626	SOS
1	EA	PANIC HARDWARE	LD-99-EO	626	VON
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	SET	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	DOOR BOTTOM (RECESSED)	381A	A	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>



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Hardware Group No. 58

For use on Door #(s):

~~003~~ 003-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<del>4</del>	<del>EA</del>	<del>CONT. HINGE</del>	<del>224XY</del>	<del>628</del>	<del>IVE</del>
<u>1</u>	<u>EA</u>	<u>CONT. HINGE</u>	<u>224XY EPT</u>	<u>628</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>POWER TRANSFER</u>	<u>EPT10</u>	<u>689</u>	<u>VON</u>
<del>4</del>	<del>EA</del>	<del>FIRE EXIT HARDWARE</del>	<del>99-EO-F</del>	<del>626</del>	<del>VON</del>
<u>1</u>	<u>EA</u>	<u>ELEC PANIC HARDWARE</u>	<u>RX-QEL-99-NL 24 VDC</u>	<u>626</u>	<u>VON</u>
<u>1</u>	<u>EA</u>	<u>RIM CYLINDER</u>	<u>MATCH OWNER'S EXISTING SYSTEM</u>	<u>626</u>	<u>BES</u>
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	WEATHERSTRIPPING	429AA-S	AA	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
<u>1</u>	<u>EA</u>	<u>CREDENTIAL READER</u>	<u>MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)</u>	<u>BLK</u>	<u>SCE</u>
<u>1</u>	<u>EA</u>	<u>POWER SUPPLY</u>	<u>BY ACCESS CONTROL INTEGRATOR</u>		<u>B/O</u>
1	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR(S) NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 59

For use on Door #(s):  
060-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-BE-F-M51	626	VON
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 60

For use on Door #(s):  
003-1      048      048-1      048-5      060

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE EXIT HARDWARE	99-L-BE-F-M51	626	VON
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

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Hardware Group No. 61

For use on Door #(s):  
201-3

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY (OR 027XY AS REQ'D FOR DR THK)	628	IVE
2	EA	OFFICE/ENTRY VERTICAL CABLE LOCK	LM9250L M51B LBL L583-363	626	SCH
2	EA	MORTISE CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
2	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN

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Hardware Group No. 62

For use on Door #(s):  
032-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC VERTICAL CABLE LOCK	LM9290EU M51B LBL 12/24 VDC	626	SCH
1	EA	ELEC VERTICAL CABLE LOCK	LM9292EUL M51B LBL 12/24 VDC	626	SCH
1	EA	MORTISE CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP REG ST-1630	689	LCN
2	EA	MOUNTING PLATE	4040XP-18TJ	689	LCN
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 63

For use on Door #(s):

066 067

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	<u>ELEC FIRE EXIT</u> <del>HARDWARE (ELEC</del> <del>PANIC HARDWARE)</del>	<u>RX-9927-EO-F-LBR-499F</u> <del>(LD-</del> <del>RX-9927-EO-LBR)</del>	626	VON
1	EA	<u>ELEC FIRE EXIT</u> <del>HARDWARE (ELEC</del> <del>PANIC HARDWARE)</del>	<u>RX-9927-L-F-LBR-M996-M51-</u> <u>499F-FSE</u> <del>(LD-RX-9927-L-LBR-</del> <del>M996-M51-FSE)</del>	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
<u>1</u>	<u>EA</u>	<u>GASKETING</u>	<u>488SBK PSA</u>	<u>BK</u>	<u>ZER</u>
<u>1</u>	<u>EA</u>	<u>GASKETING, MEETING</u> <u>STILE</u>	<u>5070</u>	<u>BK</u>	<u>NGP</u>
<del>2</del>	<del>EA</del>	<del>SILENCER</del>	<del>SR64</del>	<del>GRY</del>	<del>IVE</del>
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL</u> <u>INTEGRATOR</u> <del>(PS902-120/240</del> <del>VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 65

For use on Door #(s):

108-2

108-3

~~115V~~

~~115X~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-EO-LBL 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-NL-OP-110MD-LBL 24 VDC	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630-316	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-900-2RS 120/240 VAC)</del>		<u>B/O</u> <del>(VON)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR(S) NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 66

For use on Door #(s):

115-1      ~~115-2~~      115-3

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-L-DT-M51-LBL 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-L-NL-M51-LBL 24 VDC	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-900-2RS 120/240 VAC)</del>		<u>B/O</u> <del>(VON)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 67

For use on Door #(s):

~~002-1~~ 002-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-L-DT-M51-LBL 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-L-NL-M51-LBL 24 VDC	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	SURFACE CLOSER (W/ DEAD STOP & HO)	4040XP HCUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-900-2RS 120/240 VAC)</del>		<u>B/O</u> <del>(VON)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.



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DOOR HARDWARE  
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Hardware Group No. 68

For use on Door #(s):

002B

002D-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>2</u>	<u>EA</u>	<u>CONT. HINGE</u>	<u>224XY EPT</u>	<u>628</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>ELEC PANIC HARDWARE</u>	<u>RX-QEL-9949-L-DT-M51-LBL 24</u>	<u>626</u>	<u>VON</u>
			<u>VDC</u>		
<u>1</u>	<u>EA</u>	<u>ELEC PANIC HARDWARE</u>	<u>RX-QEL-9949-L-NL-M51-LBL 24</u>	<u>626</u>	<u>VON</u>
			<u>VDC</u>		
<u>1</u>	<u>EA</u>	<u>RIM CYLINDER</u>	<u>MATCH OWNER'S EXISTING</u>	<u>626</u>	<u>BES</u>
			<u>SYSTEM</u>		
<u>2</u>	<u>EA</u>	<u>SURFACE CLOSER</u>	<u>4040XP EDA</u>	<u>689</u>	<u>LCN</u>
<u>2</u>	<u>EA</u>	<u>KICK PLATE</u>	<u>8400 10"H X WIDTH AS REQ'D</u>	<u>630</u>	<u>IVE</u>
			<u>B-CS</u>		
<u>2</u>	<u>EA</u>	<u>ELEC WALL MAG</u>	<u>SEM SERIES (VERIFY</u>	<u>689</u>	<u>LCN</u>
		<u>HOLDER</u>	<u>MOUNTING AND PROJECTION</u>		
			<u>REQ'D)</u>		
<u>2</u>	<u>EA</u>	<u>SILENCER</u>	<u>SR64</u>	<u>GRY</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>CREDENTIAL READER</u>	<u>MT SERIES - BY ACCESS</u>	<u>BLK</u>	<u>SCE</u>
			<u>CONTROL INTEGRATOR</u>		
			<u>(COORDINATE W/ HEAD END</u>		
			<u>AND CREDENTIAL TYPE)</u>		
<u>1</u>	<u>EA</u>	<u>POWER SUPPLY</u>	<u>BY ACCESS CONTROL</u>		<u>B/O</u>
			<u>INTEGRATOR</u>		
<u>2</u>	<u>EA</u>	<u>DOOR CONTACT</u>	<u>BY ACCESS</u>		<u>B/O</u>
			<u>CONTROL/SECURITY</u>		
			<u>INTEGRATOR</u>		

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

DOORS CAPABLE OF BEING HELD OPEN BY ELEC WALL HOLDERS. DOORS RELEASE AS CONTROLLED BY ACCESS CONTROL SYSTEM. DOOR CAN ALSO BE RELEASED MANUALLY FROM WALL HOLDERS.

# RATIO Design

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Hardware Group No. ~~68-Not Used~~

For use on Door #(s):

~~002B 002D-1~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	<del>CONT. HINGE</del>	<del>224XY</del>	<del>628</del>	<del>IVE</del>
1	EA	<del>CONT. HINGE</del>	<del>224XY-EPT</del>	<del>628</del>	<del>IVE</del>
1	EA	<del>POWER TRANSFER</del>	<del>EPT10</del>	<del>689</del>	<del>VON</del>
1	EA	<del>DELAYED PANIC HARDWARE</del>	<del>CX9949-EO-LBL-24-VDC</del>	<del>626</del>	<del>VON</del>
1	EA	<del>PANIC HARDWARE</del>	<del>LD-9949-EO-LBL</del>	<del>626</del>	<del>VON</del>
1	EA	<del>MORTISE CYLINDER</del>	<del>MATCH OWNER'S EXISTING SYSTEM</del>	<del>626</del>	<del>BES</del>
2	EA	<del>SURFACE CLOSER</del>	<del>4040XP-EDA</del>	<del>689</del>	<del>LCN</del>
2	EA	<del>KICK PLATE</del>	<del>8400-10"H X WIDTH AS REQ'D B-CS</del>	<del>630</del>	<del>IVE</del>
2	EA	<del>ELEC WALL MAG HOLDER</del>	<del>SEM SERIES (VERIFY MOUNTING AND PROJECTION REQ'D)</del>	<del>689</del>	<del>LCN</del>
1	EA	<del>CREDENTIAL READER</del>	<del>MT SERIES--BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)</del>	<del>BLK</del>	<del>SCE</del>
1	EA	<del>DOOR CONTACT</del>	<del>679-SERIES</del>	<del>BLK</del>	<del>SCE</del>
1	EA	<del>POWER SUPPLY</del>	<del>PS902-120/240-VAC</del>	<del>LGR</del>	<del>SCE</del>

~~DOOR NORMALLY CLOSED AND LOCKED IN ONE DIRECTION. PRESENTING VALID  
CREDENTIAL TO READER WILL UNLOCK PANIC BAR ALLOWING ACCESS/IMMEDIATE  
EGRESS. WITHOUT VALID CREDENTIAL, PRESSING PUSH BAR WILL ACTIVATE  
DELAYED EGRESS SYSTEM AND ALLOW FREE EGRESS IN 15 SECONDS. DELAYED  
EGRESS EXIT DEVICE UNLOCKED WITH LOSS OF POWER OR WITH FIRE ALARM  
ACTIVATION. FREE EGRESS ALLOW IN OTHER DIRECTION AT ALL TIMES.~~

# RATIO Design

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Hardware Group No. 70

For use on Door #(s):

106

107-1

109-1

~~115U~~

~~115W~~

~~115Y~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	LX-RX-QEL-9949-NL-OP-110MD-LBL 24 VDC	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-EO-LBL 24 VDC	626	VON
1	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630-316	IVE
2	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	689	LCN
1	EA	MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
2	EA	ACTUATOR	8310-853T (WALL MOUNT)	630	LCN
2	EA	MOUNT BOX	8310-867S		LCN
1	EA	CREDENTIAL READER	MT SERIES - BY ACCESS CONTROL INTEGRATOR (COORDINATE W/ HEAD END AND CREDENTIAL TYPE)	BLK	SCE
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902 900-4RL 120/240 VAC)</del>	<del>(LGR)</del>	<u>B/O</u> <del>(SCE)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

DOOR(S) NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH AND ENABLES EXTERIOR ACTUATOR. PUSHING ENABLED EXTERIOR ACTUATOR SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING INTERIOR ACTUATOR RETRACTS LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

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Hardware Group No. 71

For use on Door #(s):

111-2                      116-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT (OR 027XY EPT AS REQ'D FOR DR THK)	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9949-EO 24 VDC	626	VON
2	EA	LONG DOOR PULL, OFFSET	9264F 36" O	630-316	IVE
2	EA	OH STOP	100S	630	GLY
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	689	LCN
2	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198AA	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
1	EA	POWER SUPPLY	<u>BY ACCESS CONTROL INTEGRATOR</u> <del>(PS902-900-2RS 120/240 VAC)</del>		<u>B/O</u> <del>(VON)</del>
2	EA	DOOR CONTACT	<u>BY ACCESS CONTROL/SECURITY INTEGRATOR</u> <del>(679 SERIES)</del>	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

EXIT DEVICE LATCH CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

# RATIO Design

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Hardware Group No. 72

For use on Door #(s):

~~002~~

002-1

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
2	EA	PANIC HARDWARE	CD-9949-L-M51-LBL	626	VON
2	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	MORTISE CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	WALL STOP/HOLDER	WS20/WS20X	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 73

For use on Door #(s):

002D-2

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
2	EA	PANIC HARDWARE	CD-9949-L-M51-LBL	626	VON
2	EA	RIM CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	MORTISE CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES
2	EA	SURFACE CLOSER	4040XP EDA	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
2	EA	ELEC WALL MAG HOLDER	SEM SERIES (VERIFY MOUNTING AND PROJECTION REQ'D)	689	LCN
2	EA	SILENCER	SR64	GRY	IVE

VERIFY HOW MAG HOLD OPENS WILL FUNCTION?

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Hardware Group No. 74

For use on Door #(s):  
115E

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
10	EA	INVISIBLE HINGE	218	626	SOS
2	EA	PANIC HARDWARE	LD-9949-EO	626	VON
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10"H X WIDTH AS REQ'D B-CS	630	IVE
1	SET	WEATHERSTRIPPING	429AA-S	AA	ZER
2	EA	DOOR BOTTOM (RECESSED)	381A	A	ZER
2	EA	ASTRAGAL, MEETING STILE	8195AA (VERIFY ASTRAGAL TYPE WITH ARCHITECT)	AA	ZER
1	EA	THRESHOLD, 1/2"	655A	A	ZER
2	EA	DOOR CONTACT	<u>BY ACCESS</u> <u>CONTROL/SECURITY</u> <u>INTEGRATOR</u> -(679-SERIES)	<del>(BLK)</del>	<u>B/O</u> <del>(SCE)</del>

Hardware Group No. 76

For use on Door #(s):  
055-3      056-1      102-3      104-2      ~~115N~~

Provide each OPENING with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	MORTISE CYLINDER	MATCH OWNER'S EXISTING SYSTEM	626	BES

VERIFY EXACT CYLINDER TYPE REQUIRED. BALANCE OF HARDWARE BY DOOR  
MANUFACTURER.

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Hardware Group No. 76A

For use on Door #(s):

108AB

Provide each OPENING with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>1</u>	<u>EA</u>	<u>MORTISE CYLINDER</u>	<u>MATCH OWNER'S EXISTING</u>	<u>SYSTEM</u>
			<u>626</u>	<u>BES</u>

VERIFY EXACT CYLINDER TYPE REQUIRED. BALANCE OF HARDWARE BY DOOR MANUFACTURER.

END OF SECTION

## SECTION 116623.13 - BASKETBALL 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. Height Adjustable Portable Backstop with rectangular Glass Backboard.

#### 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 assembly, disassembly, and storage instructions for removable equipment.
  - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: For gymnasium equipment.
  - 1. Include plans, elevations and sections details.
  - 2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, and operational clearances.
  - 3. Include transport and storage accessories for removable equipment.
  - 4. Include diagrams for power, signal, and control wiring.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, and other details, drawn to scale, and coordinated with game lines, and markers applied to finished flooring, and coordinated with each other, using input from installers of the items involved:



1. Structural members to which overhead-supported gymnasium equipment will be attached.
  - B. Setting Drawings: For embedded items and cutouts required in other work.
  - C. Qualification Data: For Installer.
  - D. Product Certificates: For each type of gymnasium equipment.
  - E. Field quality-control reports.
  - F. Sample Warranty: For special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For gymnasium equipment to include in operation and maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- 1.8 FIELD CONDITIONS
- A. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.
- 1.9 WARRANTY
- A. Special Warranty: Manufacturer agrees to repair or replace components of basketball equipment that fail in materials or workmanship within specified warranty period.
    1. Failures include, but are not limited to, the following:
      - a. Basketball backboard failures, including glass breakage.
      - b. Faulty operation of basketball backstops.
    2. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. In compliance with NCAA: The National Collegiate Athletic Association requirements.

### 2.2 BASKETBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Basis of Design: Porter Athletic Equipment Company; 90949000 Forward Fold Backstop.
  - 2. Bison, Inc.
  - 3. Spalding Equipment.
  - 4. Draper, Inc.
- B. Source Limitations: Obtain from single source from single manufacturer.
- C. Standard Rules: Provide equipment according to the requirements of NBA's "Official Rules of the National Basketball Association."
- D. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- E. Overhead-Supported Backstops:
  - 1. Folding Type: Manufacturer's standard assembly for forward-folding, front-braced backstop, with hardware and fittings to permit folding.
  - 2. Framing: Steel pipe, tubing, and shapes designed to minimize vibration during play.
    - a. Center-Mast Frame: Welded with side sway bracing.
    - b. Finish: Manufacturer's standard polyester powder-coat finish.
- F. Backstop Base: 4 ft-5 ½ inches (1.36m) in width by 6 ft-3 ¾ in ches (1.93m) in length (including padding). Constructed of heavy-wall, 3 inches (7.6cm) by 5 inches (12.7cm) structural steel tubing sections. Furnished complete with compact, heavy solid steel ballast (1650 lb - 749 kg) weights concealed and nested inside rear of frame.
- G. Base Frame: Incorporate four (4) non-marking, rubber tread caster wheels equipped with roller bearings for ease of operation. Front two casters: 5 inches (12.7cm) diameter, single-wheel swivel-type and rear two casters: 8 inches (20.3cm) diameter, dual-wheel rigid-type.

1. Front of Base: Furnished with an auto-retract foot pad which engages when the unit is raised.
  2. Rear of base is positioned by docking tray floor anchor system, which is furnished as standard. Docking trays align unit into playing position and front locator pins ensure unit is repeatedly in same playing position on court. Provide two (2) floor anchors as required for specific floors. Goal is locked at competition 10 ft - 0 inches (3.05m) height setting by means of a concealed handwheel mechanism with a roller thrust bearing for ease of operation.
  3. Front and rear vertical support assemblies: Fabricated of heavy-wall, unitized rectangular steel sections and designed for maximum stability. Upper and lower ends of vertical support shall pivot in permanently lubricated bushings for ease of operation.
- H. Center Horizontal Backboard Support: 6 inch by 4 inch (15.2cm x 10.2cm) heavy-wall steel section extending to a heavy steel mounting plate behind the backboard. Goal shall bolt through sleeves in the glass backboard into said mounting plate, to eliminate any strain on the glass backboard during slam-dunk type maneuvers. Two additional backboard mounting bolts are provided to hold backboard in position, should the four goal mounting bolts be removed for replacement of the goal. This direct goal mount feature conforms to NCAA rule (BR-36-14) for basket-ring mounting.
- I. Horizontal, Support: Includes cutouts which provide a concealed raceway for shot clock and/or backboard perimeter LED wiring. Extension assembly shall provide a full 8 ft-0 inches (2.44m) from the face of the backboard to the front padding, and 9 ft-7 inches (2.92m) vertical dimension from the playing floor with the goal located at the 10 ft -0 inches (3.05m) competition height. Upper backboard support arms shall extend diagonally from the horizontal extension assembly for proper backboard support.
- J. Overall dimension of backstop in folded, storage position: Height of 10 feet, , width of 4 ft -5 ½ inches (1.36m) (backboard width of 6 ft -4 inches (1.93m)), length of 15 ft-2 inches (4.63m).
- K. Backstop Electric Operator: Provide operating machine of size and capacity recommended in writing by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
1. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Electromechanical Actuator: 120 VAC (60 Hz), 2.25 amp, motor.
    - a. Automatic reset thermal overload protection and a load limiting friction disc clutch. In the event of a power failure or electricity is not available, the actuator can be disconnected from the lever arm and the unit operated manually.
    - b. Counterbalanced-type multiple tension nested spring operating system allows one individual to easily raise or lower backboard within a five second

cycle time without the use of additional tools. Counterbalance system, along with the actuator, to be concealed within the rear of the backstop base and completely enclosed and out of sight. Goal shall be locked in playing position (8 ft, 9 ft or 10 ft) by means of an integral, telescoping diagonal brace system equipped with a positive thru pin and pressure lock arrangement to provide stability in all positions. The thru pin mechanism is designed to accept a padlock provided with each unit to lock the backstop at any playing height or storage position to eliminate use or operation by unauthorized individuals

3. Actuator Control Box: Contains connections for a standard extension cord and a 6 ft control cable with push button switches for raising and lowering the backboard. Incorporate a safety control switch to prevent power being applied with the telescoping brace thru pin in place. Two push button limit switches to cut power to the actuator in the fully raised and lowered positions.

**L. Basketball Backboards:**

1. Basis of Design: Porter, Model 208, rectangular glass without height adjuster.
2. Backboard Material: Provide with predrilled holes or preset inserts for mounting goals, and as follows:
  - a. Glass: Minimum 1/2-inch-thick, transparent tempered glass according to ASTM C1048 Kind FT (fully tempered) and with impact-testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing.
    - 1) Frame: Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, painted steel frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backstop.
    - 2) Direct Mount: Designed for mounting backboard frame to center mast of backstop, to maximize stress relief on backboard frame and glass.
    - 3) Rim-Restraining Device: According to NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced standard rules.
4. Target Area and Border Markings: Marked in pattern, stripe width, and color according to referenced standard rules.
5. Finish: Manufacturer's standard factory-applied, white background.

**M. Basketball Goals: Basket ring complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.**

1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced standard rules.
2. Type:

- a. Movable: Pressure-release design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
- 3. Pressure-Release Characteristics: Positive-lock movable breakaway design, with manufacturer's standard mechanism, including preset pressure release, set to release between 181- and 231-lb load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
- 4. Field Adjustment: Provide ring that is field adjustable for rebound elasticity without being removed from the backboard.
- 5. Mount: Rear.
- 6. Net Attachment: Tube tie for attaching net to ring.
- 7. Finish: Polyester powder-coat finish.
- N. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit ring diameter, and as follows:
  - 1. Cord: Made from white nylon.
  - 2. Competition Cord: Antiwhip, made from white nylon cord, minimum 120-gm thread and maximum 144-gm thread.
- O. Backboard Safety Pads: Designed for backboard thickness and extending continuously along bottom and up sides of backboard and over backstop as required by referenced standard rules.
  - 1. Attachment: Manufacturer's standard.
  - 2. Backstop shall be furnished with front vertical support and sides of base covered in durable protective padding.
  - 3. Front padding shall consist of a minimum 4 inches (10.2cm) thick pad, and side padding a minimum of 2 inches (5.1cm) thick, covered with a 19 oz. (per square yard) vinyl coated polyester scrim material for rip and superior tear resistance.
  - 4. Padding shall be provided with a rigid, solid-core plywood backing for securing to the backstop frame.
  - 5. Color: As selected by Architect from manufacturer's full range.

## **2.3 MATERIALS**

- A. Anchors, Fasteners, Fittings, and Hardware: Gymnasium equipment manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for court layout, alignment of mounting substrates, installation tolerances,

operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

1. Verify critical dimensions.
2. Examine supporting structure, subfloors, and footings below finished floor.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

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

### 3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions and competition rules for each type of equipment.
- B. Install gymnasium equipment after other finishing operations, including painting, have been completed unless otherwise indicated.
- C. Connections: Connect electric operators to building electrical system.
- D. Removable Gymnasium-Equipment Components: Assemble in place to verify that equipment and components are complete and in proper working order. Disassemble removable gymnasium equipment after assembled configuration is approved by Owner, and store units in location indicated on Drawings.

### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Perform visual inspections and operational tests as recommended by referenced standard rules of each sport and the equipment manufacturer.
  2. Test rebound elasticity of basketball goals.
  3. Test basketball goal pressure-release characteristics and adjustability.
- C. Gymnasium equipment will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.4 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly; free from binding, warp, distortion, nonalignment, misplacement,

disruption, or malfunction, throughout entire operational range; and lubricate as recommended in writing by manufacturer.

## **3.5 DEMONSTRATION**

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

**END OF SECTION 116623**

## SECTION 118129 - FACILITY 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, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Fall arrest safety anchors.
- 2. Roof Anchors.
- 3. Horizontal cable system.

- B. Related Requirements:

- 1. AIA A201 General Conditions, for Contractor's temporary provisions for jobsite safety, for which the methods and means remain exclusively the Contractor's responsibility.
- 2. Section 018113 "Sustainable Design Requirements – LEEDv4HC" for sustainable design requirements applicable to this project.
- 3. Section 033000 "Cast-in-Place Concrete" for concrete roof deck.
- 4. Section 051200 "Structural Steel" for steel supporting roof anchors.
- 5. Section 053100 "Steel Decking" for steel roof deck.
- 6. Division 07 roofing Section(s) for roof penetration flashing.
- 7. Division 08 curtain wall Sections.

#### 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 National Standards Institute / International Window Cleaning Association (ANSI/IWCA).



1. ANSI/IWCA I-14.1 2006, Window Cleaning Safety Standard.
  - E. 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.
  - F. 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.
  - G. International Code Council (ICC).
    1. International Building Code.
  - H. Occupational Safety and Health Administration (OSHA).
    1. OSHA 1910, Subpart D, Walking and Work Surfaces.
    2. OSHA 1910, Subpart F, Appendix C, Personal Fall Arrest Systems.
    3. OSHA Ruling on Window Cleaning by Bosun's Chair.
    4. OSHA 1910.66 Subpart F, Powered Platforms.
  - I. National Roofing Contractor's Association (NRCA)
    1. The NRCA Roofing and Waterproofing Manual, Fifth Edition.
- 1.4 COORDINATION AND MEETINGS
- A. Coordinate installation of anchorages for maintenance equipment. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete. Deliver such items to Project site in time for installation.
- 1.5 ACTION SUBMITTALS
- A. Product Data: Include construction details, material descriptions, rated capacities, operating characteristics, furnished specialties, accessories, dimensions of individual components and profiles, and finishes.
  - B. Sustainable Design Submittals: Refer to Division 01 Sections for sustainable design requirements for LEED documentation required under this section.

- C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Submit shop drawings showing complete layout and configuration of hoist support and roof anchor locations and all other components and accessories.
  - 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Delegated-Design Submittal: For facility fall protection systems permanently attached to the building.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For Installer and professional engineer.
- B. Product Test Reports: Based on evaluation of tests performed by manufacturer and supervised and verified by a qualified independent professional engineer.
- C. Proof of specified liability insurance.
- D. Manufacturer's installation instructions.

**1.7 CLOSEOUT SUBMITTALS**

- A. Field Quality Control Reports.
- B. Maintenance Data: For maintenance equipment to include in maintenance manuals.
  - 1. Safety Inspection Log Book with "Initial inspection – Certificate for Use" and "Inspection Sign-off" completed.
  - 2. Two Laminated copies of roof plan, at a convenient scale, showing location of roof anchors and hoist supports to be posted by Owner near exits to roof.

**1.8 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: An experienced firm specializing in the design, fabrication and installation of permanent building maintenance equipment with a record of successful in-service installations of equipment similar in design and extent to that proposed for this project.
  - 1. Minimum five years' experience in the design, fabrication and installation of similar maintenance equipment.
  - 2. Firm shall have specific product liability insurance of \$2,000,000 for all aspects of design and installation of all components.
- B. Installer Qualifications: Provide experienced and qualified technicians to carry out erection, assembly and installation of window washing and suspended maintenance equipment system. .

- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of facility fall protection similar to those indicated for this Project in material, design, and extent.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- E. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 4. AWS D1.6, "Structural Welding Code--Stainless Steel."
- F. Design Standards: Comply with the following:
  - 1. AISC publication S342 with Supplement No. 1 "Load and Resistance Factor Design Specification for Structural Steel Buildings."
  - 2. AISI publication SG-971 with latest supplements: "Specification for Design of Cold-Formed Steel Structural Members."
  - 3. Aluminum Association's publication AA ADM-1 "Aluminum Design Manual."
  - 4. Aluminum Association's publication AA ADM-1 "Aluminum Design Manual."

## **1.9 PROJECT CONDITIONS**

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

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS AND SYSTEM DESCRIPTIONS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements" and in this Section to design facility fall protection systems permanently attached to the building.
- B. Regulatory Requirements.

1. Comply with International Building Code (IBC) and Building Code for State of Indiana.
2. Comply with OSHA regulations as follows:
  - a. 1910, Subpart D, Walking and Working Surfaces.
  - b. Appendix C to 1910 Subpart F, Personal Fall Arrest Systems.
  - c. OSHA Ruling on Window Cleaning by Bosun's Chair.
  - d. 1910.66, Subpart F, Powered Platforms.
- C. Structural Performance: Provide safety anchorage capable of withstanding design loads within limits and under conditions indicated.
- D. Design system fall arrest safety anchors and equipment supports to AISC S342L (including supplement No.1) and ANSI/IWCA I-14.1, and as follows:
  1. Comply with OSHA 1910, Subpart F, Appendix C.
- E. Locate anchorages to suit suspension equipment specified.
- F. Design anchor components for cleaning and suspended maintenance equipment to ASME A120.1.
  1. Ensure compatibility with industry standard equipment.
  2. Anchorage and anchor components: Designed by Engineer qualified in design of window cleaning and suspended maintenance equipment and licensed in State of Indiana.
- G. Design system fall arrest safety anchors and equipment supports to AISC S342L (including supplement No.1) and ANSI/IWCA I-14.1, and as follows:
  1. Comply with OSHA 1910, Subpart F, Appendix C.
  2. Fall Arrest Safety Anchors:
    - a. Fall arresting force safety factor of 2 to 1 without permanent deformation: 1800 lbs (8.0 kN) minimum.
    - b. Fall arrest force against fracture or detachment: 5,000 lbs (22.4 kN) minimum.

## 2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide the Basis-of-Design products indicated, or approved comparable products.
  1. **Fall Arrest Anchors Basis of Design: Pro-Bel Enterprises, PBE75 or approved equivalent.**
  2. **Horizontal Lifeline System Assembly Basis of Design: Pro-Bel HLL-DL3-PB or approved equivalent.**

- B. Other manufactured products meeting this specification may be substituted if approved prior to bidding. Companies, such as miscellaneous metal fabricators, who are not normally engaged in design and manufacture of building maintenance equipment are not acceptable.

## **2.3 ANCHORS**

- A. Fall Arrest Safety Anchors:
  - 1. Fall arresting force safety factor of 2 to 1 without permanent deformation: 1800 lbs minimum.
  - 2. Fall arrest force against fracture or detachment: 5,000 lbs minimum.
- B. Safety U-bars: Stainless steel to ASTM A276, Type 304 with 35 Ksi (240 MPa) minimum yield strength
  - 1. U-bar: 0.75 inches (19 mm) minimum diameter material with 1.5 inches (38 mm) eye opening.
- C. Hollow Steel Section (HSS) Piers: Mild steel, Type 300W with 50 Ksi (350 MPa) minimum yield strength, hot dipped galvanized to ASTM A123/A123M
  - 1. Wall thickness to suit application.
- D. Plate and other sections: Mild steel, Type 300W with 44 Ksi (300 MPa) minimum yield strength, hot dipped galvanized to ASTM A123/A123M
  - 1. Wall thickness to suit application.
- E. Seamless Spun Aluminum Flashing (for Roof Anchors): To AA ADM-1 Type 6061-T6 alloy and to ASTM B221.
  - 1. Deck flange flashing: To NRCA Roofing and Waterproofing Manual recommendations, detachable watertight stainless steel cap.
- F. Miscellaneous Bolts, Nuts and Washers: Stainless steel to ASTM A276, Type 304 with 35 Ksi (240 MPa) minimum yield strength.

## **2.4 HORIZONTAL CABLE SYSTEM**

- A. Horizontal Cable System: Hands free system, including all associated accessories as required to complete system. Provide lanyards rated for 900-pounds maximum arrest force.
- B. Provide 5/16 inch (8mm) dia. Stainless steel cable, 9127 lbs (40 kN) minimum breaking strength with permanently swedged cable ends.
- C. Data plate: Ensure non-corrosive data plate stating Maximum Service Capacity of cable, Manufacturer's Name, Serial No., Manufacturing Date, rated load and other pertinent information is prominently displayed at cable system entry points.

- D. Tensioner: Stainless steel turnbuckle to ASTM A167, Type 316.
- E. Harness: Manufacturer's standard full body harness with double shock absorber lanyard.

**2.5 ~~ELECTRICAL REQUIREMENTS~~**

- ~~A. Receptacles: Waterproof, independently protected main line power receptacles rated 208 volts, 3 phase, 60 Hertz, 30 amperes.~~
  - ~~1. Acceptable material: Hubbell Twist-Lock.~~
- ~~B. Ensure main line power is located 100 feet (30 m) maximum from powered window washing equipment.~~
- ~~C. Ensure power outlets experience 3% maximum voltage drop under full load.~~

**2.6 METALS, GENERAL**

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

**2.7 FERROUS METALS**

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Mild Steel: Type 300W, hot-dipped galvanized to ASTM A123/A or proprietary polyurethane/polyurea coating system, with yield strength as follows:
  - 1. Hollow steel section piers: 50 ksi.
  - 2. Securement bolts: 44 ksi.
  - 3. Base plates and other sections: 44 ksi.

**2.8 NONFERROUS METALS**

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

## **2.9 FINISHES, GENERAL**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
  - 1. ASTM A 123/A 123M for iron and steel.
  - 2. ASTM A 153/A 153M for iron and steel hardware.

## **2.10 MISCELLANEOUS MATERIALS**

- A. Tethers: Secure all pins and loose pieces using 1/8 inch (3 mm) stainless steel cable complete with easily inserted connectors to avoid loss.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- A. Examine areas, dimensions, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of maintenance equipment.
- B. Verify that structural frame and substrates to which safety anchors are to be attached have adequate bearing surface as indicated on shop drawings and as necessary to ensure 100 percent weld area.
- C. Inform Architect of unacceptable conditions immediately upon discovery.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Commencement of Work constitutes Contractor's acceptance of substrates and conditions.

## **3.2 INSTALLATION**

- A. Install building maintenance equipment systems according to approved shop drawings, specifications, manufacturer's instructions and under supervision of professional engineer registered in state in which project is located.
- B. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions and manufacturer's technical data sheets.

- C. Provide all items to be installed. Provide handling, installation instructions, anchorage information, roughing-in dimensions, templates and service requirements for completion of work of this Section. Assist or supervise, or both, setting of anchorage devices when handled by others. Provide advice and assistance with respect to construction of other work related to products specified in this section.
- D. Install all work true, level, tightly fitted, and flush to adjacent surfaces where required for installation.
- E. Provide anchorage and mounting devices required for installation of each product.
- F. Deform threads of all exposed studs behind nuts after nuts have been tightened.
- G. Where contact is made between dissimilar materials, protect components with bituminous paint or other materials, to prevent corrosion.
- H. Lubricate moving parts to operate smoothly and fit accurately.

**3.3 FIELD QUALITY CONTROL**

- A. Conduct full live load and operational tests using load cell test apparatus in accordance with manufacturer's recommendations, after completion of the installation, under maximum design live loading conditions over a selected range of the building surfaces, in accord with applicable standards.
- B. At a time mutually agreeable to all parties, allow one (1) full day to conduct operational demonstrations for the Owner and/or the Owner's representative, after completion of the operational tests.
- C. Repair or replace any components and correct all deficiencies observed as a result of these tests and demonstrations, and retest to assure compliance with the Contract Documents.

**3.4 MAINTENANCE**

- A. Repair or replace parts of window washing equipment whenever required due to defect and normal wear and tear.
- B. Use only standard parts of product line of manufacturer of window washing equipment.
- C. Perform work during regular trade working hours satisfactory to Architect.
- D. Ensure that maintenance personnel register with designated building personnel at time of inspections and maintenance.

**END OF SECTION 118129**



## SECTION 126100 - FIXED AUDIENCE SEATING

### 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 fixed, chair-type seating **and bench type seating with backs** with the following:
  - 1. Floor mounting.
  - 2. ~~Upholstered chairs with rocker backs.~~
  - 3. ~~Portable stackable chairs.~~
- B. Related Requirements:
  - 1. Section 018113 "Sustainable Design Requirements – LEEDv4HC" for sustainable design requirements applicable to this project.
  - 2. Refer to Section 126120 "Telescoping Audience Seating" for telescoping seating to match fixed audience seating.

#### 1.3 COORDINATION

- A. Coordinate layout and installation of electrical wiring and devices with seating layout to ensure that floor junction boxes for electrical devices are accurately located to allow connection without exposed conduit.
- B. Coordinate layout and installation of diffuser pedestals with HVAC work and with properties of diffuser pedestals to ensure alignment, proper air diffusion, and correct seat locations.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of components, and finishes for fixed audience seating.
  - 2. Include electrical characteristics of electrical components, devices, and accessories.

- B. Sustainable Design Submittals: Refer to Division 01 Sections for sustainable design requirements for LEED documentation required under this section.
- C. Shop Drawings:
  - 1. Seating Layout: Show seating layout, aisle widths, aisle-end alignment or stepping, row-lettering and chair-numbering scheme, chair widths, and chair spacing in each row.
  - 2. Include diagrams for power, signal, and control wiring.
- D. Samples for Initial Selection: For each type of exposed color, finish, texture, and pattern indicated.
  - 1. Include Samples of accessories involving color and finish selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Chair Unit: Full-size unit of each type and combination of finishes. Build sample chairs for each model required to demonstrate aesthetic effects and set quality standards for fabrication.
  - 2. Molded Plastic: Manufacturer's standard-size unit, not less than 3 inches square.
  - 3. ~~Plastic Laminate: Manufacturer's standard size unit, not less than 3 inches square.~~
  - 4. Baked-on Coating Finishes: Manufacturer's standard-size unit, not less than 3 inches square.
  - 5. Aluminum Finishes: Manufacturer's standard-size unit, not less than 3 inches square.
  - 6. ~~Wood and Plywood Materials and Finishes: Manufacture's standard-size unit, not less than 3 inches square.~~
  - 7. ~~Upholstery Fabric: Full with long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.~~
  - 8. Row-Letter and Chair-Number Plates: Full-size units with letters and numbers marked.
  - 9. ~~Exposed Fasteners: Full-size units of each type.~~

## 1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of fixed audience seating.
- B. Material Certificates: For each type of flame-retardant treatment of upholstery fabric.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fixed audience seating to include in operation and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Maintenance of self-rising seat mechanisms, folding armrests, and other operating components.
    - b. Adjustment of self-rising seat mechanisms to align seats.
    - c. Maintenance of electrical components, devices, and accessories.
    - d. Methods for maintaining upholstery fabric.
    - e. Precautions for cleaning materials and methods that could be detrimental to seating finishes and performance.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of fixed audience seating that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including standards, beams, and pedestals.
    - b. Faulty operation of self-rising seat mechanism.
    - c. Faulty operation of electrical components.
    - d. Wear and deterioration of fabric and stitching beyond normal use.
    - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Periods: As follows, from date of Substantial Completion.
    - a. Structural: Five years.
    - b. Operating Mechanisms: Five years.
    - c. Electrical Components: Five years.
    - d. Plastic, ~~Wood~~, and Paint Components: Five years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of seating required, including accessories and mounting components, from single source from single manufacturer.
  - 1. Upholstery Fabric: Obtain fabric of a single dye lot for each color and pattern of fabric required.

## 2.2 PERFORMANCE REQUIREMENTS

### A. ~~Fire Test Response Characteristics of Upholstered Chairs:~~

#### 1. ~~Fabric and Padding:~~

- a. ~~Fabric: Class 1 according to DOC CS 191 or 16 CFR 1610, tested according to California Technical Bulletin 117-2000.~~
- b. ~~Padding: Comply with California Technical Bulletin 117-2000.~~

### B. Strength and Durability Performance: Chairs and components shall pass testing according to BIFMA X5.4.

## 2.3 FIXED AUDIENCE SEATING

### A. Description: Assembly-space seating in permanent arrangement as indicated on Drawings.

#### 1. Basis-of-Design Product: Subject to compliance with requirements, provide ~~Irwin Seating Company, No 90.12.56.12 Citation~~ **Hussey, Camatic Quantum SQ and Hussey XCS12 with backrest** or comparable product by one of the following:

- a. Hussey Seating Company.
- b. Irwin Seating Company.
- c. Navetta Design.

### B. Chair Mounting Standards: Floor attached of the following material:

- 1. Steel: One-piece, heavy-tube or reinforced sheet with welded mounting plate and welded connections for seat pivots, backs, armrests, and end panels.
- 2. ~~Standards shall have integral cast lugs for mounting armrests. Standards shall be cast to be compatible with the floor incline to maintain proper seat and back height and angle. Cast standards shall be provided with mounting feet featuring 4 anchoring holes allowing a choice of 2 alternative 2 hole anchoring schemes.~~

### C. Chair Mounting Beam: Steel horizontal beam mounted on floor-attached steel support pedestals spaced at intervals of 2 to 2-1/2 chair widths.

### D. ~~End Panels: Material: Aisle end panels shall be rectangular shaped with rounded bottom corners, constructed of medium density fiberboard (MDF) and surfaced with plastic laminate specified and a lacquered edge to match the dominant color of the laminate. Panels shall be secured to a formed 14 gage steel panel MIG welded to the support column.~~

### E. Fabric Upholstered Chairs:

#### 1. Back: **Injection molded co-polymer polypropylene. Extends below the seating surface to provide foot protection.**

- a. ~~Padding Thickness: 2 inches.~~

- ~~b. Outer Back Surface: Polyethylene, with fasteners.~~
  - ~~c. Top Corners: Rounded.~~
- 2. Seats: Seats shall be padded and upholstered on their top surface with an engineered polymer seat foundation. Seats shall self-rise to a uniform position when unoccupied. Two part top and bottom construction and as follows: **Injection molded co-polymer polypropylene.**
  - ~~a. Top Padding Thickness: Minimum 3 inches at front and rear edges.~~
  - ~~b. Seat Bottom: Seat foundation shall be engineered polymer, strengthened by deep internal ribs and gussets, completely enclosing the self-rising hinge mechanism. Bottom surface of the foundation shall be textured and feature an attractive molded recess. Bolted attachment of the seat assembly to the chair standard shall be concealed by an integral color coordinated plastic cap to present a finished, refined appearance.~~
- 3. Fabric: As selected by Architect from manufacturer's full range.
- F. Chair Width: 19-23 inches, Vary chair widths to optimize sightlines and row lengths, with minimum chair width of 19 inches from center to center of armrests.
- G. Back Height: 34 inches high from the floor.
  - 1. Back height and pitch shall be fixed as shown on seating layout drawings.
- H. Back Pitch: Variable, hinged (rocker).
  - 1. Back Angle: 18 degrees. Coordinate with final rake of floors..
  - 2. Chair Back Hinges: Self-lubricating type with noiseless mechanism that raises back to vertical position when chair is unoccupied.
- I. Chair Seat Hinges: Self-lubricating, with noiseless self-rising seat mechanism passing ASTM F851, positive internal stops cushioned with rubber or neoprene, and requiring no maintenance.
  - 1. Self-Rising Seat Mechanism: Spring actuated, three-quarter fold.
- J. Armrests/ **Side Supports**: Solid maple with concealed mounting. **Injection molded glass reinforced polyamide, black in color.**
- K. Accessible Seating:
  - 1. Provide removable chair for each wheelchair space unless otherwise indicated.
  - 2. Provide chairs with folding armrest on aisle side in locations indicated, but not less than 5 percent of aisle seats, dispersed through the audience seating area. Identify these seats with a sign or marker.
- L. Row-Letter and Chair-Number Plates: Manufacturer's standard.
  - 1. Material: Aluminum with black embossed characters.

2. Location: row letter on top of aisle armrest.
3. Attachment: Manufacturer's standard method.

M. LED Aisle Light.

## 2.4 ~~UPHOLSTERED CHAIRS~~

A. ~~Description: Upholstered seating.~~

1. ~~Basis of Design Product: Subject to compliance with requirements, provide Uniflex Church Furnishings, Inc., The Optima or approved comparable product.~~

B. ~~Ergonomic lumbar support.~~

C. ~~Width: 21 inches.~~

D. ~~Enclosed Back.~~

E. ~~Fabric: As selected by Architect from manufacturer's full range.~~

## 2.5 MATERIALS AND FINISHES

A. ~~Plastic Laminate: NEMA LD 3, Grade VGS for vertical surfaces and Grade HGS for horizontal surfaces.~~

1. ~~Color and Pattern: As selected by Architect from manufacturer's full range.~~

B. Molded Plastic: High-density polyethylene or polypropylene, blow or injection molded, with surface that is mar and dent resistant.

1. Provide with UV inhibitors to retard fading.
2. Color and Texture: As selected by Architect from manufacturer's full range.

C. ~~Fabric: Manufacturer's standard 100 percent polyolefin with flame-retardant treatment if required to meet performance requirements.~~

1. ~~Weight: 18 oz./linear yd..~~
2. ~~Color and Pattern: As selected by Architect from manufacturer's full range.~~

D. ~~Upholstery Padding: Flexible, cellular, molded or slab polyurethane foam.~~

E. Metal Finish: Finish exposed metal parts with manufacturer's standard baked-on coating.

1. Color: As selected by Architect from manufacturer's full range.

## 2.6 FABRICATION

- A. Floor Attachments: Fabricate to conform to floor slope so that standards and pedestals are plumb and chairs are maintained at same angular relationship to vertical throughout Project.
- B. ~~Upholstery: Fabricate fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.~~
- C. ~~Upholstered Chairs: Fabricate as follows:~~
  - 1. ~~Two-Part Upholstered Back: Padded cushion glued to a curved steel plywood or molded plastic inner panel and covered with easily replaceable fabric; with curved steel or molded plastic outer back shell that fully encloses upholstery edges.~~

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Install seating in locations indicated and fasten to substrates according to manufacturer's written installation instructions.
  - 1. Install fixed audience seating with each chair capable of complying with performance requirements without failure or other conditions that might impair the chair's usefulness.
  - 2. Install standards and pedestals plumb.
  - 3. Install seating so moving components operate smoothly and quietly.
- B. Install seating with end standards aligned or stepped as indicated from first to last row and with backs and seats varied in spacing to optimize sightlines.
- C. Install riser-mounted standards and attachments to maintain uniform chair heights above floor.
- D. Where seating is indicated in curved rows, install seating at a constant radius unless otherwise indicated.

## 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Inspect components, assemblies, and equipment, including connections, to verify proper, complete, and sturdy installation according to manufacturer's written instructions and product specifications.
  - 2. Verify that self-rising seats return to uniform at-rest, raised position.
- B. Fixed audience seating will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

## 3.4 ADJUSTING

- A. Adjust chair backs so that they are at required angles and aligned with each other in uniform rows.
- B. Adjust hardware and moving parts to function smoothly so they operate easily. Lubricate bearings and sliding parts as recommended in writing by manufacturer.
- C. Adjust self-rising seat mechanisms so seats in each row are aligned when in upright position.
- D. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.
- E. Replace damaged and malfunctioning components that cannot be acceptably repaired.
- ~~F. Replace upholstery fabric damaged during installation or work of other trades.~~

**END OF SECTION 126100**



## SECTION 126600 - TELESCOPING STANDS

### 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. Telescoping stands.
- B. Related Requirements:
  - 1. Section 018113 "Sustainable Design Requirements – LEEDv4HC" for sustainable design requirements applicable to this project.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design telescoping stands, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Telescoping stands shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ICC 300 and NFPA 102.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.
- B. Sustainable Design Submittals: Refer to Division 01 Sections for sustainable design requirements for LEED documentation required under this section.
- C. Shop Drawings: For telescoping stands in both stacked and extended positions. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Wiring Diagrams: For power, signal, and control wiring.
- D. Samples for Initial Selection: For units with factory-applied finishes.

- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Decking: 6-inch- square Samples of finished material.
  - 2. Metal Components: 6-inch- square Sample of each color and finish indicated.
  - 3. Seating: 6-inch- square Sample of each seating material, color, and finish indicated.
- F. Delegated-Design Submittal: For telescoping stands indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and professional engineer.
- B. Welding certificates.
- C. Product Certificates: For each type of fire-resistant construction, from manufacturer.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- 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 telescoping stands to comply with ICC 300 and NFPA 102.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings and construction contiguous with telescoping stands by field measurements before fabrication. Verify locations of walls, columns, and other construction that will interface with operating telescoping stands.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. Wood:

1. Lumber: Kiln dried, surfaced four sides; southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B&B Finish (B and better) grade-of-finish requirements.
2. Plywood: APA-grade trademarked, DOC PS 1.

#### B. Steel:

1. Structural-Steel Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
3. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold-rolled commercial steel), or ASTM A 1011/A 1011M, Designation CS (hot-rolled commercial steel).
4. Tubing: ASTM A 500, cold formed; ASTM A 501, hot formed; or ASTM A 513, mechanical.

#### C. Extruded Aluminum: ASTM B 221, alloy as standard for manufacturer.

### 2.2 TELESCOPING STANDS

#### A. General: Operable systems of multiple-tiered seating on interconnected folding platforms that close, without being dismantled, into a nested stack for storing. Stand units permit opening and closing of adjacent rows, allow individual and collective rows to be locked open for use, and close with vertical faces of upper skirts on the same vertical plane.

#### B. Wall-Attached Telescoping Stands : Forward-folding system, in which the bleachers open in the forward direction by initially moving the front row away from the stack to the fully extended position, and the rear of bleacher understructure is permanently attached to wall construction.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ~~Irwin, Versadeck~~ **Hussey Maxim Plus and Courtside XCS12** or comparable product by one of the following:
  - a. Irwin Telescopic Seating.
  - b. **Hussey Seating Company.**
2. Row Spacing: 24-inches **As indicated on Drawings.**
3. Row Rise: 9-5/8 inches.
4. Operation: Automatic, power assisted by electrically powered unit controlled by key switch.

- a. Limit Switches: Automatically stop integral power system when telescoping stands reach fully opened or closed positions.
- b. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 feet, mounted under telescoping seating for audio and visual warning during integral power operation.
- c. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.
- d. Keyed wall switch, coordinate location with Architect

## 2.3 COMPONENTS

### A. Benches: Seats and skirts **with back rest.**

- 1. Material: Molded plastic with contour surfaces .
- 2. Bench Height: Not less than 16 inches or more than 18 inches .
- 3. Bench Depth: ~~40~~ **12** inches.
- 4. **Color: As selected by Architect from manufacturer's full range.**

### B. Deck: Plywood, 5/8 inch thick .

- 1. Finish: Transparent .

### C. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.

### D. Safety Rails: Structural steel, finished with manufacturer's standard powder coat system.

- 1. Self-storing mid-aisle handrails located at centerline of each vertical aisle with seating on both sides.
- 2. End rails (guards) that are telescoping and self-storing.
- 3. Back rails (guards) along rear of units where required by referenced safety standard.
- 4. Fixed front rails (guards) along front of units where required by referenced safety standard.
- 5. Fixed rails around accessible seating cutouts and truncations.
- 6. Color: As selected by Architect .

### E. Understructure: Structural steel.

- 1. Finish: Manufacturer's standard rust-inhibiting finish.
- 2. Color: As selected by Architect .

### F. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.

- 1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four

per column or less than 3-1/2 inches in diameter and 1 inch wide.

- G. Fasteners: Vibration proof, in manufacturer's standard size and material.

## 2.4 ACCESSORIES

A. Steps:

1. Slip-resistant, abrasive tread surfaces at vertical aisles.
2. Intermediate aisle steps, fully enclosed, at each vertical aisle.
3. Transitional top step, fully enclosed, at each vertical aisle where last row of telescoping stands is adjacent to a cross aisle.
4. Removable front steps, fully enclosed, at each vertical aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.

B. Closure Panels and Void Fillers:

1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
2. End panels covering exposed ends of stands in the stored position.
3. Panels at cutouts and truncations for accessible seating.
4. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
5. Gap fillers for closing openings between stand units or between stand units and adjoining construction.
6. Side Curtains on all exposed ends.

C. Signage:

1. Accessibility signs at each accessible space and accessible aisle seat.
- ~~2. Custom graphics on whole seating array when in closed position.~~
  - ~~a. Text: Provision for four (4). "FGHS" unless indicated otherwise by Owner.~~

~~D. Scorer's Table: Removable unit that attaches to mounting sockets installed in telescoping stand unit.~~

## 2.5 FABRICATION

- A. Fabricate understructure from structural-steel members in size, spacing, and form required to support design loads specified in referenced safety standard.
- B. Weld understructure to comply with applicable AWS standards.
- C. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.

- D. Form exposed sheet metal with flat, flush surfaces, level and true in line, and without cracking and grain separation.
- E. Seating Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair the usefulness of seating units.
  - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where telescoping stands are to be installed, 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. Install telescoping stands to comply with referenced safety standard and manufacturer's written instructions.

### 3.3 ADJUSTING AND CLEANING

- A. On completion of installation, lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.
- B. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

### 3.4 DEMONSTRATION

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

**END OF SECTION 126600**

**SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION****PART 1 - GENERAL****1.1 SUMMARY****A. The Work of this Section includes:**

1. Motors.
2. Sleeves without waterstop.
3. Sleeves with waterstop.
4. Stack-sleeve fittings.
5. Sleeve-seal systems.
6. Grout.
7. Escutcheons.

**B. Related Requirements:**

1. Section 018113.14 "Sustainable Design Requirements – LEEDv4 BD+C, New Construction" for sustainable design requirements applicable to this Project.

**1.2 ACTION SUBMITTALS****A. Product Data:**

1. For each type of product, excluding motors which are included in Part 1 of the fire-suppression equipment Sections.
  - a. Include construction details, material descriptions, and dimensions of components.
  - b. Include operating characteristics and furnished accessories.

**B. Sustainable Design Submittals:**

1. Product Data: For sealants indicating VOC content.
2. Refer to Table 1-1 "Sustainable Design Requirements Supplement" for specific credit requirements associated with Work in this Specification Section.

**C. LEED Requirements:**

1. Refer to LEED v4.1 REQUIREMENTS for additional contract compliance requirements, including but not limited to, performance and submittal requirements that may apply to any product herein specified.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.
- B. Laboratory Test Reports: For sealants indicating compliance with requirements for low-emitting materials.

**1.4 COORDINATION**

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
  - 1. Motor controllers.
  - 2. Torque, speed, and horsepower requirements of the load.
  - 3. Ratings and characteristics of supply circuit and required control sequence.
  - 4. Ambient and environmental conditions of installation location.

**1.5 QUALITY ASSURANCE**

- A. DDC System Provider Qualifications:
  - 1. In-place facility located within 100 Miles of Project.
  - 2. Demonstrate past experience with installation of DDC system products being installed for period within five consecutive years before time of bid.
  - 3. Demonstrate past experience on five projects of similar complexity, scope, and value.
  - 4. Demonstrate past experience of each person assigned to Project.

**PART 2 - PRODUCTS****2.1 MOTORS**

- A. Motor Requirements, General:
  - 1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
  - 2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
  - 3. Comply with NEMA MG 1 unless otherwise indicated.
- B. Motor Characteristics:



1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 ft. above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Single-Phase Motors:

1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split phase.
  - c. Capacitor start, inductor run.
  - d. Capacitor start, capacitor run.
2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 HP and Smaller: Shaded-pole type.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

## 2.2 SLEEVES AND SLEEVE SEALS

A. Sleeves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Advance Products & Systems, Inc.
  - b. CALPICO, Inc.
  - c. GPT; an EnPro Industries company.
2. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
3. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.
4. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Stack-Sleeve Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Wade; a subsidiary of McWane, Inc.
  - c. Zurn Industries, LLC.
2. Description: Manufactured, Dura-coated or Duco-coated galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
  - a. Underdeck Clamp: Clamping ring with setscrews.

**C. Sleeve-Seal Systems:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Advance Products & Systems, LLC.
  - b. CALPICO, Inc.
  - c. GPT; an EnPro Industries company.
  - d. Metraflex Company (The).
  - e. Proco Products, Inc.
2. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - a. Hydrostatic Seal: 20 psig minimum.
  - b. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
  - c. Pressure Plates: Carbon steel.
  - d. Connecting Bolts and Nuts: Carbon steel, with ASTM B633 coating of length required to secure pressure plates to sealing elements.

**D. Grout:**

1. Description: Non-shrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

**2.3 ESCUTCHEONS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. BrassCraft Manufacturing Co.; a Masco company.
  - 2. Dearborn Brass.
  - 3. Jones Stephens Corp.
  - 4. Keeney Manufacturing Company (The).
  - 5. Mid-America Fittings, LLC; A Midland Industries Company.
- B. Escutcheon Types:
  - 1. One-Piece, Stainless-Steel Type: With polished stainless steel finish.
  - 2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
  - 3. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.
- C. Floor Plates:
  - 1. Split Floor Plates: Steel with concealed hinge.

**PART 3 - EXECUTION****3.1 INSTALLATION OF SLEEVES, GENERAL**

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  - 2. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire-resistance of floor/slab/wall.
  - D. Install sleeves for pipes passing through interior partitions.
    1. Cut sleeves to length for mounting flush with both surfaces.
    2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
    3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.
  - E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."
- 3.2 INSTALLATION OF SLEEVES WITH WATERSTOP
- A. Install sleeve with waterstop as new walls and slabs are constructed.
  - B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange centered across width centered in concrete slab or wall.
  - C. Secure nailing flanges to wooden concrete forms.
  - D. Using grout, seal space around outside of sleeves.
- 3.3 INSTALLATION OF STACK-SLEEVE FITTINGS
- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
    1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
    2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
    3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.
    4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
    5. Using silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

- B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- or smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

### **3.4 INSTALLATION OF SLEEVE-SEAL SYSTEMS**

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building and passing through exterior walls.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### **3.5 INSTALLATION OF ESCUTCHEONS**

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

### **3.6 FIELD QUALITY CONTROL**

- A. Sleeves and Sleeve Seals:
  - 1. Perform the following tests and inspections:
    - a. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
    - b. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
  - 2. Prepare test and inspection reports.
- B. Escutcheons:
  - 1. Using new materials, replace broken and damaged escutcheons and floor plates.

### **3.7 SLEEVES APPLICATION**

- A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls Above and Below Grade:
  - a. Sleeves with Waterstops:
    - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
2. Concrete Slabs-on-Grade:
  - a. Sleeves With Waterstops:
    - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs Above Grade:
  - a. Stack-sleeve fittings.
4. Interior Walls and Partitions:
  - a. Sleeves without waterstops.

### **3.8 ESCUTCHEONS APPLICATION**

- A. Escutcheons for New Piping and Relocated Existing Piping:
  1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
  2. Chrome-Plated Piping: One piece or split plate steel with polished, chrome-plated finish.
  3. Insulated Piping:
    - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
  4. Bare Piping at Wall and Floor Penetrations in Finished Spaces:
    - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
  5. Bare Piping at Ceiling Penetrations in Finished Spaces:
    - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
  6. Bare Piping in Unfinished Service Spaces:

- a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
- 7. Bare Piping in Equipment Rooms:
  - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
- B. Install floor plates for piping penetrations of equipment room floors.
- C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
  - 1. New Piping and Relocated Existing Piping: One piece, floor plate.

**END OF SECTION 210500**

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**SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Two-piece ball valves with indicators.
2. Iron butterfly valves with indicators.
3. Check valves.
4. Iron OS&Y gate valves.
5. NRS gate valves.
6. Indicator posts.
7. Trim and drain valves.

**1.2 DEFINITIONS**

- A. NRS: Non-rising stem.
- B. OS&Y: Outside screw and yoke.
- C. SBR: Styrene-butadiene rubber.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of valve.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  1. Protect internal parts against rust and corrosion.
  2. Protect threads, flange faces, and weld ends.
  3. Set valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.
- D. Protect flanges and specialties from moisture and dirt.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:
  1. Fire Main Equipment: HAMV - Main Level.
    - a. Indicator Posts, Gate Valve: HCBZ - Level 1.
    - b. Ball Valves, System Control: HLUG - Level 3.
    - c. Butterfly Valves: HLXS - Level 3.
    - d. Check Valves: HMER - Level 3.
    - e. Gate Valves: HMRZ - Level 3.
  2. Sprinkler System and Water Spray System Devices: VDGT - Main Level.
    - a. Valves, Trim and Drain: VQGU - Level 1.
- B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:
  1. Automated Sprinkler Systems:
    - a. Indicator posts.
    - b. Valves:
      - 1) Gate valves.
      - 2) Check valves.
      - 3) Miscellaneous valves.

- C. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded-end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B31.9 for building services piping valves.
- D. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- E. NFPA Compliance for Valves:
  - 1. Comply with NFPA 13, NFPA 14, NFPA 20, and NFPA 24.
- F. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher, as required by system pressures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. Valve Actuator Types:
  - 1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
  - 2. Handwheel: For other than quarter-turn trim and drain valves.
  - 3. Handlever: For quarter-turn trim and drain valves NPS 2 and smaller.

## 2.3 TWO-PIECE BALL VALVES WITH INDICATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Ames Fire & Waterworks; A Watts Water Technologies Company.
  - 2. NIBCO, INC.
  - 3. Victaulic Company.
- B. Description:
  - 1. UL 1091, except with ball instead of disc and FM Global approved for indicating valves (butterfly or ball type), Class Number 1112.
  - 2. Minimum Pressure Rating: 175 psig.
  - 3. Body Design: Two piece.
  - 4. Body Material: Forged brass or bronze.
  - 5. Port Size: Full or standard.
  - 6. Seats: PTFE.
  - 7. Stem: Bronze or stainless steel.
  - 8. Ball: Chrome-plated brass.
  - 9. Actuator: Worm gear.
  - 10. Supervisory Switch: Internal or external.

11. End Connections for Valves NPS 1 through NPS 2: Threaded ends.
12. End Connections for Valves NPS 2-1/2: Grooved ends.

## 2.4 IRON BUTTERFLY VALVES WITH INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ALEUM USA.
2. Anvil; an ASC Engineered Solution.
3. Globe Fire Sprinkler Corporation.
4. Kennedy Valve Company; a division of McWane, Inc.
5. NIBCO, INC.
6. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
7. Victaulic Company.
8. Zurn Industries, LLC.

B. Description:

1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
2. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
4. Seat Material: EPDM.
5. Stem: Stainless steel.
6. Disc: Ductile iron.
7. Actuator: Worm gear.
8. Supervisory Switch: Internal or external.
9. Body Design: Lug or wafer.

## 2.5 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ALEUM USA.
2. FEBCO; A WATTS Brand.
3. Globe Fire Sprinkler Corporation.
4. Matco-Norca.
5. Mueller Co. LLC; Mueller Water Products, Inc.
6. NIBCO, INC.
7. Reliable Automatic Sprinkler Co., Inc. (The).

8. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
9. Victaulic Company.
10. Viking Group, Inc.
11. WATTS; A Watts Water Technologies Company.
12. Zurn Industries, LLC.
13. Kennedy Valve Company; a division of McWane, Inc.

B. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless steel with elastomeric seal.
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.6 IRON OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Cast Iron Pipe Company.
2. Clow Valve Company; a subsidiary of McWane, Inc.
3. Hammond Valve.
4. Mueller Co. LLC; Mueller Water Products, Inc.
5. NIBCO, INC.
6. Victaulic Company.
7. WATTS; A Watts Water Technologies Company.
8. Zurn Industries, LLC.
9. Kennedy Valve Company; a division of McWane, Inc.

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze.
5. Wedge Seat: Cast or ductile iron, or bronze.
6. Stem: Brass or bronze.

7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Grooved.

## 2.7 NRS GATE VALVES

### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Cast Iron Pipe Company.
2. Clow Valve Company; a subsidiary of McWane, Inc.
3. Mueller Co. LLC; Mueller Water Products, Inc.
4. NIBCO, INC.
5. Victaulic Company.
6. Zurn Industries, LLC.
7. Kennedy Valve Company; a division of McWane, Inc.

### B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron.
5. Wedge Seat: Cast or ductile iron, or bronze.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Grooved.

## 2.8 INDICATOR POSTS

### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Cast Iron Pipe Company.
2. Clow Valve Company; a subsidiary of McWane, Inc.
3. Mueller Co. LLC; Mueller Water Products, Inc.
4. NIBCO, INC.
5. Kennedy Valve Company; a division of McWane, Inc.

### B. Description:

1. Standard: UL 789 and FM Global standard for indicator posts.
2. Type: Upright.

3. Base Barrel Material: Cast or ductile iron.
4. Extension Barrel: Cast or ductile iron.
5. Cap: Cast or ductile iron.
6. Operation: Wrench.

## 2.9 TRIM AND DRAIN VALVES

### A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
  - b. Flowserve Corporation.
  - c. Jomar Valve.
  - d. KITZ Corporation.
  - e. Milwaukee Valve Company.
  - f. NIBCO, INC.
  - g. Potter Roemer LLC; a Division of Morris Group International.
  - h. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
  - i. Victaulic Company.
  - j. WATTS; A Watts Water Technologies Company.
  - k. Zurn Industries, LLC.
2. Description:
  - a. Pressure Rating: 175 psig.
  - b. Body Design: Two piece.
  - c. Body Material: Forged brass or bronze.
  - d. Port size: Full or standard.
  - e. Seats: PTFE.
  - f. Stem: Bronze or stainless steel.
  - g. Ball: Chrome-plated brass.
  - h. Actuator: Handlever.
  - i. End Connections for Valves NPS 1 through NPS 2-1/2: Threaded ends.
  - j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2: Grooved ends.

### B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fire Protection Products Inc (FPPI); a brand of Anvil International and Smith-Cooper International.
  - b. NIBCO, INC.

- c. United Brass Works, Inc.
- 2. Description:
  - a. Pressure Rating: 175 psig.
  - b. Body Material: Brass or bronze.
  - c. Ends: Threaded.
  - d. Stem: Bronze.
  - e. Disc: Bronze.
  - f. Packing: Asbestos free.
  - g. Handwheel: Malleable iron, bronze, or aluminum.
- C. Globe Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. NIBCO, INC.
    - b. United Brass Works, Inc.
  - 2. Description:
    - a. Pressure Rating: 175 psig.
    - b. Body Material: Bronze with integral seat and screw-in bonnet.
    - c. Ends: Threaded.
    - d. Stem: Bronze.
    - e. Disc Holder and Nut: Bronze.
    - f. Disc Seat: Nitrile.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron, bronze, or aluminum.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.



- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 INSTALLATION, GENERAL

- A. Comply with requirements in the following Sections for specific valve-installation requirements and applications:
  - 1. Section 211000 "Water-Based Fire-Suppression Systems" for application of valves in fire-suppression standpipes; wet-pipe, fire-suppression sprinkler systems; and dry-pipe, fire-suppression sprinkler systems.
- 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. Install double-check valve assembly in each fire-protection water-supply connection.
- D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the pipe center.
- F. Install valves in position to allow full stem movement.
- G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

**END OF SECTION 210523**

**SECTION 210529 - HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND 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. Metal pipe hangers and supports.
- 2. Trapeze pipe hangers.
- 3. Metal framing systems.
- 4. Fastener systems.
- 5. Equipment supports.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
  - 3. Equipment supports.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.

**1.5 QUALITY ASSURANCE**

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.
- B. Structural Performance: Hangers and supports for fire-suppression piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7-10.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.
- C. NFPA Compliance: Comply with NFPA 13.
- D. UL Compliance: Comply with UL 203.

**2.2 METAL PIPE HANGERS AND SUPPORTS**

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot-dip galvanized.
  - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

## 2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with NFPA-approved, UL-listed, or FM-approved carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.4 METAL FRAMING SYSTEMS

## A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cooper B-line; brand of Eaton, Electrical Sector.
  - b. Flex-Strut, Inc.
  - c. G-Strut.
  - d. Haydon Corporation.
  - e. Unistrut; Atkore International.
  - f. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
8. Metallic Coating: Plain.

## B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ABB, Electrification Business.
  - b. Cooper B-line; brand of Eaton, Electrical Sector.
  - c. Flex-Strut, Inc.
  - d. G-Strut.
  - e. Haydon Corporation.
  - f. Unistrut; Atkore International.
  - g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Select for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
8. Metallic Coating: Plain.

## 2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Not acceptable.
- B. Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM-approved, insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cooper B-line; brand of Eaton, Electrical Sector.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - e. MKT Fastening, LLC.
  2. Indoor Applications: Zinc-coated steel.
  3. Outdoor Applications: Stainless steel.

## 2.6 EQUIPMENT SUPPORTS

- A. Description: NFPA-approved, UL-listed, or FM-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

## 2.7 MATERIALS

- A. Aluminum: ASTM B221.
- B. Carbon Steel: ASTM A1011/A1011M.

- C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A240/A240M.
- E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout, suitable for interior and exterior applications.
  - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
- F. Dovetail Deck Hanger:
  - 1. Epic Wedge Bolt/Nut.
  - 2. New Millenium Versa Wedge.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

#### 3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
  - 2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal strut systems.
- D. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
  - 1. Install powder-actuated fasteners are not acceptable.
  - 2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Install in accordance with approvals and listings.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - a. MSS SP-58, Type 39 Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - a. MSS SP-58, Type 40 Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
  - b. NPS 4: 12 inches long and 0.06 inch thick.
  - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
  - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
  - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

### 3.3 INSTALLATION OF EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.



- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

### 3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.6 PAINTING

- A. Touchup:
1. Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    - a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

### 3.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with NFPA requirements for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.
- F. Use thermal hanger-shield inserts for insulated piping and tubing.
- G. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
  2. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 if little or no insulation is required.
  3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8.
  4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8.
  5. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3.
  6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
  7. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
  8. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
  9. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
- H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- I. Hanger-Rod Attachments: Comply with NFPA requirements.
- J. Building Attachments: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. C-Clamps (MSS Type 23): For structural shapes.
  3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- K. Saddles and Shields: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.
- L. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

**END OF SECTION 210529**

**SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION  
PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Elastomeric hangers.
2. Mechanical anchor bolts.
3. Concrete inserts.

**B. Related Requirements:**

1. Section 220548 "Vibration Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
2. Section 230548 "Vibration Controls for HVAC" for devices for HVAC equipment and systems.

**1.2 DEFINITIONS****A. IBC: International Building Code.****B. OSHPD: Office of Statewide Health Planning and Development (for the State of California).****1.3 ACTION SUBMITTALS****A. Product Data: For each type of product.**

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component.
3. Annotate to indicate application of each product submitted and compliance with requirements.
4. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

**B. Shop Drawings:**

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittal:

1. Include design calculations and details for selecting vibration isolators complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified Professional Engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show coordination of seismic bracing for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For Professional Engineer and testing agency.
- C. Welding certificates.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to Authorities Having Jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- C. Seismic-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and Authorities Having Jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: ICC-ES product listing or an agency acceptable to Authorities Having Jurisdiction.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Professional Engineer, as defined in Section 014000 "Quality Requirements," to design wind-load-restraint system.

### 2.2 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Ace Mountings Co., Inc.
    - b. California Dynamics Corporation.
    - c. Kinetics Noise Control, Inc.
    - d. Mason Industries, Inc.
    - e. Novia; A Division of C&P.
    - f. Vibration Mountings & Controls, Inc.
  2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
  3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

### 2.3 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. B-line, an Eaton business.
  2. Hilti, Inc.
  3. Mason Industries, Inc.

4. Powers Fasteners.
  5. Simpson Strong-Tie Co., Inc.
  6. Unistrut; Part of Atkore International.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
- C. Expansion-type anchor bolts are not permitted by ASCE/SEI 7 for non-isolated equipment in excess of 10 hp.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to Authorities Having Jurisdiction.
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry calculated static and seismic loads within specified loading limits.

#### 3.3 INSTALLATION OF VIBRATION CONTROL DEVICES

- A. Installation of vibration isolators must not cause any stresses, misalignment, or change of position of equipment or piping.
- B. Equipment Restraints:

1. Install snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
  2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
- C. Piping Restraints:
1. Comply with requirements in MSS SP-127.
  2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
  3. Brace a change of direction longer than 12 feet.
- D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- G. Post-Installed Concrete Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural Engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors to be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
  5. Set anchors to manufacturer's recommended torque, using a torque wrench.
  6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.



**3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
  - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to Authorities Having Jurisdiction.
  - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
  - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
  - 4. Test at no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
  - 5. Test to 90 percent of rated proof load of device.
  - 6. Measure isolator restraint clearance.
  - 7. Measure isolator deflection.
  - 8. Verify snubber minimum clearances.
- D. Prepare test and inspection reports.

**END OF SECTION 210548**

**SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Valve tags.
  - 5. Warning tags.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.
- D. Valve-numbering scheme.
- E. Valve Schedules: Provide for fire-suppression piping system. Include in operation and maintenance manuals.

**PART 2 - PRODUCTS****2.1 EQUIPMENT LABELS**

- A. Plastic Labels for Equipment:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Brady Corporation.
    - b. Carlton Industries, LP.
    - c. Champion America.

- d. Craftmark Pipe Markers.
    - e. Kolbi Pipe Marker Co.
    - f. LEM Products, Inc.
  - 2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
  - 3. Letter and Background Color: As indicated for specific application under Part 3.
  - 4. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
  - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 7. Fasteners: Stainless steel rivets or self-tapping screws.
  - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

## 2.2 WARNING SIGNS AND LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Brady Corporation.
  - 2. Carlton Industries, LP.
  - 3. Champion America.
  - 4. Craftmark Pipe Markers.
  - 5. LEM Products, Inc.
  - 6. Marking Services, Inc.
  - 7. National Marker Company.
  - 8. Pipemarker.com; Brimar Industries, Inc.
  - 9. Seton Identification Products; a Brady Corporation company.
  - 10. Stranco, Inc.
  - 11. emedco.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
- C. Letter and Background Color: As indicated for specific application under Part 3.
- D. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.

- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
  - 2. Brady Corporation.
  - 3. Carlton Industries, LP.
  - 4. Champion America.
  - 5. Craftmark Pipe Markers.
  - 6. Kolbi Pipe Marker Co.
  - 7. LEM Products, Inc.
  - 8. Marking Services, Inc.
  - 9. Pipemarker.com; Brimar Industries, Inc.
  - 10. Seton Identification Products; a Brady Corporation company.
  - 11. emedco.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.
- C. Letter and Background Color: As indicated for specific application under Part 3.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include the following:
  - 1. Flow-Direction Arrows: Include flow-direction arrows on main distribution piping. Arrows may be either integral with label or applied separately.
  - 2. Lettering Size: Size letters in accordance with ASME A13.1 for piping.

## 2.4 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
  2. Brady Corporation.
  3. Carlton Industries, LP.
  4. Champion America.
  5. Craftmark Pipe Markers.
  6. Kolbi Pipe Marker Co.
  7. LEM Products, Inc.
  8. Marking Services, Inc.
  9. Pipemarker.com; Brimar Industries, Inc.
  10. Seton Identification Products; a Brady Corporation company.
  11. emedco.
- B. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.
1. Tag Material: stainless steel, 0.024 inch thick, with predrilled or stamped holes for attachment hardware.
  2. Fasteners: Brass beaded chain.
- C. Letter and Background Color: As indicated for specific application under Part 3.
- D. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Include valve-tag schedule in operation and maintenance data.

## 2.5 WARNING TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady Corporation.
  2. Champion America.
  3. Craftmark Pipe Markers.
  4. Kolbi Pipe Marker Co.
  5. LEM Products, Inc.
  6. Marking Services, Inc.
  7. Pipemarker.com; Brimar Industries, Inc.

8. Seton Identification Products; a Brady Corporation company.
  9. emedco.
- B. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches minimum.
  2. Fasteners: Reinforced grommet and wire or string.
  3. Nomenclature: Large-size primary caption, such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  4. Letter and Background Color: As indicated for specific application under Part 3.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

#### 3.2 INSTALLATION GENERAL REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.
- D. Locate identifying devices so that they are readily visible from the point of normal approach.
- E. Paint all exposed fire protection piping in finished spaces per Architect's selected finish. Refer to Division 09 specifications. Piping not exposed or located in unfinished rooms to not be painted.

#### 3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

- A. Permanently fasten labels on each item of fire-suppression equipment.
- B. Locate equipment labels where accessible and visible.

- C. Entrance Doors: Install metal or rigid plastic signage for sprinkler riser rooms and fire pump rooms accordingly starting from main corridor.
- D. Fire Department Connections: All FDCs will be provided with signage using Red Reflective letters on White reflective background.

### 3.4 INSTALLATION OF PIPE LABELS

- A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.
- B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit a view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Flow- Direction Arrows: Provide arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Fire-Suppression Pipe Label Color Schedule:
  - 1. Fire-Suppression Pipe Labels: White letters on an ANSI Z535.1 safety-red background.

### 3.5 INSTALLATION OF VALVE TAGS

- A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule in the operating and maintenance manual. Include the identification "FSV" on all fire-suppression system valve tags.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" subparagraph below.

1. Valve-Tag Size and Shape:
    - a. Wet-Pipe Sprinkler System: 1-1/2 inches, round.
    - b. Dry-Pipe Sprinkler System: 1-1/2 inches, round.
  2. Valve-Tag Color: White letters on an ANSI Z535.1 safety-red background.
  - C. Zone control valves to be clearly marked with sign indicating the area of the building that is served by the valve, safety, and area coverage information.
- 3.6 INSTALLATION OF WARNING TAGS
- A. Warning Tag Color: Black letters on an ANSI Z535.1 safety-yellow background.
  - B. Attach warning tags, with proper message, to equipment and other items where required.

**END OF SECTION 210553**



**SECTION 211000 - WATER-BASED FIRE-SUPPRESSION SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Fire-suppression piping, fittings, and appurtenances.
2. Fire department connections.
3. Hose connections and hose stations.
4. System control valves.
5. Dry-sprinkler system
6. Fire-suppression piping specialties.
7. Cover systems for sprinkler piping.
8. Sprinklers.
9. Alarm devices.
10. Manual control stations.
11. Control panels.
12. Pressure gauges.

**B. Related Requirements:**

1. Section 331415 "Site Water Distribution Piping" for site fire-suppression water-service and backflow prevention devices.

**1.2 DEFINITIONS**

- A. Standard-Pressure Fire-Suppression System Piping: Piping designed to operate at working pressure of 175 psig maximum.

**1.3 ACTION SUBMITTALS****A. Product Data:**

1. For each type of product.
  - a. Include construction details, material descriptions, dimensions of individual components and profiles.
  - b. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

**B. Shop Drawings:**

1. Prepare in accordance with NFPA 13, NFPA 14 AND NFPA 20
  - a. Include plans, elevations, and sections of the system piping and details.
  - b. Include detailed riser diagram and schematic diagram showing system supply, supply connection, devices, valves, pipe and fittings, as well as the delineation of the standard-pressure and high-pressure portions of the fire-suppression system.
- C. Delegated Design Submittals: For fire-suppression systems indicated to comply with performance requirements and design criteria, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation (licensed in the state of the project).
- D. Sprinkler Contractor to submit state approved shop drawings to IU Engineering services and IU Office of Insurance, Loss Controls & Claims (INLOCC) prior to installation of any fire protection work. All shop drawings and submittals shall be in electronic format and shall be routed through IU Engineering Services.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Fire-suppression system plans and sections, or Building Information Model (BIM), drawn to scale, showing the items described in this Section and coordinated with all building trades.
- B. Seismic Qualification Certificates: For fire-suppression equipment, 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.
- C. Qualification Data: For qualified Installer and professional engineer.
- D. Design Data: Approved fire-suppression piping working plans, prepared in accordance with NFPA 13, including documented approval by AHJs, and including hydraulic calculations if applicable.
- E. Welding certificates.
- F. Field Test Reports:
  1. 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."

2. Fire-hydrant flow test report.

G. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-suppression systems and specialties to include in emergency, operation, and maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project. Location to be approved by INLOCC.

#### 1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code.

C. DDC System Provider Qualifications:

1. In-place facility located within 100 Miles of Project.
2. Demonstrate past experience with installation of DDC system products being installed for period within five consecutive years before time of bid.
3. Demonstrate past experience on five projects of similar complexity, scope, and value.
4. Demonstrate past experience of each person assigned to Project.

## PART 2 - PRODUCTS

## 2.1 SYSTEM DESCRIPTION

- A. Automatic wet-type, Class I standpipe system.
- B. Automatic combination wet-type standpipe sprinkler system.
- C. Automatic wet-pipe sprinkler system.
- D. Automatic dry-pipe sprinkler.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Suppression System Components, Devices, and Accessories: Listed in UL's "Fire Protection Equipment Directory" and FM Approvals' "Approval Guide."
- 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. Fire-suppression system equipment, specialties, accessories, installation, and testing to comply with NFPA 13
- D. Standard-Pressure Piping System Component: Listed for 175 psig minimum working pressure.
- E. Delegated Design: Engage a qualified professional engineer to design fire-suppression systems.
  - 1. Fire-Hydrant Flow Test: Refer to drawings
    - a. Fire-hydrant flow test must be performed within previous 12 months prior to completion of design documents and hydraulic calculations.
  - 2. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers.
  - 3. Sprinkler Occupancy Hazard Classifications: Refer to NFPA 13 codes
  - 4. Minimum Density for Automatic-Sprinkler Piping Design: Refer to NFPA codes for density for different hazard types.
    - a. Light-Hazard Occupancy: 0.10 gpm/sq. ft. over 1500 sq. ft.area.
    - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm/sq. ft. over 1500 sq. ft. area.
  - 5. Maximum Protection Area per Sprinkler:

- a. Office Spaces: 225 sq. ft.
  - b. Storage Areas: 130 sq. ft.
  - c. Mechanical Equipment Rooms: 130 sq. ft.
  - d. Electrical Equipment Rooms: 130 sq. ft.
  - e. Other Areas: In accordance with NFPA 13 recommendations unless otherwise indicated.
- F. Obtain documented approval of fire-suppression system design from AHJs.

## 2.3 FIRE-SUPPRESSION PIPING, FITTINGS, AND APPURTENANCES

### A. Steel Pipe, Fittings, and Appurtenances:

1. Schedule 40 Steel Pipe: Black-steel pipe, ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M.
  - a. Standards:
    - 1) UL 852.
    - 2) FM 1630.
  - b. Factory-applied exterior coating.
  - c. Factory-applied bacterial-resistant internal coating to reduce microbiologically influenced corrosion.
  - d. Pipe ends may be factory or field formed to match joining method.
2. Steel Pipe Nipples: Black steel, ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.
3. Steel Couplings: Galvanized steel, ASTM A865/A865M, threaded.
4. Gray-Iron Threaded Fittings: Galvanized gray-iron threaded fittings, ASME B16.4, Class 125, standard pattern.
5. Malleable- or Ductile-Iron Unions: ASME B16.3.
6. Cast-Iron Flanges: ASME B16.1, Class 125.
7. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
  - a. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick
    - 1) Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
    - 2) Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.
  - b. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1 carbon steel unless otherwise indicated.
8. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

- a. 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.
- 9. Plain-End-Pipe Fittings:
  - a. Pressure Rating: 175 psig minimum.
  - b. Plain-End Fittings for Steel Piping: Galvanized plain-end fittings, ASTM A53/A53M, carbon steel or ASTM A106/A106M, forged steel with dimensions matching steel pipe.
  - c. Plain-End-Pipe Couplings for Steel Piping: Rigid pattern for steel-pipe dimensions, ductile-iron or malleable-iron housing. Include EPDM-rubber gasket, and bolts and nuts.
- 10. Grooved-Joint, Steel-Pipe Appurtenances:
  - a. Pressure Rating: 175 psig minimum.
  - b. Grooved-End Fittings for Steel Piping: Galvanized grooved-end fittings, ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
  - c. 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.
  - d. Single bolt groove fittings are not acceptable.
- 11. Fittings for Grooved-End, Stainless Steel Pipe:
  - a. Source Limitations: Obtain appurtenance for grooved-end, stainless steel pipe from single manufacturer.
- 12. Mechanical Couplings for Grooved-End, Stainless Steel Pipe:
  - a. AWWA C606 for stainless steel pipe dimensions.
  - b. Stainless steel housing sections.
  - c. Stainless steel bolts and nuts.
  - d. EPDM-rubber gaskets suitable for hot and cold water.
  - e. Minimum Pressure Rating:
    - 1) NPS 8 (DN 200) and Smaller: 600 psig.
    - 2) NPS 10 and NPS 12 (DN 250 to DN 300): 400 psig.
    - 3) NPS 14 to NPS 24 (DN 350 to DN 600): 250 psig.

## 2.4 FIRE DEPARTMENT CONNECTIONS

- A. Fire Department Connection, Yard type:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Elkhart Brass Mfg. Co., Inc.
2. Fire Protection Products, Inc.
3. Fire-End & Croker Corporation.
4. Potter Roemer LLC; a Division of Morris Group International.
5. Standard: UL 405.
6. Description: Exposed, freestanding.
7. Pressure Rating: 175 psig minimum.
8. Body Material: Corrosion-resistant metal.
9. Inlets: Brass with threads in accordance with NFPA 1963 and matching local fire department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
10. Caps: Brass, lugged type, with gasket and chain.
11. Escutcheon Plate: Rectangular, brass, floor type.
12. Outlet: Bottom, with pipe threads.
13. Body Style: Horizontal.
14. Number of Inlets: Coordinate with AHJ.
15. Escutcheon Plate Marking: "AUTO SPKR & STANDPIPE."
16. Finish: Polished chrome-plated.
17. Outlet Size: Coordinate with AHJ.

## 2.5 HOSE CONNECTIONS AND HOSE STATIONS

A. Hose Connections, Adjustable Valve:

1. Standards:
  - a. UL 668.
  - b. UL 1468.
2. Description: Fire hose valve, with integral reducing or restricting pressure-control device, for connecting fire hose.
3. Pressure Rating: 175 psig maximum inlet.
4. Material: Brass or bronze.
5. Size: NPS 1-1/2 or 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 in accordance with NFPA 1963 and matching local fire department threads.
8. Pattern: Angle or gate.
9. Pressure-Control Device Type: Pressure reducing.
10. Finish: Polished chrome-plated.

## 2.6 SYSTEM CONTROL VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Globe Fire Sprinkler Corporation.
    - b. Reliable Automatic Sprinkler Co., Inc. (The).
    - c. Tyco by Johnson Controls Company.
    - d. Venus Fire Protection Ltd.
    - e. Viking Corporation.
- B. Pressure Rating:
  - 1. Standard-Pressure Piping Valves: 175 psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. System Control Valve, Alarm Valve:
  - 1. Standard: UL 193.
  - 2. Design: For horizontal or vertical installation.
  - 3. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gauges, and fill-line attachment with strainer.

## 2.7 FIRE-SUPPRESSION PIPING SPECIALTIES

- A. Branch Outlet Fittings:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Engineered Corrosion Solutions.
    - 2) Gast Manufacturing, Inc.
    - 3) General Air Products, Inc.
    - 4) Viking Corporation.
  - 2. Standard: UL 213.
  - 3. Pressure Rating: 175 psig minimum.
  - 4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
  - 5. Type: Mechanical-tee 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, provide products by one of the following:
  - a. AGF Manufacturing, Inc.
  - b. Reliable Automatic Sprinkler Co., Inc. (The).
  - c. Tyco by Johnson Controls Company.
  - d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
3. Pressure Rating: 175 psig minimum.
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 or grooved.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AGF Manufacturing, Inc.
  - b. Elkhart Brass Mfg. Co., Inc.
  - c. Fire-End & Croker Corporation.
  - d. Potter Electric Signal Company, LLC.
  - e. Potter Roemer LLC; a Division of Morris Group International.
2. Standard: UL 199.
3. Pressure Rating: 175 psig.
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, provide products by one of the following:
  - a. AGF Manufacturing, Inc.

- b. Triple R Specialty.
    - c. Tyco by Johnson Controls Company.
    - d. Victaulic Company.
    - e. Viking Corporation.
  - 2. Standard: UL's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
  - 3. Pressure Rating: 175 psi minimum.
  - 4. Body Material: Cast- or ductile-iron housing with sight glass.
  - 5. Size: Same as connected piping.
  - 6. Inlet and Outlet: Threaded.
- E. Adjustable Drop Nipples:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aegis Technologies, Inc.
    - b. CECA, LLC.
    - c. CPS Products, Inc.
    - d. Merit Manufacturing.
  - 2. Standard: UL 1474.
  - 3. Pressure Rating: 250 psig minimum.
  - 4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
  - 5. Size: Same as connected piping.
  - 6. Length: Adjustable.
  - 7. Inlet and Outlet: Threaded.
- F. Flexible Sprinkler Hose Fittings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ALEUM USA.
    - b. FlexHead Industries, Inc.
    - c. Gateway Tubing, Inc.
    - d. Victaulic Company.
  - 2. Standards:
    - a. UL 2443.
    - b. FM 1637.
  - 3. Description: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
  - 4. Pressure Rating: 175 psig minimum.
  - 5. Size: Same as connected piping, for sprinkler.

## G. Automatic (Ball-Drip) Drain Valves:

1. Pressure Rating: 175 psig minimum.
2. Type: Automatic draining, ball check.
3. Size: NPS 3/4.
4. End Connections: Threaded.

## H. Manual Air Vent/Valve:

1. Description: Ball valve that requires human intervention to vent air.
2. Body: Forged brass.
3. Ends: Threaded.
4. Minimize Size: 1/2 inch.
5. Minimum Water Working Pressure Rating: 300 psig.

## I. Automatic Air Vent:

1. Description: Automatic air vent that automatically vents trapped air without human intervention. Approved for use in wet-pipe fire-suppression system.
2. Vents oxygen continuously from system.
3. Float valve to prevent water discharge.
4. Minimum Water Working Pressure Rating: 175 psig.

## J. Automatic Air Vent Assembly:

1. Description: Automatic air vent assembly that automatically vents trapped air without human intervention, including Y-strainer and ball valve in a pre-piped assembly. Approved for use in wet-pipe fire-suppression system.
2. Vents oxygen continuously from system.
3. Float valve to prevent water discharge.
4. Minimum Water Working Pressure Rating: 175 psig.

## 2.8 SPRINKLERS

## A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. SprinkGuard.
4. Tyco by Johnson Controls Company.
5. Victaulic Company.
6. Viking Corporation.

## B. Standards:

1. UL 199.
  2. UL 1767.
  3. UL 1626.
  4. FM 2000.
  5. FM 2008.
  6. FM 2030.
- C. Listed in UL's "Fire Protection Equipment Directory" or FM Approvals' "Approval Guide."
- D. Pressure Rating for Sprinklers:
1. Standard Automatic Sprinklers: 175 psig minimum.
- E. Sprinklers, Automatic Wet with Heat-Responsive Element:
1. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
  2. Standard Spray, Standard Response:
    - a. Upright.
    - b. Pendent.
    - c. Recessed pendent.
    - d. Flat, concealed pendent.
    - e. Vertical sidewall.
    - f. Horizontal sidewall.
  3. Standard Spray, Quick Response:
    - a. Upright.
    - b. Pendent.
    - c. Recessed pendent.
    - d. Flat, concealed pendent.
    - e. Vertical sidewall.
    - f. Horizontal sidewall.
    - g. Flat, concealed horizontal sidewall.
  4. Extended Coverage:
    - a. Upright.
    - b. Pendent.
    - c. Flat, concealed pendent.
    - d. Horizontal sidewall.
    - e. Flat, concealed horizontal sidewall.
- F. Special Sprinklers:

1. Attic.
2. Combustible, concealed.
3. ESFR.
4. Flat spray.
5. Hallway.
6. Institutional.
7. MRI/Non-Ferrous, concealed.
8. Window.

G. Open Sprinklers and Nozzles:

1. Nominal Orifice:
  - a. 1/2 inch, with discharge coefficient K between 5.3 and 5.8.
  - b. 17/32 inch with discharge coefficient K between 7.4 and 8.2.

H. Sprinkler Finishes: Chrome-plated and painted. Sprinklers in finished spaces shall be concealed type with cover plate. Coordinate sprinkler cover plate color in each space with architecture.

I. Special Coatings: Wax and corrosion-resistant paint.

J. 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: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel.

K. Sprinkler Guards and Water Shields:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Reliable Automatic Sprinkler Co., Inc. (The).
  - b. Tyco by Johnson Controls Company.
  - c. Victaulic Company.
  - d. Viking Corporation.
2. Standard: UL 199.
3. Description: Wire cage with fastening device for attaching to sprinkler.

2.9 ALARM DEVICES

A. Match alarm-device material and connection types to piping and equipment materials and connection types.

## B. Electrically-Operated Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fire-Lite Alarms; Honeywell International, Inc.
  - b. Notifier; Honeywell International, Inc.
  - c. Potter Electric Signal Company, LLC.
2. Electric Bell:
  - a. Standard: UL 464.
  - b. Type: Vibrating, metal alarm bell.
  - c. Size: 6-inch minimum-diameter.
  - d. Voltage: 24 V dc.
  - e. Finish: Red-enamel or polyester powder-coat factory finish, suitable for outdoor use with approved and listed weatherproof backbox.
3. Strobe/Horn:
  - a. Standard: UL 464.
  - b. Tone: Selectable, steady, Temporal-3 (T-3) in accordance with ISO 8201 and ANSI/ASA S3.41, 2400 Hz, electromechanical, broadband.
  - c. Voltage: 120 V ac, 60 Hz.
  - d. Effective Intensity: 110 cd.
  - e. Finish: Red, suitable for outdoor use with approved and listed weatherproof backbox. White letters on housing identifying device as for "Fire."
  - f. Sign, Integrated: Mount between backbox and strobe/horn with text visible on both sides, above and below strobe/horn. Housing to be shaped to cover surface-mounted weatherproof backbox. Sign is to consist of white lettering on red plastic identifying it as a "Sprinkler Fire Alarm" and instructing viewers to call 911, police or fire department.

## C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ADT Security Services, Inc.
  - b. McDonnell & Miller.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor.
  - e. Viking Corporation.
  - f. WATTS.
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.

D. Pressure Switches - Water-Flow Alarm Detection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Barksdale, Inc.
  - b. Detroit Switch, Inc.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor.
  - e. Tyco by Johnson Controls Company.
  - f. United Electric Controls Co.
  - g. Viking Corporation.
2. Description: Electrically supervised, pressure-activated water-flow switch with retard feature.
3. Components: Two single-pole, double-throw switches with normally closed contacts.
4. Design Operation: Rising pressure to 6 psi, plus or minus 2 psi signals water flow.
5. Adjustability: Each switch is to be independently adjustable.
6. Wire Separation: Pressure switch to provide for separation of wiring to each switch connection to allow for low- and high-voltage connections to comply with NFPA 70, Article 760 requirements.

E. Pressure Switches - Low/High Air Pressure Supervisory:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Barksdale, Inc.
  - b. Detroit Switch, Inc.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor.
  - e. Tyco by Johnson Controls Company.
  - f. United Electric Controls Co.
  - g. Viking Corporation.
2. Description: Electrically supervised pressure supervisory switch.
3. Components: Two single-pole, double-throw switches.

4. Design Operation: Detects increase and/or decrease from normal supervisory air pressure.
5. Adjustability: Each switch is to be independently adjustable.
6. Wire Separation: Pressure switch to provide for separation of wiring to each switch connection to allow for low- and high-voltage connections to comply with NFPA 70, Article 760 requirements.

F. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Fire-Lite Alarms; Honeywell International, Inc.
  - b. Kennedy Valve Company; a division of McWane, Inc.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Design: Signals that controlled valve is in other than fully open position.
5. Wire Terminal Designations: Indicates normal switch position when switch is properly installed on valve and valve is fully open.
6. 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.
7. OS&Y Valve Supervisory Switches:
  - a. One or two single-pole, double-throw switches.
  - b. NEMA Rating: NEMA 4 and NEMA 6P enclosures suitable for mounting in any position indoors or outdoors.
  - c. Visual Switch Indication: Indicates device is properly installed and OS&Y valve is fully open.
  - d. Mounting Hardware: Mounting bracket to grip valve yoke and prevent movement of switch assembly on OS&Y valve.
  - e. Trip Rod Length: Adjustable.
8. Butterfly Valve Supervisory Switches:
  - a. Two single-pole, double-throw switches.
  - b. NEMA Rating: NEMA 4 and NEMA 6P enclosures suitable for mounting in any position indoors or outdoors.
  - c. Mounting Hardware: Removable nipple.
  - d. Trip Rod Length: Adjustable.
9. Ball Valve Supervisory Switches:
  - a. One single-pole, double-throw switch.



- b. NEMA Rating: NEMA 4 enclosure suitable for mounting in any position indoors or outdoors.
- c. Mounting Hardware: Suitable for mounting directly to pipe, ball valves, or backflow preventers sized from up to NPS 2.

G. Indicator-Post Supervisory Switches:

- 1. Type: Electrically supervised.
- 2. Components: Single-pole, double-throw switch with normally closed contacts.
- 3. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.10 PRESSURE GAUGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1. AGF Manufacturing, Inc.
- 2. AMETEK, Inc.
- 3. Ashcroft, Inc.
- 4. Brecco Corporation.
- 5. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0 to 250 psig minimum

E. Water System Piping Gauge: Include "WATER" or "AIR/WATER" label on dial face.

F. Air System Piping Gauge: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Refer to fire hydrant flow test on FP0.1 sheet. If the date of test is more than 12 months old, contractor shall be responsible for carrying out a new test.

- 1. Flow test is to be performed to meet the criteria established by NFPA 13 and NFPA 14.
- 2. Flow test is to be conducted in accordance with NFPA 291.
- 3. Test is to be performed during a period of ordinary demand for the water system.

- a. To obtain satisfactory test results of expected flow or rated capacities, sufficient discharge should be achieved to cause drop of at least 10 percent.
  4. Pitot readings are to be taken at the 2-1/2-inch orifice connection.
    5. The pitot reading is to range from 10 to 35 psig.
    6. Open additional hydrant outlets as needed to control pitot readings.
    7. The pitot pressure and corresponding residual pressure readings are to be taken consecutively as pressure fluctuates between a high number and low number.
  - B. Flow Test Data Written Report:
    1. Flow data report is to be written in accordance with NFPA 291.
    2. Flow data report is to include a copy of all flow data recorded during the test, including a site plan showing the tested fire hydrants with respect to the fire water service to the building. Site plan is to indicate which hydrant was flowed and which hydrant was used for pressure reading. Provide date of test, name of testing agency, and name of individual performing test.
  - C. Water Supply Curve: Provide water supply curve based on the lowest supply for a given set of test data. For a given residual pressure reading, the supply is to be graphed utilizing the corresponding pitot pressure/flow reading and static pressure reading.
  - D. Documentation is to include calibration certifications for gauges used in the flow tests. The certifications are to be from within the previous six (6) months from a reputable agency recognized for certifying pressure gauges.
  - E. Report flow test results promptly and in writing. A copy of the flow test data report is to be submitted with the hydraulic calculations.
- 3.2 INSTALLATION OF FIRE-SUPPRESSION WATER-SERVICE PIPING
- A. Comply with requirements for fire-suppression water-service piping in Section 331415 "Site Water Distribution Piping."
- 3.3 INSTALLATION OF DOMESTIC WATER-SUPPLY CONNECTIONS
- A. Connect fire-suppression water piping to building's interior domestic water-distribution piping. Comply with requirements for interior piping in Section 221116 "Domestic Water Piping."
  - B. Install shutoff valve, backflow preventer, pressure gauge, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements for backflow preventers in Section 331415 "Site Water Distribution Piping."

## 3.4 INSTALLATION OF FIRE-SUPPRESSION PIPING

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
  - 1. Deviations from approved working plans for piping require written approval from AHJs. File written approval with Architect before deviating from approved working plans.
  - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 and NFPA 14 requirements for installation of fire-suppression piping.
- C. Install 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 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install inspector's test connections in sprinkler system piping, complete with shutoff valve, and sized and located in accordance with NFPA 13.
- G. Install fire-suppression system piping with drains for complete system drainage. Extend drain piping to exterior of building where possible.
- 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 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 exterior of building.
- J. Install alarm devices in piping systems.
- K. Install hangers and supports for fire-suppression piping in accordance with NFPA standards. Comply with requirements for hanger materials in NFPA standards. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

- L. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe/sprinkler supply. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they are not subject to freezing.
- M. Pressurize and check dry-pipe standpipe or sprinkler system piping and air-pressure maintenance devices or air compressors.
- N. Fill wet-type fire-suppression system piping with water.
- O. Drain dry-type fire-suppression system piping.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210500 "Common Work Results for Fire-Suppression Piping."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210500 "Common Work Results for Fire-Suppression Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210500 "Common Work Results for Fire-Suppression Piping."

### 3.5 INSTALLATION OF PIPING JOINTS

- 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 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 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 in accordance with ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads in accordance with 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. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Welded Joints: Construct joints in accordance with AWS D10.12M/D10.12, using qualified processes and welding operators in accordance with "Quality Assurance" Article.
1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Steel-Piping, Cut-Grooved Joints: Not acceptable.
- L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe in accordance with AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings in accordance with AWWA C606 for steel-pipe grooved joints.
- M. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- 3.6 INSTALLATION OF FIRE DEPARTMENT CONNECTIONS
- A. Install pedestal-type fire department connections.
- B. Install automatic (ball-drip) drain valve at each check valve for fire department connection.
- 3.7 INSTALLATION OF HOSE CONNECTIONS AND HOSE STATIONS
- A. Examine roughing-in for hose connections and hose stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and hose stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Install hose connections adjacent to standpipes.

- E. Install freestanding hose connections and hose stations for access and minimum passage restriction.
- F. Install NPS 1-1/2 hose-connection and hose-station valves with flow-restricting device unless otherwise indicated.
- G. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device unless otherwise indicated.

### 3.8 INSTALLATION OF VALVES AND SPECIALTIES

- A. Install listed fire-suppression system control valves, trim and drain valves, specialty valves and trim, controls, and specialties in accordance with manufacturer's installation instructions, NFPA standards, and AHJ.
- B. Install listed fire-suppression system shutoff valves in supervised open position, 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. System Control Valves:
  - 1. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
  - 2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball-drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
    - a. Install air compressor and compressed-air-supply piping.
  - 3. Install deluge valves with trim sets for drain, priming level, alarm connections, ball-drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.
- D. Air Vent:
  - 1. Provide at least one air vent at high point in each wet-pipe fire-suppression system in accordance with NFPA standards. Connect vent into top of fire-suppression piping.
  - 2. Provide dielectric union for dissimilar metals, ball valve, and strainer upstream of automatic air vent.
  - 3. Pipe from outlet of air vent to drain.

## 3.9 INSTALLATION OF SPRINKLERS

- A. Install sprinklers in suspended ceilings symmetrically in center of acoustical ceiling panels within tolerance of 1/2 inch. Coordinate entire pattern of sprinkler locations with approved reflected ceiling plan.
- 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.

## 3.10 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping in accordance with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment."
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

## 3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. INLOCC must be notified at least 48 hours before required fire suppression system testing occurs (812-855-6241).
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 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 fire-suppression systems in accordance with NFPA standards.
  - 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.
  - 9. Verify that sprinklers original factory finish has not been contaminated with dirt, debris, or paint. Sprinklers containing other-than-original factory finish are to be considered defective and replaced with new products. Repair and/or cleaning is not acceptable.

- D. Fire-suppression piping system will be considered defective if it does not pass tests and inspections.
- E. Fire-suppression piping system components considered defective during testing will be replaced with new components. Repair of defective components is not acceptable.
- F. Prepare test and inspection reports.

### 3.12 CLEANING

- A. Clean dirt and debris from fire-suppression system piping, system control valves, sprinklers, and associated components.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

### 3.13 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain system control valves and pressure-maintenance pumps.

### 3.14 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 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. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2 (DN 50) and Smaller, to Be One of the Following:
  - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
- D. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), to Be One of the Following:
  - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  - 2. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.



3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
- E. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 5 (DN 125) and Larger, to Be One of the Following:
1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
  2. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
  3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

### 3.15 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
1. Rooms without Ceilings: Upright sprinklers.
  2. Rooms with Suspended Ceilings: Concealed sprinkler heads with cover plate.
  3. Wall Mounting: Concealed sprinkler heads with cover plate.
  4. Spaces Subject to Freezing: Upright sprinklers, dry pendent sprinklers, and dry sidewall sprinklers as indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
1. Upright, Pendent, and Sidewall Sprinklers: Chrome-plated in finished spaces exposed to view; rough bronze in unfinished spaces and locations not generally exposed to view; and wax coated where exposed to acids, chemicals, or other corrosive fumes.
  2. Recessed Sprinklers: As a part of submittal process, Contractor shall coordinate finishes of concealed cover plates with architecture.
  3. Flat Concealed Sprinklers: As a part of submittal process, Contractor shall coordinate finishes of concealed cover plates with architecture.
- C. Provide sprinkler guards for exposed sprinkler heads at:
1. Janitor closets.
  2. Athletics spaces.
  3. IT/data rooms.

**END OF SECTION 211000**

**SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Motors.
2. Packless expansion joints.
3. Grooved-joint expansion joints, lead free.
4. Alignment guides and anchors.
5. Sleeves without waterstop.
6. Sleeves with waterstop.
7. Stack-sleeve fittings.
8. Sleeve-seal systems.
9. Grout.
10. Escutcheons.
11. Thermometers, liquid in glass, lead free.
12. Thermowells, lead free.
13. Pressure gauges, dial type, lead free.
14. Gauge attachments, lead free.
15. Test plugs, lead free.
16. Test-plug kits, lead free.
17. Sight flow indicators, lead free.

**B. Related Requirements:**

1. Section 221119 "Domestic Water Piping Specialties" for water meters.
2. Section 018113.14 "Sustainable Design Requirements – LEEDv4 BD+C, New Construction" for sustainable design requirements applicable to this Project.

**1.2 ACTION SUBMITTALS****A. Product Data:**

1. For each type of product, excluding motors which are included in Part 1 of the plumbing equipment Sections.
  - a. Include construction details, material descriptions, and dimensions of individual components, and finishes.
  - b. Include operating characteristics and furnished accessories.

- B. Delegated Design Submittals: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
  - 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
  - 3. Alignment Guide Details: Detail field assembly and attachment to building structure.
  - 4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.
- C. Sustainable Design Submittals:
  - 1. Product Data: For sealants, indicating VOC content.
  - 2. Refer to Table 1-1 "Sustainable Design Requirements Supplement" for specific credit requirements associated with Work in this Specification Section.
- D. LEED Requirements:
  - 1. Refer to LEED v4.1 REQUIREMENTS for additional contract compliance requirements, including but not limited to, performance and submittal requirements that may apply to any product herein specified.

### **1.3 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.
- B. Field quality-control reports.
- C. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

### **1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each type of expansion joint, and gauge to include in operation and maintenance manuals.

### **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

- B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

## **1.6 COORDINATION**

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
  - 1. Motor controllers.
  - 2. Torque, speed, and horsepower requirements of the load.
  - 3. Ratings and characteristics of supply circuit and required control sequence.
  - 4. Ambient and environmental conditions of installation location.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Domestic water for plumbing piping intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
- B. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.
- C. Capability: Provide products and installations to accommodate maximum axial movement as scheduled or indicated on Drawings.

### **2.2 MOTORS**

- A. Motor Requirements, General:
  - 1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
  - 2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
  - 3. Comply with NEMA MG 1 unless otherwise indicated.
  - 4. Comply with IEEE 841 for severe-duty motors.
- B. Motor Characteristics:

1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 ft. above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

**C. Polyphase Motors:**

1. Description: NEMA MG 1, Design B, medium induction motor.
2. Efficiency: Premium Efficient, as defined in NEMA MG 1.
3. Service Factor: 1.15.
4. Multispeed Motors: Variable torque.
  - a. For motors with 2:1 speed ratio, consequent pole, single winding.
  - b. For motors with other than 2:1 speed ratio, separate winding for each speed.
5. Multispeed Motors, Two Winding: Separate winding for each speed.
6. Rotor: Random-wound, squirrel cage.
7. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
8. Temperature Rise: Match insulation rating.
9. Insulation: Class F.
10. Code Letter Designation:
  - a. Motors 15 HP and Larger: NEMA starting Code F or Code G.
  - b. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
11. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

**D. Additional Requirements for Polyphase Motors:**

1. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
  - a. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time-rise pulses produced by pulse-width-modulated inverters.
  - b. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
  - c. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
  - d. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
  - e. Provide shaft ground rings.

**E. Single-Phase Motors:**

1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split phase.
  - c. Capacitor start, inductor run.
  - d. Capacitor start, capacitor run.
2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 HP and Smaller: Shaded-pole type.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

F. Electronically Commutated Motors:

1. Microprocessor-Based Electronic Control Module: Converts 120 V or 240 V single-phase AC power to three-phase DC power to operate the brushless DC motor.
2. Three-phase power motor module with permanent magnet rotor.
3. digital speed controller/LED display.
4. Building Automation System Interface: Via DC voltage signal or Digital Serial Interface (DSI).

## 2.3 EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

A. Performance Requirements:

1. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.
2. Capability: Provide products and installations that will accommodate maximum axial movement as scheduled or indicated on Drawings.

B. Packless Expansion Joints:

1. Flexible-Hose Packless Expansion Joints, Lead Free: .
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Flex-Hose Co., Inc.
    - 2) Flex-Pression.
    - 3) Flexicraft Industries.
    - 4) Mason Industries, Inc.

- 5) Metraflex Company (The).
  - b. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
  - c. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
  - d. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
    - 1) Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
  - e. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Copper-alloy fittings with threaded end connections.
    - 1) Stainless steel hoses and single-braid, stainless steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
  - f. Expansion Joints for Stainless Steel Piping NPS 4 to NPS 6 (DN 65 to DN 150): Stainless steel fittings with flanged end connections.
    - 1) Stainless steel hoses and single-braid, stainless steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.
- C. Grooved-Joint Expansion Joints, Lead Free:
- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Victaulic Company.
  - 2. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
  - 3. Standard: AWWA C606, for grooved joints.
  - 4. Material: ASTM A53/A53M, Schedule 40 stainless steel pipe with grooved ends.
  - 5. Couplings: 12, ASTM A312/A312M ductile-iron flexible type for stainless steel pipe dimensions. Include ferrous housing sections, Grade E EPDM rubber gasket or Grade P fluoroelastomer blend gasket, and bolts and nuts.
- D. Alignment Guides and Anchors:
- 1. Alignment Guides:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Flex-Hose Co., Inc.
      - 2) Flex-Weld; a division of Kelco.

- 3) Flexicraft Industries.
- 4) Hyspan Precision Products, Inc.
- 5) Metraflex Company (The).

- b. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe. Provide dielectric spacer for use with copper tubing/piping.

2. Anchor Materials:

- a. Steel Shapes and Plates: ASTM A36/A36M.
- b. Bolts and Nuts: ASME B18.10 or ASTM A183, steel hex head.
- c. Washers: ASTM F844, steel, plain, flat washers.
- d. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
  - 1) Stud: Threaded, zinc-coated carbon steel.
  - 2) Expansion Plug: Zinc-coated carbon steel.
  - 3) Washer and Nut: Zinc-coated carbon steel.
- e. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
  - 1) Bonding Material: ASTM C881/C881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
  - 2) Stud: ASTM A307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
  - 3) Washer and Nut: Zinc-coated carbon steel.

2.4 SLEEVES AND SLEEVE SEALS

A. Sleeves without Waterstop:

1. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
2. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
3. Steel Sheet Sleeves: ASTM A653/A653M, 24-gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.
4. PVC Pipe Sleeves: ASTM D1785, Schedule 40.
5. Molded-PVC Sleeves: With nailing flange.
6. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange.



**B. Sleeves with Waterstop:**

1. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.
2. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

**C. Stack-Sleeve Fittings:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Zurn Industries, LLC.
2. Description: Manufactured, galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
  - a. Underdeck Clamp: Clamping ring with setscrews.

**D. Sleeve-Seal Systems:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Advance Products & Systems, LLC.
  - b. CALPICO, Inc.
  - c. GPT; an EnPro Industries company.
  - d. Metraflex Company (The).
  - e. Proco Products, Inc.
2. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - a. Hydrostatic Seal: 20 psig minimum.
  - b. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - c. Pressure Plates: Carbon steel.
  - d. Connecting Bolts and Nuts: Carbon steel, with zinc coating, ASTM B633 of length required to secure pressure plates to sealing elements.

**E. Grout:**

1. Description: Non-shrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

F. Silicone Sealants:

1. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 ESCUTCHEONS

A. Escutcheon Types:

1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
3. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

B. Floor Plates:

1. Split Floor Plates: Cast brass with concealed hinge.

2.6 METERS AND GAUGES FOR PLUMBING PIPING

A. Thermometers, Liquid in Glass, Lead Free - Metal Case, Industrial Style:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Flo Fab, Inc.
  - b. Miljoco Corporation.
  - c. Palmer Wahl Instrumentation Group.
  - d. Tel-Tru Manufacturing Company.
  - e. Trerice, H. O. Co.
  - f. Weiss Instruments, Inc.
  - g. Weksler Glass Thermometer Corp.
  - h. Winters Instruments - U.S.
2. Source Limitations: Provide liquid-in-glass, lead-free, metal-case, industrial-style thermometers from single manufacturer.
3. Standard: ASME B40.200.
4. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
5. Case Form: Adjustable angle unless otherwise indicated.

6. Tube: Glass with magnifying lens and blue or red organic liquid, mercury free.
7. Tube Background: Nonreflective aluminum with permanent scale markings graduated in deg F.
8. Window: Glass.
9. Stem: Aluminum and of length to suit installation.
  - a. Design for Thermowell Installation: Bare stem.
10. Connector: 1-1/4 inches, with ASME B1.1 or ASME B1.20.1 screw threads to fit thermowell.
11. Accuracy: Plus or minus 1 percent of span or one scale division, to a maximum of 1.5 percent of span.

B. Thermowells, Lead Free:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: Lead-free copper.
4. Material for Use with Steel Piping: Type 304 stainless steel.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, or as required to match threaded opening in pipe.
7. Internal Threads: Size and thread type as required to match thermometer mounting threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length to extend to match thermometer stem length.
10. Lagging Extension: Include on thermowells for insulated piping and tubing. Extension is to be of sufficient length to extend beyond finished insulation surface.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

C. Pressure Gauges, Dial Type, Lead Free - Direct Mounted, Metal Case:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Ametek U.S. Gauge.
  - b. Ernst Flow Industries.
  - c. Flo Fab Inc.
  - d. Miljoco Corporation.
  - e. Palmer Wahl Instrumentation Group.
  - f. Tel-Tru Manufacturing Company.
  - g. Trerice, H. O. Co.
  - h. WATTS; A Watts Water Technologies Company.
  - i. Weiss Instruments, Inc.
  - j. Weksler Glass Thermometer Corp.
  - k. Winters Instruments - U.S.

2. Source Limitations: Provide dial-type, lead-free, direct-mounted, metal-case pressure gauges from single manufacturer.
3. Standard: ASME B40.100.
4. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
5. Pressure-Element Assembly: Lead-free Bourdon tube.
6. Pressure Connection: Lead-free brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
7. Movement: Mechanical, with link to pressure element and connection to pointer.
8. Dial: Nonreflective aluminum with permanent scale markings graduated in psi.
9. Pointer: Dark-colored metal.
10. Window plastic.
11. Ring: Stainless steel.
12. Accuracy: Grade A, plus or minus 1 percent of middle half of span.

D. Gauge Attachments, Lead Free:

1. Snubbers: ASME B40.100, lead-free brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
2. Valves: Lead-free brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

E. Test Plugs, Lead Free:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. IMI Flow Design, Inc.
  - b. Miljoco Corporation.
  - c. Trerice, H. O. Co.
  - d. WATTS; A Watts Water Technologies Company.
  - e. Weksler Glass Thermometer Corp.
2. Source Limitations: Provide lead-free test plugs from single manufacturer.
3. Description: Test-station fitting made for insertion into piping tee fitting.
4. Body: Lead-free brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
5. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.
6. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.
7. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

F. Test-Plug Kits, Lead Free:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. IMI Flow Design, Inc.
  - b. Miljoco Corporation.
  - c. Trerice, H. O. Co.
  - d. WATTS; A Watts Water Technologies Company.
  - e. Weiss Instruments, Inc.
2. Source Limitations: Provide lead-free test-plug kits from single manufacturer.
  3. Furnish one test-plug kit(s) containing two thermometer(s), one pressure gauge and adapter, and carrying case. Thermometer sensing elements, pressure gauge, and adapter probes are to be of diameter to fit test plugs and of length to project into piping.
  4. Low-Range Thermometer, Lead Free: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range is to be at least 25 to 125 deg F.
  5. High-Range Thermometer, Lead Free: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range is to be at least 0 to 220 deg F.
  6. Pressure Gauge, Lead Free: Small, lead-free Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range is to be at least 0 to 200 psig.
  7. Carrying Case: Metal or plastic, with formed instrument padding.
- G. Sight Flow Indicators, Lead Free:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dwyer Instruments, Inc.
    - b. Ernst Flow Industries.
    - c. KOBOLD Instruments, Inc. - USA.
    - d. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
    - e. Pentair Valves & Controls; Penberthy Brand.
  2. Source Limitations: Provide lead-free sight flow indicators from single manufacturer.
  3. Description: Piping inline-installation device for visual verification of flow.
  4. Construction: Lead-free bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.
  5. Minimum Pressure Rating: 125 psig.
  6. Minimum Temperature Rating: 200 deg F.
  7. End Connections: NPS 2-1/2 and larger, flanged.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF EXPANSION JOINTS, GENERAL

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.

**3.2 INSTALLATION OF PACKLESS EXPANSION JOINTS**

- A. Install metal-bellows expansion joints in accordance with EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
- B. Install rubber packless expansion joints in accordance with FSA-PSJ-703.

**3.3 INSTALLATION OF GROOVED-JOINT EXPANSION JOINTS**

- A. Install grooved-joint expansion joints to grooved-end steel piping.

**3.4 INSTALLATION OF ALIGNMENT GUIDES AND ANCHORS**

- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
- B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
- C. Attach guides to pipe, and secure guides to building structure.
- D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
- E. Anchor Attachments:
  - 1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9.
  - 2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-58, Type 24; U bolts bolted to anchor.
- F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
  - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
  - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
  - 3. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

**3.5 INSTALLATION OF SLEEVES - GENERAL**

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  - 2. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  - 3. Using grout, seal the space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire resistance of floor/slab/wall.
- D. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.
- E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

### **3.6 INSTALLATION OF SLEEVES WITH WATERSTOP**

- A. Install sleeve with waterstop as new walls and slabs are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange centered across width of concrete slab or wall.
- C. Secure nailing flanges to wooden concrete forms.
- D. Using grout, seal space around outside of sleeves. Select to maintain fire resistance of floor/slab/wall.

**3.7 INSTALLATION OF STACK-SLEEVE FITTINGS**

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
  - 1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  - 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
  - 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
  - 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 5. Using silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.
- B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

**3.8 INSTALLATION OF SLEEVE-SEAL SYSTEMS**

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building and passing through exterior walls.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

**3.9 INSTALLATION OF ESCUTCHEONS**

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

**3.10 INSTALLATION OF METERS AND GAUGES**

- A. Install thermowells in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.



- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install valve and snubber in piping for each pressure gauge for fluids.
- G. Install test plugs in piping tees.
- H. Install thermometers in the following locations:
  - 1. Inlet and outlet of each water heater.
- I. Install pressure gauges in the following locations:
  - 1. Building water service entrance into building.
  - 2. Inlet and outlet of each pressure-reducing valve.
  - 3. Suction and discharge of each domestic water pump.

### **3.11 CONNECTIONS**

- A. Install meters and gauges adjacent to machines and equipment to allow space for service and maintenance of meters, gauges, machines, and equipment.

### **3.12 ADJUSTING**

- A. After installation, calibrate meters according to manufacturer's written instructions.
- B. Adjust faces of meters and gauges to proper angle for best visibility.

### **3.13 FIELD QUALITY CONTROL**

- A. Sleeves and Sleeve Seals:
  - 1. Perform the following tests and inspections:
    - a. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
    - b. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
  - 2. Prepare test and inspection reports.

**B. Escutcheons:**

1. Using new materials, replace broken and damaged escutcheons and floor plates.

**3.14 SLEEVES APPLICATION****A. Use sleeves and sleeve seals for the following piping-penetration applications:**

1. Exterior Concrete Walls Above and Below Grade:
  - a. Sleeves with Waterstops:
    - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
2. Concrete Slabs-on-Grade:
  - a. Sleeves with Waterstops:
    - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs Above Grade:
  - a. Sleeves with waterstops.
4. Interior Wall and Partitions:
  - a. Sleeves without waterstops.

**3.15 ESCUTCHEONS APPLICATION****A. Escutcheons for New Piping and Relocated Existing Piping:**

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
2. Chrome-Plated Piping: One piece, or split-casting brass with polished, chrome-plated finish.
3. Insulated Piping:
  - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
4. Bare Piping at Wall and Floor Penetrations in Finished Spaces:
  - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.

5. Bare Piping at Ceiling Penetrations in Finished Spaces:
    - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
  6. Bare Piping in Unfinished Service Spaces:
    - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
  7. Bare Piping in Equipment Rooms:
    - a. One-piece, stamped steel or split plate, stamped steel with concealed hinge with polished, chrome-plated finish.
  - B. Install floor plates for piping penetrations of equipment-room floors.
  - C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
    1. New Piping: One piece, floor plate.
- 3.16 THERMOMETER, LEAD FREE, APPLICATION
- A. Thermometers at inlet and outlet of each domestic water heater are to be the following:
    1. Metal case, industrial-style, liquid-in-glass type.
    2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.
  - B. Thermometer stems are to be of length to match thermowell insertion length.
- 3.17 THERMOMETER, LEAD FREE, SCALE-RANGE APPLICATION
- A. Scale Range for Domestic Cold-Water Piping:
    1. 0 to 100 deg F.
  - B. Scale Range for Domestic Hot-Water Piping:
    1. 0 to 250 deg F.

**3.18 PRESSURE-GAUGE APPLICATION**

- A. Pressure gauges at discharge of each water service into building are to be the following:
  - 1. Sealed, direct mounted, metal case.
  - 2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.
- B. Pressure gauges at inlet and outlet of each water pressure-reducing valve are to be the following:
  - 1. Sealed, direct mounted, metal case.
  - 2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.
- C. Pressure gauges at suction and discharge of each domestic water pump are to be the following:
  - 1. Sealed, direct mounted, metal case.
  - 2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

**3.19 PRESSURE-GAUGE SCALE-RANGE APPLICATION**

- A. Scale Range for Water Service Piping:
  - 1. 0 to 160 psi.
- B. Scale Range for Domestic Water Piping:
  - 1. 0 to 200 psi.

**END OF SECTION 220500**

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**SECTION 220719 - PLUMBING PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes insulating the following plumbing piping services:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Domestic recirculating hot-water piping.
  - 4. Roof drains and rainwater leaders.
  - 5. Supplies and drains for handicap-accessible lavatories and sinks.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Sustainable Design Submittals:
  - 1. Product Data: For adhesives, mastics, and sealants, indicating VOC content.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.
- D. Laboratory Test Reports: For adhesives, mastics, and sealants, indicating compliance with requirements for low-emitting materials.

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.
- C. LEED Requirements:
  - 1. Refer to LEED v4.1 REQUIREMENTS for additional contract compliance requirements, including but not limited to, performance and submittal requirements that may apply to any product herein specified.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Insulation system materials are to be delivered to the Project site in unopened containers. The packaging is to include name of the manufacturer, fabricator, type, description, and size.

#### **1.6 COORDINATION**

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

#### **1.7 SCHEDULING**

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly in each area as possible in each area of construction.

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
  - 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. All Insulation Installed Indoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

**2.2 INSULATION MATERIALS**

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials are applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.
- E. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric: Closed-cell or expanded-rubber materials; suitable for maximum use temperature between minus 70 deg F and 220 deg F. Comply with ASTM C534/C534M, Type I for tubular materials.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aeroflex USA.
    - b. Armacell LLC.
    - c. K-Flex USA.



- G. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Johns Manville; a Berkshire Hathaway company.
    - b. Knauf Insulation.
    - c. Manson Insulation Inc.
    - d. Owens Corning.
  2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ-SSL.
  3. 850 deg F.
  4. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
  5. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## 2.3 ADHESIVES

- A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Solvent-based adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Aeroflex USA.
    - b. Armacell LLC.
    - c. Foster Brand; H. B. Fuller.
    - d. K-Flex USA.
  2. Flame-spread index is 25 or less and smoke-developed index is 50 or less as tested in accordance with ASTM E84.
  3. Wet Flash Point: Below 0 deg F.
  4. Service Temperature Range: 40 to 200 deg F.
  5. Color: Black.
  6. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller.
  2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. ASJ Adhesive and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller.
    - c. Mon-Eco Industries, Inc.
  2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

#### 2.4 MASTICS AND COATINGS

- A. Materials are compatible with insulation materials, jackets, and substrates.
- B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller.
    - c. Knauf Insulation.
    - d. Vimasco Corporation.
  2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Color: White.
  5. Mastics shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

**2.5 LAGGING ADHESIVES**

- A. Adhesives comply with MIL-A-3316C, Class I, Grade A, and are compatible with insulation materials, jackets, and substrates.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller.
    - c. Vimasco Corporation.
  - 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
  - 3. Service Temperature Range: 20 to plus 180 deg F.
  - 4. Color: White.
  - 5. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

**2.6 SEALANTS**

- A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.
- B. Joint Sealants:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. Foster Brand; H. B. Fuller.
    - c. Mon-Eco Industries, Inc.
    - d. Owens Corning.
  - 2. Permanently flexible, elastomeric sealant.
  - 3. Service Temperature Range: Minus 58 to plus 176 deg F.
  - 4. Color: White or gray.
  - 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Childers Brand; H. B. Fuller Construction Products.
  - b. Foster Brand; H. B. Fuller.
  - c. Mon-Eco Industries, Inc.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Childers Brand; H. B. Fuller Construction Products.
  - b. Foster Brand; H. B. Fuller.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## 2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

**2.8 TAPES**

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Industrial Adhesives and Tapes Division.
    - b. Avery Dennison Corporation, Specialty Tapes Division.
    - c. Ideal Tape Co., Inc., an American Biltrite Company.
    - d. Knauf Insulation.
  - 2. Width: 3 inches.
  - 3. Thickness: 11.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

**2.9 SECUREMENTS**

- A. Bands:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Johns Manville; a Berkshire Hathaway company.
    - b. RPR Products, Inc.
  - 2. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
  - 3. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. C & F Wire Products.

**2.10 PROTECTIVE SHIELDING GUARDS****A. Protective Shielding Pipe Covers:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Buckaroos, Inc.
  - b. MVG Molded Products.
  - c. McGuire Manufacturing.
  - d. Plumberex Specialty Products, Inc.
  - e. Truebro; IPS Corporation.
  - f. Zurn Industries, LLC.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

**3.3 GENERAL INSTALLATION REQUIREMENTS**

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
  - 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
  - 2. Cover circumferential joints with 3-inch-wide strips of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.

- a. For below-ambient services, apply vapor-barrier mastic over staples.
- 4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
- 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- P. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.



2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
  2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.5 GENERAL PIPE INSULATION INSTALLATION
- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation made from same material and density as that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation conforms to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  1. Install pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
  4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  1. Install sections of pipe insulation and miter if required in accordance with manufacturer's written instructions.
  2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  1. Install prefabricated valve covers manufactured of same material as that of pipe insulation when available.
  2. When prefabricated valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  3. Install insulation to flanges as specified for flange insulation application.
  4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

**3.7 INSTALLATION OF MINERAL-FIBER INSULATION****A. Insulation Installation on Straight Pipes and Tubes:**

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

**B. Insulation Installation on Pipe Flanges:**

1. Install prefabricated pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral-wool blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

**C. Insulation Installation on Pipe Fittings and Elbows:**

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

**D. Insulation Installation on Valves and Pipe Specialties:**

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

**3.8 FINISHES**

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

**3.9 FIELD QUALITY CONTROL**

- A. Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective if they do not pass tests and inspections.

**3.10 PIPING INSULATION SCHEDULE, GENERAL**

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

**3.11 INDOOR PIPING INSULATION SCHEDULE**

- A. Domestic Cold / Hot/ Recirculated:
  - 1. NPS 1 and Smaller: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
  - 2. NPS 1-1/4 and Larger: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

- B. Stormwater and Overflow for both horizontal and vertical piping:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- C. Roof Drain and Overflow Drain Bodies:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- E. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- F. Hot Service Drains:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- G. Hot Service Vents:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- H. PVC Piping within Circulated Air Plenums:
  - 1. All Pipe Sizes: Insulation shall be the following:
    - a. Fire Retardant Insulation meeting required flame and smoke development ratings: 1/2 inch thick.

**3.12 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET**

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

**END OF SECTION 220719**

**SECTION 223500 - DOMESTIC-WATER HEAT EXCHANGERS****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Semi-instantaneous, domestic-water heaters.
2. Accessories.

**1.2 ACTION SUBMITTALS****A. Product Data:** For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.**B. Shop Drawings:**

1. Include diagrams for power, signal, and control wiring.

**1.3 INFORMATIONAL SUBMITTALS****A. Coordination Drawings:** Equipment room drawing or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades. Also indicate the following:

1. Tube removal space, both vertical and/or horizontal as applicable.
2. Structural members to which heat exchangers will be attached.

**B. Product Certificates:** For each type of semi-instantaneous water heater from manufacturer.

1. Domestic-Water, Heat-Exchanger Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
2. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

**C. Source quality-control reports.****D. Field quality-control reports.****E. Sample Warranty:** For special warranty.



**1.4 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For domestic-water heat exchangers and heaters to include in emergency, operation, and maintenance manuals.

**1.5 COORDINATION**

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

**1.6 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of domestic-water heat exchangers and heaters that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:

- a. Structural failures, including domestic-water heat exchanger, water heater, storage tank, and supports.
  - b. Faulty operation of controls.
  - c. Deterioration of metals, metal finishes, and other materials beyond normal use.

- 2. Warranty Periods: From date of Substantial Completion.

- a. Semi-Instantaneous, Domestic-Water Heaters:

- 1) Tank: Five years.
    - 2) Tube Coil: Five years.
    - 3) Controls and Other Components: Three years.

- b. Compression Tanks: One year(s).

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

- A. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.
- B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label heat-exchanger storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

- C. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

## 2.2 SEMI-INSTANTANEOUS, DOMESTIC-WATER HEATERS

- A. Semi-Instantaneous, Heating-Fluid-in-Coil, Packaged, Compact, Less than 100-Gal., Domestic-Water Heater:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
    - a. AERCO; A WATTS Brand.
    - b. Armstrong.
    - c. Cemline.
    - d. Patterson Kelley.
  - 2. Description: Factory-packaged assembly of shell, heat-exchanger coils, and specialties for heating domestic water with steam in coils.
  - 3. Construction:
    - a. Fabricate and label heat exchanger to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1.
  - 4. Configuration: Vertical-stacked helically shaped coils.
  - 5. Shell Materials: Carbon steel, copper-lined shell with 250-psig minimum working-pressure rating.
    - a. Tappings: Factory fabricated of materials compatible with heat-exchanger shell. Attach tappings to shell before testing and labeling.
      - 1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
      - 2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
  - 6. Head: Cast iron, flanged and bolted to shell.
  - 7. Heat-Exchanger Coil: Double-wall, copper-nickel coils for domestic water. Include pressure rating equal to or greater than heating-fluid supply pressure.
  - 8. Relief Valves: ASME rated and stamped for combination temperature- and pressure-relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting of less than working-pressure rating of heat exchanger. Select one relief valve with sensing element that extends into storage tank.

9. Miscellaneous Components: Strainers, steam-control valve, steam trap, valves, pressure gauge, thermometer, and piping.
  - a. Exception: Steam trap is not required if manufacturer's written instructions direct that it not be used.
10. Stand: Factory fabricated on skid for floor mounting.
11. Insulation: Complying with ASHRAE/IES 90.1, unless otherwise indicated, and suitable for operating temperature. Surround entire shell and nozzle, except connections and controls.
12. Required Connections: Domestic cold water in; domestic hot water out; steam supply in; condensate return out.
13. Capacity and Characteristics: See schedule on drawings for characteristics.

## 2.3 ACCESSORIES

### A. Domestic-Water Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. A. O. Smith Corporation.
  - b. AMTROL, Inc.
  - c. Flexcon Industries.
  - d. State Industries.
  - e. Taco Comfort Solutions.
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system operating pressure at tank.
3. Construction:
  - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
  - b. Interior Finish: Comply with NSF 61 barrier materials for potable water tank linings, including extending finish into and through tank fittings and outlets.
  - c. Air-Charging Valve: Factory installed.
4. Capacity and Characteristics: See schedule on drawings for characteristics.

### B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IES 90.1 or ASHRAE 90.2.

### C. Heat-Trap Fittings: ASHRAE 90.2.

- D. Combination Temperature- and Pressure-Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than heat-exchanger working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- E. Pressure-Relief Valves: ASME rated and stamped. Include pressure setting less than heat-exchanger working pressure rating.
- F. Vacuum-Relief Valves: ANSI Z21.22/CSA 4.4.

## **2.4 SOURCE QUALITY CONTROL**

- A. Factory Tests: Test and inspect domestic-water heat exchangers and domestic-water heaters specified to ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test domestic-water heat exchangers and domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heat exchangers and domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF DOMESTIC-WATER HEAT EXCHANGERS AND DOMESTIC-WATER HEATERS**

- A. Domestic-Water Heat Exchangers and Domestic-Water Heaters Mounting: Install domestic-water heat exchangers and domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."
  - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch 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.

5. Anchor heat exchangers and heaters to substrate.
- B. Install domestic-water heat exchangers and domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
  1. Install shutoff valves on domestic cold-water supply piping to domestic-water heat exchangers and domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."
  2. Install shutoff valves on heating hot-water piping to domestic-water heat exchangers and domestic-water heaters. Comply with requirements for shutoff valves specified in Section 2305023 "General-Duty Valves for HVAC Piping."
  3. Install shutoff valves on steam and condensate piping to domestic-water heat exchangers and domestic-water heaters. Comply with requirements for shutoff valves specified in Section 2305023 "General-Duty Valves for HVAC Piping."
- C. Install domestic-water heat exchangers and domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration Controls for Plumbing Piping and Equipment."
- D. Install temperature- and pressure-relief valves in top portion of domestic-water storage tank shells. Use relief valves with sensing elements that extend into shells. Extend relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install combination temperature- and pressure-relief valves in water piping for domestic-water heat exchangers and domestic-water heaters without storage. Extend relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install domestic-water heat exchangers and domestic-water heaters drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in domestic-water piping for heat exchangers and heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- G. Install thermometer on each domestic-water heat exchanger and domestic-water heater inlet and outlet piping, and install thermometer on each heat exchanger and heater heating-fluid inlet and outlet piping. Comply with requirements for thermometers specified in Section 220500 "Common Work Results for Plumbing."
- H. Install pressure gauges on domestic-water heat exchanger and domestic-water heater heating-fluid piping. Comply with requirements for pressure gauges specified in Section 220500 "Common Work Results for Plumbing."
- I. Fill domestic-water heat exchangers and domestic-water heaters with water.

- J. Charge domestic-water compression tanks with air.

### **3.2 PIPING CONNECTIONS**

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for steam and condensate piping specified in Section 232213 "Steam and Condensate Heating Piping" and Section 232216 "Steam and Condensate Heating Piping Specialties."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to domestic-water heat exchangers and heaters, allow space for service and maintenance. Arrange piping for easy removal of heat exchangers and heaters.

### **3.3 IDENTIFICATION**

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency:
  - 1. Owner will engage a qualified testing agency to perform tests and inspections.
  - 2. Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- E. Domestic-water heat exchangers and domestic-water heaters will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

**3.5 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain domestic-water semi-instantaneous domestic-water heaters.

**END OF SECTION 223500**

**SECTION 224200 - COMMERCIAL PLUMBING FIXTURES****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Commercial lavatories.
2. Commercial showers.
3. Commercial sinks.
4. Commercial urinals.
5. Commercial water closets.
6. Flushometer valves.
7. Toilet seats.
8. Fixture carriers.

**1.2 DEFINITIONS**

- A. FRP: Fiberglass-reinforced plastic.
- B. PMMA: Polymethyl methacrylate; also known as "acrylic."
- C. Standard-Efficiency Flush Volume: 1.6 gal. per flush.
- D. High-Efficiency Flush Volume: 1.28 gal. or less per flush.
- E. WaterSense Fixture: Water closet and/or flushometer valve/tank certified by the EPA to meet the WaterSense performance criteria.

**1.3 ACTION SUBMITTALS****A. Product Data:**

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for plumbing fixtures.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

**B. Shop Drawings:**

1. Plans, elevations, sections, and mounting details.



2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Diagrams for power, signal, and control wiring.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories and/or counter-mounted sinks.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:

1. For lavatories and faucets.
  - a. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - 1) Servicing and adjustments of automatic faucets.
2. For shower valves to include in maintenance manuals
3. For sinks and faucets to include in operation and maintenance manuals.
  - a. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - 1) Servicing and adjustments of automatic faucets.
4. For flushometer valves and electronic sensors to include in operation and maintenance manuals.
5. For wash fountains and components to include in operation and maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
  3. Shower Valve Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.

4. Shower Valve Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
5. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

**PART 2 - PRODUCTS****2.1 PERFORMANCE REQUIREMENTS**

- A. Lavatory faucets, sink faucets, shower valves, and wash fountain spray heads and faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.
- 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 COMMERCIAL LAVATORIES****A. Lavatories, Counter-Mounted:**

1. Lavatory, Counter-Mounted - Vitreous China, Self-Rimming, Oval or Round:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) American Standard.
    - 2) Kohler Co.
    - 3) Mansfield Plumbing Products LLC.
    - 4) Sloan Valve Company.
    - 5) TOTO USA, Inc.
    - 6) Zurn Industries, LLC.
  - b. Fixture:
    - 1) Standard: ASME A112.19.2/CSA B45.1.
    - 2) Type: Self-rimming for above-counter mounting.
    - 3) Faucet-Hole Location: Top.
    - 4) Color: White.
    - 5) Mounting Material: Sealant.

- c. Faucet: See schedule on drawings.
- 2. Lavatories, Wall-Mounted - Vitreous China, Rectangular with:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) American Standard.
    - 2) Kohler Co.
    - 3) Mansfield Plumbing Products LLC.
    - 4) Sloan Valve Company.
    - 5) TOTO USA, Inc.
    - 6) Zurn Industries, LLC.
  - b. Fixture:
    - 1) Standard: ASME A112.19.2/CSA B45.1.
    - 2) Type: For wall hanging.
    - 3) Faucet-Hole Location: Top.
    - 4) Color: White.
    - 5) Mounting Material: Chair carrier.
  - c. Faucet: See schedule on drawings.
  - d. Support: Type II, concealed-arm lavatory carrier
- 3. Lavatories, Wall-Mounted Trough – Continuous Solid Surface Custom Length:
  - a. Manufacturers: Subject to compliance requires provide products by one of the following:
    - 1) The Splash Labs.
  - b. Fixture:
    - 1) Standard: ASME A112.19.2/CSA B45.1.
    - 2) Type: For wall hanging.
    - 3) Faucet-Hole Location: Top.
    - 4) Solid Surface color: Glacier White
    - 5) Pipe Skirt:
      - a) Angled.
      - b) Brushed stainless steel.
  - c. Faucet: See schedule on drawings.

**2.3 COMMERCIAL SHOWERS****A. Shower Valve Assemblies:**

1. Shower Valve Assemblies - Single-Handle, Pressure-Balanced Mixing Valve with Head:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) American Standard.
    - 2) Kohler Co.
    - 3) Leonard Valve Company.
    - 4) POWERS; A WATTS Brand.
    - 5) Symmons.
    - 6) Zurn Industries, LLC.
  - b. Source Limitations: Obtain shower heads and shower valves from single source from single manufacturer.
  - c. Description: Single-handle, accessible, pressure-balance mixing valve with hot- and cold-water indicators; check stops; and hose with handheld shower head shower head.
  - d. Shower Valve:
    - 1) Standards:
      - a) ASME A112.18.1/CSA B125.1.
      - b) ASSE 1016/ASME A112.1016/CSA B125.16.
  - e. Supply Connections: NPS 1/2.
  - f. Shower Head:
    - 1) Standard: ASME A112.18.1/CSA B125.1.
  - g. See schedule on drawings for additional characteristics.

**B. Grout:**

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Characteristics: Non-shrink; recommended for interior and exterior applications.
3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory-packaged.

**2.4 COMMERCIAL SINKS****A. Service Sinks, Floor-Mounted:**

1. Service Sinks, Floor-Mounted - Molded Stone:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Fiat Products.
    - 2) Florestone Products Co., Inc.
  - b. Source Limitations: Obtain sinks from single source from single manufacturer.
  - c. Fixture: See schedule on drawings for characteristics.
  - d. Mounting: On floor and flush to wall.
  - e. Faucet: See schedule on drawings for characteristics.

**B. Kitchen/Utility Sinks:**

1. Kitchen/Utility Sinks, Counter-Mounted - Stainless Steel:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Amtekco Industries, Inc; a Wasserstrom Company.
    - 2) Eagle Group.
    - 3) Elkay.
    - 4) Just Manufacturing.
    - 5) Sloan Valve Company.
  - b. Source Limitations: Obtain sinks from single source from single manufacturer.
  - c. Fixture:
    - 1) Standard: ASME A112.19.3/CSA B45.4.
    - 2) Material: 18-gauge, Type 304 stainless steel.
    - 3) Compartment(s): See schedule on drawings for characteristics.
  - d. Faucet(s): See schedule on drawings for characteristics.

**C. Handwash Sinks:**

1. Handwash Sinks - Stainless Steel:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Amtekco Industries, Inc; a Wasserstrom Company.
    - 2) Eagle Group.
    - 3) Elkay.
    - 4) Just Manufacturing.

- 5) Sloan Valve Company.
  - b. Source Limitations: Obtain sinks from single source from single manufacturer.
  - c. Fixture:
    - 1) Standards:
      - a) ASME A112.19.3/CSA B45.4.
      - b) NSF 61.
  - d. Faucet: See schedule on drawings for characteristics.
- D. Sink Faucets, Manually-Operated:
- 1. Sink Faucets, Manually-Operated:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) American Standard.
      - 2) Chicago Faucets; Geberit Company.
      - 3) Elkay.
      - 4) Just Manufacturing.
      - 5) Kohler Co.
      - 6) T&S Brass and Bronze Works, Inc.
      - 7) Wolverine Brass, Inc.
      - 8) Zurn Industries, LLC.
    - b. Source Limitations: Obtain sink faucets from single source from single manufacturer.
    - c. Standards:
      - 1) ASME A112.18.1/CSA B125.1.
      - 2) NSF 61.
      - 3) NSF 372.
    - d. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
    - e. See schedule on drawings for characteristics.
- E. Grout:
- 1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
  - 2. Characteristics: Non-shrink; recommended for interior and exterior applications.
  - 3. Design Mix: 5000 psi, 28-day compressive strength.

4. Packaging: Premixed and factory-packaged.

## **2.5 COMMERCIAL URINALS**

### **A. Urinals, Wall-Hung:**

#### **1. Urinals, Wall-Hung - Back Outlet, Blowout:**

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) American Standard.
  - 2) Crane Plumbing, LLC.
  - 3) Kohler Co.
  - 4) Mansfield Plumbing Products, LLC.
  - 5) Sloan Valve Company.
  - 6) TOTO USA, Inc.
  - 7) Zurn Industries, LLC.
- b. Fixture:
  - 1) Standards:
    - a) ASME A112.19.2/CSA B45.1.
    - b) ASME A112.19.5/CSA B45.15.
  - 2) Material: Vitreous china.
  - 3) Strainer or Trapway: Open trapway with integral trap.
  - 4) Outlet Size and Location: NPS 2; back.
  - 5) Color: White.
- c. Waste Fitting:
  - 1) Standard: ASME A112.18.2/CSA B125.2 for coupling.
  - 2) Size: NPS 2.
- d. Support: Type 1 urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture.
- e. See schedule on drawings for additional characteristics.

## **2.6 COMMERCIAL WATER CLOSETS**

### **A. Water Closets, Floor-Mounted:**

#### **1. Water Closets, Floor-Mounted - Bottom Outlet, Top Spud:**

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) American Standard.
  - 2) Crane Plumbing, LLC.
  - 3) Kohler Co.
  - 4) Mansfield Plumbing Products LLC.
  - 5) Sloan Valve Company.
  - 6) TOTO USA, INC.
  - 7) Zurn Industries, LLC.
- b. Source Limitations: Obtain water closets from single source from single manufacturer.
- c. Standard: ASME A112.19.2/CSA B45.1.
- d. Bowl:
  - 1) Material: Vitreous china.
  - 2) Type: Siphon jet.
  - 3) Style: Flushometer valve.
  - 4) Color: White.
- e. See schedule on drawings for additional characteristics.

## **2.7 FLUSHOMETER VALVES**

### **A. Flushometer Valves, Sensor-Operated:**

#### **1. Flushometer Valves, Sensor-Operated - Diaphragm:**

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) American Standard.
  - 2) Kohler Co.
  - 3) Sloan Valve Company.
  - 4) TOTO USA, INC.
  - 5) Zurn Industries, LLC.
- b. Source Limitations: Obtain flushometer valve from single source from single manufacturer.
- c. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
- d. Refer to schedule on drawings for characteristics.

## **2.8 TOILET SEATS**

### **A. Toilet Seats:**



1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Standard.
  - b. Bemis Manufacturing Company.
  - c. Centoco Manufacturing Corporation.
  - d. Church Seats; Bemis Manufacturing Company.
  - e. Jones Stephens Corp.
  - f. Kohler Co.
  - g. TOTO USA, INC.
  - h. Zurn Industries, LLC.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (heavy-duty).
5. Shape: Elongated rim, open front.
6. Hinge: Check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

## **2.9 FIXTURE CARRIERS**

### **A. Fixture Carriers - Lavatory:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS; A Watts Water Technologies Company.
  - e. Zurn Industries, LLC.
2. Source Limitations: Obtain lavatory carriers from single source from single manufacturer.
3. Standards:
  - a. ASME A112.6.1M.
  - b. ASME A112.6.2.

### **B. Fixture Carriers - Sink:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Jay R. Smith Mfg Co; a division of Morris Group International.

- b. Josam Company.
    - c. MIFAB, Inc.
    - d. WATTS; A Watts Water Technologies Company.
    - e. Zurn Industries, LLC.
  - 2. Source Limitations: Obtain sink carriers from single source from single manufacturer.
  - 3. Standards:
    - a. ASME A112.6.1M.
    - b. ASME A112.6.2.
- C. Fixture Carriers - Urinal:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Jay R. Smith Mfg Co; a division of Morris Group International.
    - b. Josam Company.
    - c. MIFAB, Inc.
    - d. WATTS; A Watts Water Technologies Company.
    - e. Zurn Industries, LLC.
  - 2. Source Limitations: Obtain urinal carriers from single source from single manufacturer.
  - 3. Standard: ASME A112.6.1M.
  - 4. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings, gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
- D. Fixture Carriers - Water Closet:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Jay R. Smith Mfg Co; a division of Morris Group International.
    - b. Josam Company.
    - c. MIFAB, Inc.
    - d. WATTS; A Watts Water Technologies Company.
    - e. Zurn Industries, LLC.
  - 2. Source Limitations: Obtain water closet carriers from single source from single manufacturer.
  - 3. Standard: ASME A112.6.1M.

4. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings, gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine roughing-in of water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine walls and floors for suitable conditions where plumbing fixtures will be installed.
- C. Examine counters for suitable conditions where lavatories and sinks will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION OF COMMERCIAL PLUMBING FIXTURES**

- A. Lavatory Installation:
  1. Install lavatories level and plumb in accordance with roughing-in drawings.
  2. Install supports, affixed to building substrate, for wall-mounted lavatories.
  3. Install accessible, wall-mounted lavatories at mounting height in accordance with ICC A117.1.
  4. Install water-supply piping with stop on each supply to each lavatory faucet. Install stops in locations that are accessible for ease of operation.
  5. Install trap and waste piping on each drain outlet of each lavatory to be connected to sanitary drainage system.
  6. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
  7. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
  8. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- B. Shower Installation:

1. Assemble shower components in accordance with manufacturers' written instructions.
2. Install showers level and plumb in accordance with roughing-in drawings.
3. Install ball or gate valves in water-supply piping to the shower if supply stops are specified with the shower valve. Comply with ball or gate valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping." Install valves in locations that are accessible for ease of operation.
4. Install shower flow-control fittings with specified maximum flow rates in shower arms.
5. Set shower receptors in leveling bed of cement grout.
6. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
7. Seal joints between showers, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

C. Sink Installation:

1. Install sinks level and plumb in accordance with roughing-in drawings.
2. Install supports, affixed to building substrate, for wall-mounted sinks.
3. Install accessible, wall-mounted sinks at mounting height in accordance with ICC A117.1.
4. Set floor-mounted sinks in leveling bed of cement grout.
5. Install water-supply piping with stop on each supply to each sink faucet.
  - a. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping."
  - b. Install stops/valves in locations that are accessible for ease of operation.
6. Install trap and waste piping on each drain outlet of each sink to be connected to sanitary drainage system.
7. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
8. Seal joints between sinks, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
9. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

D. Urinal Installation:

1. Install urinals level and plumb in accordance with roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste-fitting seals and attached to supports.
3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
4. Install accessible, wall-mounted urinals at mounting height in accordance with ICC A117.1.
5. Install trap-seal liquid in waterless urinals.
6. Install supports, affixed to building substrate, for wall-hung urinals.
7. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
8. Use carriers without waste fitting for urinals with tubular waste piping.
9. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.
10. Measure support height installation from finished floor, not structural floor.
11. Install flushometer-valve, water-supply fitting on each supply to each urinal.
12. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
13. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
14. Install actuators in locations easily reachable for people with disabilities.
15. Install new batteries in battery-powered, electronic-sensor mechanisms.
16. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Install deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
17. Seal joints between urinals, walls, and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to urinal color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

**E. Water Closet Installation:**

1. Install water closets level and plumb in accordance with roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.1.
4. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
5. Use carrier supports with waste-fitting assembly and seal.
6. Install floor-mounted, back-outlet water closets, attached to building floor substrate, onto waste-fitting seals; and attach to support.
7. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals, and affix to building substrate.
8. Measure support height installation from finished floor, not structural floor.
9. Install flushometer-valve, water-supply fitting on each supply to each water closet.
10. Attach supply piping to supports or substrate within pipe spaces behind fixtures.

11. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
12. Install actuators in locations easily reachable for people with disabilities.
13. Install new batteries in battery-powered, electronic-sensor mechanisms.
14. Install toilet seats on water closets.
15. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Install deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
16. Seal joints between water closets, walls, and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to water-closet color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Wash Fountain Installation:

1. Install wash fountains level and plumb in accordance with roughing-in drawings.
2. Set freestanding wash fountains on floor.
3. Install off-floor carrier supports, affixed to building substrate, for wall-mounted wash fountains.
4. Install accessible, wall-mounted wash fountains at mounting height in accordance with ICC A117.1.
5. Install water-supply piping with shutoff valve on each supply to each wash fountain faucet. Use ball or gate valves if supply stops are not specified with wash fountain. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping." Install stops/valves in locations that are accessible for ease of operation.
6. Install trap and waste piping on each drain outlet of each wash fountain to be connected to sanitary drainage system.
7. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
8. Seal joints between wash fountains, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
9. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

### 3.3 INSTALLATION OF PIPING CONNECTIONS

- A. Connect plumbing fixtures with water supplies and soil, waste, and vent piping. Use size fittings required to match plumbing fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

- C. Comply with soil, waste, and vent piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Install protective-shielding pipe covers and enclosures on exposed supplies and waste piping of accessible plumbing fixtures. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- E. Where installing piping adjacent to water closets and urinals, allow space for service and maintenance.

### **3.4 INSTALLATION OF ELECTRICAL CONNECTIONS**

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
  - 1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
  - 2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

### **3.5 INSTALLATION OF CONTROL CONNECTIONS**

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

### **3.6 ADJUSTING**

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning plumbing fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Adjust water pressure at shower valves to produce proper flow.

- D. Adjust water pressure at flushometer valves to produce proper flow.
- E. Install new batteries in battery-powered, electronic-sensor mechanisms.

**3.7 CLEANING AND PROTECTION**

- A. After completing installation of plumbing fixtures, inspect and repair damages finishes. Replace any fixtures unable to be repaired to the satisfaction of the Owner.
- B. Clean plumbing fixtures and associated faucets, valves, flushometer valves, and fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and associated faucets, valves, flushometer valves, and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION 224200**



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**SECTION 230000 - HVAC GENERAL REQUIREMENTS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Division 01.
- B. The requirements of the General Conditions and Supplementary Conditions.

**1.2 SUMMARY**

- A. All equipment, materials, and installations shall comply with the Indiana State University Design Standards. They can be accessed via eBuilder CPF Design Standards.
- B. Furnish and install a complete (fully tested, adjusted, and ready for operation) mechanical system and fully automatic indoor space thermal conditioning and ventilation (commonly "HVAC") system with associated controls as described by the Contract Drawings and Specifications.
- C. The HVAC systems and design described in the Project documents reflect a building designed for low consumption of energy and water and minimum environmental footprint. Any modifications to the systems described herein shall maintain or improve on the sustainability and energy efficiency features of the project.
- D. All design modifications that pertain to system selection, system energy efficiency and energy use, material selection and indoor air quality issues shall require the approval of Integral Group.
- E. Include incidental details not usually shown or specified, but necessary for proper installation and operation.
- F. Check, verify, and coordinate Work with Contract Drawings and Specifications prepared by all other trades. Include modifications, relocations, and adjustments necessary to complete work or avoid interference with other trades.
- G. Where architectural features govern location of Work, refer to Architectural Drawings.
- H. Contractor may install additional piping, fittings, and valves, not shown on the drawings, for testing purposes or convenience of installation. Where such materials are installed, they shall comply with the specifications and shall be properly sized for the system and operation. Remove such installed materials when they interfere with design conditions or as directed by the Architect.

## I. LEED:

1. This building shall be LEED certified. Contractor and their subs shall provide all relevant support documentation pertaining to the LEED credits that relate to their work.
2. Comply with Sheet Metal and Air Conditioning Contractors' National Association *IAQ Guidelines for Occupied Buildings Under Construction*. Chapter 3. Chantilly, VA: SMACNA, 1995.
3. Section 018113.14 "Sustainable Design Requirements – LEEDv4 BD+C, New Construction" for sustainable design requirements applicable to this Project.

- J. Commissioning: The scope of work for the Contractor shall not include the duties of the Commissioning Authority (CxA). Contractor will be required, however, to include in their scope of work duties relevant to the commissioning process, including but not limited to training of owner's personnel in the operation of the HVAC equipment, providing manufacturer's startup and pre functional checklists and contractor-provided pre-functional and startup checklists to Commissioning Authority, performing and documenting pre-functional tests for HVAC equipment, performing and documenting functional tests for HVAC equipment, supporting DDC Contractor and Test and Balance Contractor in the performance of their duties, and providing operations and maintenance manuals.

## 1.3 CODES AND STANDARDS

- A. All work and materials shall be in full accordance with the latest local rules and regulations, applicable sections of the Indiana Mechanical Code and applicable Local requirements. Nothing in these Plans and Specifications is to be construed to permit work not conforming to these requirements.
- B. HVAC system installers shall be trained and certified in the proper installation of HVAC systems including ductwork, pipework, and equipment by a nationally or regionally recognized training or certification program. Uncertified persons may perform HVAC installations when under the direct supervision and responsibility of a person trained and certified to install HVAC systems or a contractor licensed to install HVAC systems.
- C. Wherever the Specifications call for or describe materials or construction of better quality or larger sizes than are required by the above rules and regulations, these Specifications shall govern. Should there be any direct conflict between the above rules and regulations and the Specifications the rules shall govern.
- D. Equipment shall have UL label listing.

## 1.4 DESIGN CONDITIONS

- A. Ambient Temperature for Condensing Equipment: 95 deg F.

- B. Design Winter Temperature: -10°F.
- C. Altitude: 720 feet above sea level.

**1.5 DRAWINGS**

- A. Layout of the equipment and work is diagrammatic, unless specifically dimensioned. Drawings and details shall be checked for interferences before installing the work. Any interference noted between different drawings, and between drawings and actual field conditions shall be brought to the attention of the Architect and Engineer of Record for a decision. The right is reserved to make any reasonable change in location of equipment without additional expense to the Owner.
- B. For purposes of clarity and legibility, drawings are diagrammatic to the extent that many offsets, bends, special fittings, exact locations of items are not indicated, unless specifically dimensioned. Exact routing of piping and ductwork and locations of equipment shall be governed by structural conditions and obstructions. Contractor shall make use of all data in Contract Drawings and Specifications and field conditions.
- C. In the event a major re-routing of a system appears necessary, Contractor shall prepare and submit for approval, shop drawings of the proposed re-arrangement. Because of the diagrammatic nature and small scale of the Contract Drawings, all necessary offsets, adjustments, and transitions required for the complete installation are not shown. Contractor shall carefully investigate the structural and finish conditions affecting all the Work and shall arrange such Work accordingly, furnishing such fittings, equipment, accessories, etc., as may be required to meet such conditions, at no increase in Contract Sum.
- D. The construction documents for this Project were prepared by the design team using BIM (Building Information Modeling). Using this software by the design team does not relieve the Contractor from performing the necessary coordination to provide complete, code-compliant and operational building systems. The plans and sections provided are diagrammatic and show the design intent, these are not intended to be used for fabrication or installation. Contractor is responsible for generating shop drawings for fabrication that meet the design intent as shown on the Contract Documents. The exact location of the piping, ductwork, electrical and support components are to be determined by the Contractor. All building sections and details provided are for information only and do not relieve the Contractor from performing final coordination. Contractor is responsible for coordinating with all other trades.
- E. All dimensions and locations of equipment, doors, partitions, etc., are to be taken from the architectural plans but shall be verified at the site.

**1.6 MECHANICAL SUBMITTAL PROCEDURES**

- A. See Division 01 "Administrative Requirements" for submittal procedures.
- B. Mechanical and related submittals are, in addition, subject to the requirements of this Article. In the event of a conflict between the requirements of Division 01 and this Article, the requirements of this Article shall supersede and take precedence over those of Division 01.
- A. General: Submittals are not requested for all products covered in the Specifications. Submit only the data requested under the Submittals portion of each Specification Section or where indicated in a Submittal Log, if included within Division 01. Un-requested Submittals will not be processed, reviewed or returned and the Contractor will be notified that the Submittal will not be reviewed by the Engineer of Record.
  - 1. Non-requirement of Submittals, when so noted, is not to be construed as an allowance for substitutions and does not relieve the Contractor from full compliance with the plans and Specifications.
  - 2. Any deviation from specified items is considered a substitution. If the Contractor desires to use other than specified items, then a formal request for substitution must be submitted prior to bid date (no exceptions), in accordance with the procedures and time limitations set forth in Division 01. Where not defined in Division 01, requests for substitutions shall be submitted no less than ten (10) working days prior to bid date. Review of substitution requests by the Engineer shall be done at the expense of the Contractor. Charges for this substitution review shall be calculated based on the Engineer's standard hourly rates, as defined in their Contract with the Owner.
  - 3. Action Submittals:
    - a. Sustainable Design Submittals:
      - 1) Refer to Table 1-1 "Sustainable Design Requirements Supplement" for specific credit requirements associated with Work in this Specification Section.
- C. It is the responsibility of the Contractor to ensure that all Submittals have been reviewed for total completeness and accuracy as to the requirements of the Specifications and Drawings before being submitted to the Engineer for review.
  - 1. One (1) comprehensive Submittal shall be provided for each individual Specification Section. All required Submittal information called for in each individual Specification Section shall be included in the Submittal.
  - 2. The Engineer of Record shall not be responsible for informing the Contractor on items that have not been included and are necessary for a complete review of the required Submittal information for a Specification Section.

3. The Engineer of Record shall have the option of returning any Submittal, unmarked, if all required documentation called for in the Specifications has not been provided in the Submittal.
  4. The Engineer of Record shall review each Submittal no more than two (2) times and return to the Contractor with the appropriate disposition.
  5. If the Engineer of Record is required to review a Submittal a second time, it shall be limited to review of the changed information, clearly highlighted by the submitter, and/or confirmation of documentation only and it shall be returned to the Contractor with the appropriate disposition.
  6. If the Submittal is required to be reviewed a third time, it shall be done at the expense of the Contractor. Charges for this additional Submittal review shall be calculated based on the Engineer's standard hourly rates, as defined in their Contract with the Owner.
- D. Operation and Maintenance Manuals: All items required for insertion into each Operation and Maintenance (O&M) Manual are called out in the Submittals portion of each Specification Section or in a Submittal Log, if included within Division 01. It is the responsibility of the Contractor to ensure that the O&M Submittal has been reviewed and includes all the requirements of the Specifications. The Engineer of Record shall review the Submittal for the Operation and Maintenance Manual one (1) time and return to the Contractor with the appropriate disposition.
1. If the Submittal is required to be reviewed a second time, it shall be done at the expense of the Contractor. Charges for this additional Submittal review shall be calculated based on the Engineer's standard hourly rates, as defined in their Contract with the Owner.
  2. Submittals for the Operation and Maintenance Manual must be original documentation.
  3. Photocopies of marked up Operations and Maintenance Submittals are not acceptable.
- E. For DDC building automation systems, see also "Submittals" in Part 1 of 230900 "HVAC Instrumentation and Controls" for additional submittal requirements and a detailed submittal schedule.
- F. Engineer of Record or designated design team member will review submittals and provide comments within the following timeframe after receipt by the Engineer:
1. For typical submittals, allow 10 working days.
  2. For large or complex submittals, allow 15 working days. Determination of "large and complex" submittal shall be at the discretion of the Engineer of Record.
  3. Do not send Engineer of Record more than 10 submittals in a contiguous period of 5 working days. If excess submittals are received, review period will be extended as necessary to perform proper review. Submittals priority order shall be provided by the contractor.
  4. Submittal review periods shall not be reduced from the times herein except by agreement with the reviewing entity, in advance and in writing.

- G. Submittal documentation and drawings shall consistently use the same abbreviations, symbols, nomenclature and identifiers. Use the same identifiers (e.g. equipment tags) used in Contract Drawings.
- H. Submittals shall be provided in digital format.
1. Provide a separate file for each submittal. For submittal packages, provide a separate file for each subsection (e.g. hardware cutsheets and shop drawings for the same Section shall be provided as separate files).
  2. For submittals with materials serving various systems or with conditional installation (e.g.: insulation), a schedule or plan markup of where the materials are used shall be provided.
  3. Product cutsheets, test forms and other text documents shall be provided in word-searchable digital format. Acceptable formats are MS Word, PDF (generated from another electronic document and word-searchable; scans of paper documents are not acceptable), and HTML; other formats require approval prior to submission.
  4. Drawings and schematics shall be provided in PDF format and in AutoCAD compatible format.
  5. Scanned paper documents are not acceptable
    - a. Exception: Original signed documents, such as qualifications, inspection certificates, and warranty documents.
  6. Hardcopy (paper) submittals are not acceptable and shall not be provided except as noted elsewhere).
  7. Submittals provided in the wrong format will be returned without action.
- I. Submission and Resubmission Procedure:
1. Each submittal shall have a unique serial number that includes the associated Specification Section followed by a number for each subpart of the submittal for that Specification Section, such as "Submittal 230000-01." There is no requirement to assign particular serial numbers to any specific submittals – serial number assignment is arbitrary. The only requirements are that the serial numbers be sequential (to avoid confusing gaps) and, most importantly, consistent across all submittal correspondence.
  2. Each resubmittal shall have the original unique serial number plus unique revision number such as "Submittal 230000-01 Revision 1."
  3. Submit one copy of submittal in electronic format. Submissions made in the wrong format will be returned without action.
  4. Include with each submittal and resubmittal a copy of the relevant specification section(s) noting on each paragraph and sub-paragraph(s) the following:
    - a. Conforms: Contractor has verified that the submitted product conforms to the noted requirement(s).

- b. Conforms as Noted: Contractor has verified that the submitted product conforms to the noted requirement(s) by means of being equal to or higher quality and/or performance.
  - c. Non-Conform: Contractor has verified that the submitted product does not conform to the noted requirement(s) and delineates each deviation from the specification requirements.
  - d. Not Applicable: Contractor has verified that the noted requirement(s), in their opinion do not apply to this product, delineating the reasons for this decision.
  - e. Include with each submittal and resubmittal a copy of the relevant specification section(s) the printed name of the contractor reviewer, their signature, the company name, and date of review.
5. Any aspect of a product which does not conform to the design documents or specifications shall be plainly indicated on all submittals or resubmittals.
6. Revise Submittal:
- a. Respond to All Comments:
    - 1) Revise initial submittal to resolve review comments and corrections.
    - 2) Provide complete responses to comments or suggestions which are not practical to implement in the opinion of the Contractor.
  - b. Indicate any changes that have been made other than those requested.
  - c. Clearly identify resubmittal by original submittal number and revision number.
  - d. Resubmittals that are not responsive to all comments will be returned without action.
7. Resubmit revised submittals until no exceptions are taken, maximum one resubmittal.
- J. Shop drawings shall be provided for all mechanical systems for all floors of the building. Mechanical shop drawings shall also be provided for the under-slab systems (under the foundation slab) and slab-embedded systems such as hydronic radiant loops and controls.
- K. Prepare and submit shop drawings, sections, details and diagrams to minimum scale 1/4" = 1'-0". Mechanical rooms shall be 1/2" = 1'-0" minimum scale. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, fire protection, and electrical in relation to architectural and structural features. Include minor piping, drains, air vents, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, dampers, etc. Provide section or 3D views where required to communicate arrangement of systems.



- L. Submit manufacturer's specifications, product source, data sheets, certified equipment drawings and installation instructions, including installation dimensions, clearances, weights, materials, finishes, color selection, accessories, acoustical characteristics, capacity and full load and part load performance curves; complete with electrical data, motor horsepower, KW; motor efficiency, amperage, voltage phases and wiring diagrams. Identify the particular specification section number, paragraph and equipment identification number per equipment schedule. Note that suppliers (wholesalers and distributors) data sheets are not acceptable unless they are also manufacturers of the product being submitted.
- M. Fan and pump systems, with equipment in parallel, shall have performance curves noting single equipment operation and all iterations of additional equipment.
- N. Certified Equipment Drawings (8-1/2" x 11" sheets) shall be indexed in accordance with Specification Section. Drawings to be submitted at a later date shall be marked with a page as a placeholder for insertion when submitted. The original submittal shall note which shop drawings will be submitted later. Marked-up catalogs are not acceptable and will be returned without action. Electronic submittal is required.
- O. Engineer of Record's review of submittals is for limited purpose of verifying conformance with information given and design concept expressed in Contract Drawings and Specifications. Engineer's review is not for purpose of determining accuracy or completeness of items such as dimensions and quantities, which remain responsibility of Contractor.
- P. Contractor shall not commence with purchase, fabrication, or installation of any equipment or system until the associated submittals have been approved by the Engineer of Record and returned with "no exceptions" taken. Contractor shall be solely liable for any costs incurred from starting fabrication before approved submittals are returned.
- Q. All final submittals and equipment datasheets shall be provided, in PDF format, to the Owner as part of the as-built drawing set and shall be text-searchable.

#### **1.7 COORDINATION DRAWINGS**

- A. Utilize the latest version of 3D AutoCAD, Navisworks, and/or Revit software for the Coordination Drawings. No proprietary software of any kind shall be used other than that indicated. Drawing paper size shall not be larger than full-sized Contract Drawings, and in no case larger than 30" x 42." Coordinate available space with ALL other trades involved.
- B. Provide Coordination Drawings in digital electronic format. Provide both native file format (AutoCAD, Navisworks, or Revit) and PDF format files. Hardcopy drawings are not acceptable.

- C. These drawings are to show registers, grilles, diffusers, duct sizes, elevation of bottom of duct, pipe sizes, valves and accessories, elevation of bottom of pipe, all elevations of materials and/or systems throughout each floor inclusive of hanger components, seismic bracing if applicable, and any component of construction that impacts vertical and/or horizontal space. In addition, the locations of all valves, dampers, and other items requiring access for service and maintenance are to be shown. The drawings are to also show electrical, structural beams, architectural bracing, structural bracing, ceiling heights, access doors, walls, floor to floor dimensions, columns, doors and other major architectural and structural features as shown on the architectural and structural drawings. Where the routing of work differs from that indicated on the Contract Drawings, such areas are to be indicated by highlighting with a note describing the reason for the change.
- D. Rerouting of any system or part thereof shall be submitted separately in order to obtain concurrence of the Engineer of Record. Submitted rerouting must include fully documented proposed solutions with all trades coordinated. Contractor is fully responsible for coordination of systems included herein. Any effort by Engineer of Record beyond answering Contractor's questions will be at Contractor's expense, including attending coordination meetings, review of interim plans, or review of incomplete questions (routing issues without suggested solutions).
- E. The Contractor and subcontractors are responsible to review and resolve any real or apparent interferences or conflicts as indicated by the coordination drawings produced by each trade.
- F. After all conflicts or interferences are resolved, develop a final composite drawing showing the agreed upon routing, layout and juxtaposition of all duct work, conveyers, piping, major conduit, valves, panels, lighting fixtures and all other major mechanical, plumbing and electrical installations. In the preparation of all the final Coordination Drawings, large scale details as well as cross and longitudinal sections are required to fully delineate all conditions.
- G. Submit the Coordination Drawings as digital electronic files to Engineer of Record for review and comment, as indicated under "Shop Drawings" above. Coordination Drawings shall be digitally signed-off by all other trades.
- H. Contractor shall not commence with fabrication or installation of any equipment or system until the associated shop drawings have been reviewed and returned by the Engineer of Record. Engineer's review of shop drawings shall not be taken as approval of their contents. Contractor shall be solely liable for any costs incurred due to deviations from the Contract Drawings.
- I. No extra compensation will be paid for relocating any duct, pipe, conduit, or other material that has been installed without proper coordination between all trades involved. If any improperly coordinated work, or installed work that is not in accordance with the approved coordination composites, or is specifically noted by the Architect or Engineer of Record for a valid reason, necessitates additional work by the other trades, the costs of all such additional work is to be borne solely by the Contractor.

- J. All changes in the scope of work due to revisions formally issued and approved are to be shown on both the individual subcontractor's Shop Drawings and the Coordination Drawings.

#### **1.8 REQUESTS FOR INTERPRETATION AND CLARIFICATION**

- A. See Division 01 "Project Management" for RFI procedures and forms.
- B. Limit each RFI to a single issue or group of related issues.
- C. Each RFI shall include a workable no-cost or lowest cost solution recommendation by Contractor.
- D. Do not send Engineer of Record more than 10 RFIs in a contiguous period of 5 working days. If excess RFIs are received, review period will be extended as necessary to provide a professional response. RFIs priority order shall be provided by the contractor.

#### **1.9 MATERIALS AND SUBSTITUTIONS**

- A. Comply with Division 01 "Product Requirements."
- B. Requests for product or equipment substitution shall be accompanied by a marked up copy of the Engineer of Record's original specification. For each specified product feature or requirement, Contractor shall note the equivalent feature or attribute of the proposed substitute product or equipment.
- C. Shop drawings of proposed material and equipment that differ from the specified materials and equipment, shall be accompanied by drawings that define changes. These drawings shall show modifications of architectural, plumbing, electrical and mechanical work required by the proposed materials and equipment, such as relocation of flues, drains, revised electrical circuits, relocation of roof or wall penetrations, revised foundations, etc.
- D. Product Options: The specification of each item of major mechanical equipment required for the Project may include a list of manufacturers, with one "basis of design" manufacturer, type, and model identified by virtue of their listing in the equipment schedule on the Drawings. Where several manufacturers in addition to the "basis of design" manufacturer are listed in the Specifications, it shall be understood that the words "or approved equal by" are implied to precede each of the other manufacturer's names.

1. The manufacturers other than the “basis of design” may be furnished at the Contractor’s option in lieu of the “basis of design” product, provided that the selected manufacturer’s product is equal in all material and functional respects. In addition to Submittal requirements that may be specified in this Section, submit a line-by-line written verification of the applicable Specification Section(s) identifying compliance with or variations from the specified features, materials, performance, capacities, weight, size, durability, energy consumption and efficiency, warranty, and visual impact (if exposed to view by other than maintenance persons). The burden of proof of manufacturer/product equality is on the Contractor.
  2. Where a product is not scheduled on the Drawings and, therefore, where no “basis of design” is indicated, selection among all of the listed manufacturers and products is at the Contractor’s option, subject to the requirements of the Contract Documents.
  3. Products of manufacturers not listed in the Contract Documents are considered Substitutions and are not permitted, except as provided under the General and Supplementary Conditions and Division 01 Specifications. Full compliance with Division 01 Section “Product Substitutions” is mandatory for acceptance of products or manufacturers not listed.
- E. Listing of a manufacturer does not imply approval of that manufacturer’s standard product or products. Rather, listing of a manufacturer indicates only a general acceptance of that manufacturer’s name and reputation. Final approval is subject to full compliance with these Contract Documents.
- F. Model numbers identified on the Drawings notwithstanding, all equipment must comply with the requirements of these Contract Documents. Do not assume that a manufacturer’s standard product is acceptable as-is. For example, one or more custom modifications, custom colors or finishes, manufacturer’s options, and/or accessories may be required to meet the specified requirements.
- G. Where Drawings indicate sizes, profiles, connections, and dimensional requirements of material and equipment, these are based on the “basis of design” manufacturer, type and model indicated. In the event that equipment of power, dimensions, capacities, layout, connections, and/or ratings differing from the “basis of design” are selected by the Contractor and approved by the Owner’s representative, any necessary adjustments are the Contractor’s responsibility. All connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, pipe and duct sizes, pipe and duct layout, and the like shall be adjusted by the Contractor to suit the equipment provided. No additional costs will be approved for these changes. Should revisions to the design because of Contractor’s selection of manufacturer, type, or model other than the “basis of design” require additional review and/or redesign by an Architect or Engineer, the Contractor shall reimburse the Owner for Owner’s added professional fee expenses.

- H. Where two or more materials are listed in the "Part 2 – Products" subsection of any Division 23 Section, do not assume that the selection of materials is the Contractor's option. Refer to "Part 3 – Execution" subsection of that same Division 23 Section for an explanation of which specific material(s) shall be used for which specific application(s). For example, Part 2 may list several types and grades of piping, and Part 3 will describe which type and grade of pipe to use for a given application.

**1.10 COORDINATION WITH OTHER WORK**

- A. Contractor performing Work under this Section shall become thoroughly familiar with the Drawings and Specifications. Contractor shall adjust the Work to conform with the conditions shown on these drawings to provide the best possible assembly of the combined Work.
- B. Obtain necessary information from the other trades regarding location of their work in order that the Work in this Section may be placed in correct position.
- C. The inclusion and proper location of supports, pads, sleepers, openings, anchorages, etc. provided by others is the responsibility of the Contractor under this Section. Cutting and/or boring shall be permitted under this Section only with the written approval of the Architect.
- D. It shall be the Contractor's responsibility to coordinate and have provided by other trades where not covered by the Contractor's scope of work, all electrical wiring and power to equipment, controls and devices, and any other work from other trades as required to provide fully functioning HVAC systems per the Contract Drawings and Specifications.
- E. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified with no cost impact to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

**1.11 MANUFACTURER'S DIRECTIONS**

- A. Manufacturer's directions shall be followed in cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the Contract Drawings and Specifications.

**1.12 PROTECTION OF WORK**

- A. Equipment and materials shall be stored on dunnage and remain wrapped at all times until installed.

- B. Duct and piping shall remain capped during delivery and storage.
- C. During installation, all installed duct and piping shall be capped and protected at the end of each working day to prevent ingress of foreign materials.
- D. Equipment shall be protected from weather and stored in an enclosed, indoor location.
- E. Until final acceptance of the work, protect materials from damage and provide adequate and proper storage facilities. Replace damaged or defective work, material, and equipment before requesting final acceptance.

**1.13 WORKMANSHIP**

- A. Equipment and materials shall be installed in a neat and workmanlike manner. Materials and equipment not so installed shall, upon order of the Architect or Engineer of Record, be removed and replaced in a satisfactory manner, without change in Contract Sum or additional cost to the Owner.

**1.14 CLOSING IN UNINSPECTED WORK**

- A. Do not allow or cause any work to be covered up or enclosed until it has been inspected, tested, and accepted by the Owner's Representative, and/or Commissioning Authority.
- B. Any work enclosed or covered-up prior to inspection and testing shall be uncovered. After the work has been tested, inspected and accepted, repair such materials as may be necessary to restore disturbed work to its original and proper condition at no extra cost to the Owner.

**1.15 EQUIPMENT ANCHORING**

- A. Equipment shall be securely anchored to the building structure to prevent shifting or overturning during earthquakes.

**1.16 "AS-BUILT" DRAWINGS**

- A. Comply with Section Division 01 "Project Closeout."
- B. For DDC building automation systems, see also "Completion Requirements" in Part 1 of Section 230900 "HVAC Instrumentation and Controls" for additional as-built and closeout submittal requirements.
- C. As-built drawings shall be furnished in an electronic format. Provide in drafting software (AutoCAD or Revit) native format and also in PDF format.

- D. It is the responsibility of the Contractor to incorporate all deviations from the original design drawings into the as-built or "Record" drawings. Record drawings shall depict the system as installed. The design drawings will not be revised to reflect the result of RFIs, equipment substitutions, or changes made during the construction coordination process.

**1.17 FINAL INSPECTION**

- A. At the time of final inspection, a service representative shall be available to make final adjustments.

**1.18 FINAL OPERATION**

- A. After acceptance of the installation, instruct the Owner's Representative in operation and maintenance, for a period of three (3), non-consecutive working days at a time requested by the Owner during the first year of warranty.
- B. At the beginning of the instruction period, deliver to the Owner three (3) copies of a durable binder as described under "Operating Instructions."

**1.19 OPERATING INSTRUCTIONS**

- A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these Specifications.
- B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the General Contractor for inclusion in the O&M manuals prior to the training of Owner personnel.
- C. In addition, DDC Contractor shall provide O&M material as required by "Completion Requirements" in Part 1 of Section 230900 "HVAC Instrumentation and Controls."
- D. Provide a summary of operating sequences (start-up, normal run, and shutdown), and control shop drawings in the main mechanical room.
- E. Provide three (3) complete sets of Operating Instructions. These instructions shall include brochures, diagrams, maintenance, and operating instructions and parts lists.
- F. Provide a copy of the O&M manuals to the Commissioning Authority for review.

**1.20 MAINTENANCE MANUALS**

- A. Prepare maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for equipment items:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  - 4. Servicing instructions and lubrication charts and schedules.
  - 5. Facsimiles or photocopies are not allowed as Submittals for operating and maintenance manuals. Submittals for operating and maintenance manuals must be on original manufacturer printed stock.
- B. In addition to the above, comply with ASHRAE Guideline 4-2008 (RA 2013) *Preparation of Operating and Maintenance Documentation for Building Systems*.

**1.21 TRAINING OF OWNER PERSONNEL**

- A. The General Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
- B. The Commissioning Authority (CxA) shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
- C. The Mechanical Contractor shall have the following training responsibilities:
  - 1. Provide the CxA with a training plan two weeks before the planned training.
  - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, air conditioning units, air handling units, fans, boilers, terminal units, controls, water treatment systems, etc.
  - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
  - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.



5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The DDC Contractor shall attend sessions other than the DDC System training, as requested; to discuss the interaction of the DDC System as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:
  - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
  - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
  - c. Discussion of relevant health and safety issues and concerns.
  - d. Discussion of warranties and guarantees.
  - e. Common troubleshooting problems and solutions.
  - f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
  - g. Discussion of any peculiarities of equipment installation or operation.
  - h. Instruction in the use of equipment controls that are integral to equipment or are provided by the equipment manufacturer, such as VRF system controls. This is in addition to and separate from DDC system training (see below) and does not replace or satisfy the requirement for such training, if specified. Equipment controls training shall include at least the following:

- 1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system and any interface with security and communication systems.
  - 2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
  - 3) If system supports trending, all trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
  - 4) Every screen shall be completely discussed, allowing time for questions.
  - 5) Use of keypad or plug-in laptop computer for mobile control access.
  - 6) Use of remote access to the system via phone lines or networks, if applicable.
  - 7) Graphics generation, if applicable.
  - 8) Point database entry and modifications, if applicable
- i. The format and training agenda in *The HVAC Commissioning Process*, ASHRAE Guideline 1-1989R, 1996 is recommended.
  - j. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate. A video recording of the training session is suggested but not required.
9. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.
  10. The Mechanical Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
  11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
- D. DDC Contractor:
1. See "Training" in Part 3 of Section 230900 "HVAC Instrumentation and Controls" for DDC system training requirements and DDC Contractor obligations.
  2. DDC Contractor shall coordinate with Mechanical Contractor and Commissioning Authority regarding training on equipment-integrated or manufacturer-supplied control systems as described above. Such training is the responsibility of Mechanical Contractor but may be adopted by DDC Contractor by mutual agreement, to facilitate a more integrated training experience.

E. Test and Balance (TAB) Contractor: The TAB Contractor shall have the following training responsibilities:

1. TAB Contractor shall meet with facility staff after completion of TAB and instruct them on the following:
  - a. Go over the final TAB report, explaining the layout and meanings of each data type.
  - b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
  - c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
  - d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
  - e. Other salient information that may be useful for facility operations, relative to TAB.

#### 1.22 WARRANTY

A. In accordance with Division 01 Project Closeout requirements, Guarantees, Warranties, Bonds, Service & Maintenance Contracts and as follows:

1. Contractor shall leave entire installation in complete working order and free from defects in material, workmanship, or finish.
2. Warranty all materials, equipment, apparatus, and workmanship to be free of defective materials and faulty workmanship for a minimum period of one (1) year from date of Certificate of Occupancy, or per Division 01, whichever is longer.
3. Warranty also services including instructions, adjusting, testing, noise, balancing, etc.
4. For each piece of equipment or device with a manufacturer's warranty in excess of one year, Contractor shall furnish certificate of manufacturer's warranty and contact information for manufacturer's warranty service. Contractor shall also provide a list or table of all equipment with warranties exceeding one (1) year in duration.
5. Provide new materials, equipment, apparatus, labor and/or service, and support to correct or replace that determined by the Owner to be defective or faulty.
6. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding the guarantees or relieving responsibility during the guarantee period.
7. Retain the following paragraph if issuing Section 255000 "Building Automation System Hardware and Networking."
8. For DDC System, see "Warranty" and "Warranty Maintenance" in Part 1 of Section 230900 "HVAC Instrumentation and Controls." DDC System warranty commences upon the acceptance of "Completion Requirements" described in Part 1 of that Section, which may occur after the Certificate of Occupancy.

9. After a period of 90 calendar days from date of acceptance of systems by Owner, provide, at no cost to the Owner, one service mechanic for an 8-hour period over as many working days as required to repair, replace any latent deficiency.

**1.23 SUBMITTALS**

- A. Welding certificates.

**1.24 ACTION SUBMITTALS**

- A. Product Data: For each type of product in Part 2.

**1.25 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

**PART 2 - PRODUCTS****2.1 JOINING MATERIALS**

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.

**2.2 SLEEVES**

- A. Galvanized-Steel Sheet: 0.0239 inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PE or PP: Reusable, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

**2.3 SLEEVE SEAL SYSTEMS**

- A. Manufacturers:
  - 1. Link-Seal.
  - 2. Advance Products & Systems, Inc.
  - 3. CALPICO, Inc.
  - 4. GPT; an EnPro Industries company.
  - 5. Metraflex Company (The).
- B. Description:
  - 1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 2. Designed to form a hydrostatic seal of 20-psig.
  - 3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
  - 4. Pressure Plates: Carbon steel.
  - 5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 633 of length required to secure pressure plates to sealing elements.

**2.4 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening. Polished chrome-plated finish.
1. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass.
  2. One-Piece, Cast-Brass Type: With set screw.
  3. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

**2.5 GROUT**

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi, 28-day compressive strength.
  3. Packaging: Premixed and factory-packaged.

**PART 3 - EXECUTION****3.1 CONSTRUCTION IAQ MANAGEMENT**

- A. General Intent: Perform Construction IAQ Management as further described herein, as required to achieve LEED-NCv4 Credit EQc3 for "Construction Indoor Air Quality Management Plan."
- B. Temporary Ventilation: The Contractor shall provide temporary ductwork and fan systems to exhaust the construction areas, providing negative pressures in relation to adjacent non-construction (occupied) areas, of 0.05-inch w.c. adjustable. This exhaust ductwork shall be routed through openings to the exterior, such as windows, and discharged at a location 25-feet or more removed from pedestrian walkways, roadways, other air intakes, doors, or windows serving occupied areas. The temporary exhaust fan(s) shall be installed in a draw-through arrangement to limit air leakage downstream of the fans back into the space(s).
1. Temporary exhaust fans shall be sized for approximately 0.5 cfm per square foot of construction zone served.
  2. All ductwork shall be of galvanized construction, furnished and installed per Division 23 Section "Metal Ducts" and sealed per Seal Class A.

- C. Construction Zone Pressure Monitoring: Provide monitor consisting of a transmitter module and two sensing probes with stainless steel trim plates. Mount reference probe in an adjacent, non-construction zone hallway, six inches above the floor, and construction zone probe six inches above the floor in the construction zone near the main entry into the construction zone. Transmitter module, powered by 24 VAC, shall be microprocessor based and include an air velocity sensor, 4-20ma analog output, SPDT alarm relay output, and RS-485 digital communications link. Flow measurement accuracy over the range selected shall be plus or minus 10 feet per minute and a resolution of one foot per minute; pressure measurement accuracy over the selected range shall be one percent of the set span with resolution of 0.001-inches of water column or better. Subject to compliance with Specifications, example of acceptable device is Model SPM-5100 by Tek-Air Systems, Inc. or approved equal.
1. Construction Zone Alarm Status Display: A wall-mounted display module with LED display and audible alarm horn and mute (acknowledge) button. Display module shall mount on a standard 4-inch by 4-inch electrical box, with tamper-proof screws.
  2. Provide a transformer as required for low voltage control power.
- D. If permanent building ductwork and air handling equipment are used for temporary ventilation during construction, filtration media with a MERV-8 or better shall be used at each and every return air opening for the duration of operation. Refer to Division 23 Section "Air Filters" for filter requirements.
1. Shut down or damper-off the return side of the HVAC system in areas of heavy construction or demolition. Seal return system openings with plastic where major activity occurs.
  2. Repair all leaks in ducts and air handling equipment promptly.
  3. Erect temporary barriers between work areas and non-work areas.
  4. Provide and operate temporary ventilation to maintain slightly negative air pressurization in heavy work areas, to minimize tendency of dust, debris, and contaminants from migrating to non-work areas.
- E. Building Flush-Out: After construction ends but prior to occupancy, conduct a minimum two-week building flush-out using permanent building ductwork and air handling equipment. Flush-out shall be made with 100% outdoor air and MERV-13 or better filtration media. If extremes of cold, hot, or humid weather are anticipated during flush-out, participate with design professional in formulating a climate control plan.
- F. Replace all filtration media immediately prior to occupancy, using MERV-13 or better filtration media. Refer to Division 23 Section "Air Filters" for filter requirements.
- G. Document Construction IAQ Management activities. Such documentation shall include, as a minimum:
1. List each air filter used during construction. Include the MERV value, manufacturer name and model number, and a designation of where used on this Project.

2. List each air filter installed at the end of construction. Include the MERV value, manufacturer name and model number, and a designation of where used on this Project.
3. Provide (18) photographs (six photographs taken on three different occasions during construction), along with identification of the SMACNA approach featured by each photograph, in order to show consistent adherence to the SMACNA Guideline.

### **3.2 SLEEVE INSTALLATION**

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1 inch annular clear space between piping and concrete slabs and walls.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  2. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 4 inches above finished floor level.
  3. Using grout, seal space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
  1. Cut sleeves to length for mounting flush with both surfaces.
  2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
  3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.
- E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for fire-stopping and fill materials specified in Division 07.



**3.3 SLEEVE-SEAL-SYSTEM INSTALLATION**

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

**3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE**

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Exterior Concrete Walls Above Grade: Cast-iron sleeves or Galvanized Steel pipe sleeves.
  - 2. Exterior Concrete Walls Below Grade: Cast-iron pipe sleeves with sleeve-seal system or galvanized steel pipe sleeves with sleeve-seal system.
    - a. Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 3. Concrete Slabs-on-Grade: Piping Smaller Than: Cast-iron pipe sleeves with sleeve-seal system or galvanized Steel pipe sleeves with sleeve-seal system.
    - a. Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve-seal system.
  - 4. Concrete Slabs Above Grade:
    - a. Piping Smaller Than NPS 6: Galvanized Steel pipe sleeves.
    - b. Piping NPS 6 and Larger: Galvanized Steel pipe sleeves.
  - 5. Interior Partitions: Galvanized-steel sheet sleeves.

**3.5 ESCUTCHEON INSTALLATION**

- A. Install escutcheons for penetrations of walls, ceilings, and floors.

**3.6 CUTTING AND OPENINGS**

- A. Comply with Division 01 "Cutting and Patching."

**3.7 EQUIPMENT INSTALLATION**

- A. Install equipment to minimize pressure drop and allow adequate access headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated in drawings (note that in some cases non-parallel installation is indicated in the drawing to reduce pressure drop).
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

**3.8 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Refer to architectural and structural drawings for pad construction details.
  - 2. Refer Division 03 Section "Cast-in-Place Concrete" for concrete requirements.
  - 3. Construct concrete bases not less than 4 inches larger in all directions than supported unit.
  - 4. Install dowel rods to connect concrete base to concrete floor as required by structural drawings.
  - 5. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 6. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 8. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

- A. Refer to Division 05 Section for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

**3.10 ERECTION OF WOOD SUPPORTS AND ANCHORAGES**

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

**3.11 GROUTING**

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

**END OF SECTION 230000**

**SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Requirements generally applicable to all electrical Work on the Project, including but not limited to Work specified in Divisions 26, 27, and 28.

**B. Related Requirements:**

1. Section 018113.14 "Sustainable Design Requirements – LEEDv4 BD+C, New Construction" for sustainable design requirements applicable to this Project.

**1.2 REFERENCES****A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:**

1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AIC: Ampere interrupting capacity.
6. AL, Al, or ALUM: Aluminum.
7. ASD: Adjustable-speed drive.
8. ATS: Automatic transfer switch.
9. AWG: American wire gauge; see ASTM B258.
10. BAS: Building automation system.
11. BIL: Basic impulse insulation level.
12. BIM: Building information modeling.
13. BMS: Building management system.
14. CAD: Computer-aided design or drafting.
15. CATV: Community antenna television.
16. CB: Circuit breaker.
17. cd: Candela, the SI fundamental unit of luminous intensity.
18. CO/ALR: Copper-aluminum, revised.
19. COPS: Critical operations power system.
20. CU or Cu: Copper.
21. CU-AL or AL-CU: Copper-aluminum.
22. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.

- 23. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
- 24. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
- 25. dBm: Decibel absolute power with respect to 1 mW.
- 26. DC or dc: Direct current.
- 27. DCOA: Designated critical operations area.
- 28. DDC: Direct digital control (HVAC).
- 29. EGC: Equipment grounding conductor.
- 30. ELV: Extra-low voltage.
- 31. EMF: Electromotive force.
- 32. EMI: Electromagnetic interference.
- 33. EMP: Electrical maintenance program (operation and maintenance); electromagnetic pulse (transient analysis).
- 34. EPS: Emergency power supply.
- 35. EPSS: Emergency power supply system.
- 36. ESS: Energy storage system.
- 37. EV: Electric vehicle.
- 38. EVPE: Electric vehicle power export equipment.
- 39. EVSE: Electric vehicle supply equipment.
- 40. FACU: Fire-alarm control unit.
- 41. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
- 42. FLC: Full-load current.
- 43. ft: Foot.
- 44. ft-cd: Foot-candle, the antiquated U.S. standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" when the SI unit candela (cd) replaced the international candle; see "fc."
- 45. FTP: File transfer protocol.
- 46. GEC: Grounding electrode conductor.
- 47. GFCI: Ground-fault circuit interrupter.
- 48. GFPE: Ground-fault protection of equipment.
- 49. GND: Ground.
- 50. HACR: Heating, air conditioning, and refrigeration.
- 51. HDPE: High-density polyethylene.
- 52. HID: High-intensity discharge.
- 53. HP or hp: Horsepower.
- 54. HVAC: Heating, ventilating, and air conditioning.
- 55. Hz: Hertz.
- 56. IBT: Intersystem bonding termination.
- 57. ICT: Information and communications technology.
- 58. inch: Inch. To avoid confusion, the abbreviation "in." is not used.

- 59. I/O: Input/output.
- 60. IP: Ingress protection rating (enclosures); Internet protocol (communications).
- 61. IR: Infrared.
- 62. IS: Intrinsically safe.
- 63. IT&R: Inspecting, testing, and repair.
- 64. ITE: Information technology equipment.
- 65. kAIC: Kiloampere interrupting capacity.
- 66. kcmil or MCM: One thousand circular mils.
- 67. kV: Kilovolt.
- 68. kVA: Kilovolt-ampere.
- 69. kvar: Kilovolt-ampere reactive.
- 70. kW: Kilowatt.
- 71. kWh: Kilowatt-hour.
- 72. LAN: Local area network.
- 73. lb: Pound (weight).
- 74. lbf: Pound (force).
- 75. LCD: Liquid-crystal display.
- 76. LCDI: Leakage-current detector-interrupter.
- 77. LED: Light-emitting diode.
- 78. Li-ion: Lithium-ion.
- 79. lm: Lumen, the SI-derived unit of luminous flux.
- 80. LNG: Liquefied natural gas.
- 81. LP-Gas: Liquefied petroleum gas.
- 82. LRC: Locked-rotor current.
- 83. LV: Low voltage.
- 84. lx: Lux, the SI-derived unit of illuminance equal to one lumen per square meter.
- 85. m: Meter.
- 86. MCC: Motor-control center.
- 87. MDC: Modular data center.
- 88. MG set: Motor-generator set.
- 89. MIDI: Musical instrument digital interface.
- 90. MLO: Main lugs only.
- 91. MPEG-2: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard for generic coding of moving pictures and associated audio information (ISO/IEC 13818) released in 1995 and used for most over-the-air and satellite broadcast digital television.
- 92. MPEG-4: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard framework for coding of audio-visual objects (ISO/IEC 14496) released in 1999, with digital rights management and more advanced compression algorithms than MPEG-2.
- 93. MOV: Metal-oxide varistor.
- 94. MV: Medium voltage.
- 95. MVA: Megavolt-ampere.
- 96. mW: Milliwatt.
- 97. MW: Megawatt.
- 98. MWh: Megawatt-hour.

- 99. N.C.: Normally closed.
- 100. Ni-Cd: Nickel-cadmium.
- 101. Ni-MH: Nickel-metal hydride.
- 102. NIU: Network interface unit.
- 103. N.O.: Normally open.
- 104. NPT: National (American) standard pipe taper.
- 105. OCPD: Overcurrent protective device.
- 106. ONT: Optical network terminal.
- 107. PC: Personal computer.
- 108. PCS: Power conversion system.
- 109. PCU: Power-conditioning unit.
- 110. PF or pf: Power factor.
- 111. PHEV: Plug-in hybrid electric vehicle.
- 112. PLC: Programmable logic controller.
- 113. PLFA: Power-limited fire alarm.
- 114. PoE: Power over Ethernet.
- 115. POTS: Plain old telephone service. See "public switched telephone network" definition.
- 116. PSTN: Public switched telephone network.
- 117. PV: Photovoltaic.
- 118. PVC: Polyvinyl chloride.
- 119. pW: Picowatt.
- 120. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
- 121. RMS or rms: Root-mean-square.
- 122. RPM or rpm: Revolutions per minute.
- 123. SCADA: Supervisory control and data acquisition.
- 124. SCCR: Short-circuit current rating.
- 125. SCR: Silicon-controlled rectifier.
- 126. SPD: Surge protective device.
- 127. sq.: Square.
- 128. SWD: Switching duty.
- 129. TCP/IP: Transmission Control Protocol/Internet Protocol.
- 130. TEFC: Totally enclosed fan-cooled.
- 131. TR: Tamper resistant.
- 132. TVSS: Transient voltage surge suppressor.
- 133. UL: (standards) UL Standards & Engagement Inc.; (product categories) UL, LLC.
- 134. UL CCN: UL Category Control Number.
- 135. UPS: Uninterruptible power supply.
- 136. USB: Universal serial bus.
- 137. UV: Ultraviolet.
- 138. V: Volt, unit of electromotive force.
- 139. V(ac): Volt, alternating current.
- 140. V(dc): Volt, direct current.
- 141. VA: Volt-ampere, unit of complex electrical power.
- 142. VAR: Volt-ampere reactive, unit of reactive electrical power.

- 143. VFC: Variable-frequency controller.
- 144. VOM: Volt-ohm-multimeter.
- 145. VoIP: Voice over Internet Protocol.
- 146. VPN: Virtual private network.
- 147. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
- 148. W: Watt, unit of real electrical power.
- 149. WAN: Wide area network.
- 150. Wh: Watt-hour, unit of electrical energy usage.
- 151. WPT: Wireless power transfer.
- 152. WPTE: Wireless power transfer equipment.
- 153. WR: Weather resistant.

**B. Abbreviations and Acronyms for Electrical Raceway Types:**

- 1. EMT: Electrical metallic tubing.
- 2. EMT-A: Aluminum electrical metallic tubing.
- 3. EMT-S: Steel electrical metallic tubing.
- 4. EMT-SS: Stainless steel electrical metallic tubing.
- 5. ENT: Electrical nonmetallic tubing.
- 6. EPEC: Electrical HDPE underground conduit (thin wall).
- 7. EPEC-A: Type A electrical HDPE underground conduit.
- 8. EPEC-B: Type B electrical HDPE underground conduit.
- 9. ERMC: Electrical rigid metal conduit.
- 10. ERMC-A: Aluminum electrical rigid metal conduit.
- 11. ERMC-S: Steel electrical rigid metal conduit.
- 12. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
- 13. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
- 14. ERMC-SS: Stainless steel electrical rigid metal conduit.
- 15. FMC: Flexible metal conduit.
- 16. FMC-A: Aluminum flexible metal conduit.
- 17. FMC-S: Steel flexible metal conduit.
- 18. FMT: Steel flexible metallic tubing.
- 19. FNMC: Flexible nonmetallic conduit. See "LFNC."
- 20. HDPE: HDPE underground conduit (thick wall).
- 21. HDPE-40: Schedule 40 HDPE underground conduit.
- 22. HDPE-80: Schedule 80 HDPE underground conduit.
- 23. IMC: Steel electrical intermediate metal conduit.
- 24. LFMC: Liquidtight flexible metal conduit.
- 25. LFMC-A: Aluminum liquidtight flexible metal conduit.
- 26. LFMC-S: Steel liquidtight flexible metal conduit.
- 27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
- 28. LFNC: Liquidtight flexible nonmetallic conduit.
- 29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
- 30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
- 31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.



32. PVC: Rigid PVC conduit.
33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERM-C-S-G.
38. RMC: See ERM-C.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.

- 27. ITC: Instrumentation tray cable.
- 28. ITC-ER: Instrumentation tray cable, exposed run.
- 29. MC: Metal-clad cable.
- 30. MC-HL: Metal-clad cable, hazardous location.
- 31. MI: Mineral-insulated, metal-sheathed cable.
- 32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
- 33. MV: Medium-voltage cable.
- 34. NM: Nonmetallic sheathed cable.
- 35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
- 36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
- 37. NPLF: Non-power-limited fire-alarm circuit cable.
- 38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
- 39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
- 40. NUCC: Nonmetallic underground HDPE conduit with conductors.
- 41. OFC: Conductive optical fiber general-purpose cable.
- 42. OFCG: Conductive optical fiber general-purpose cable.
- 43. OFCP: Conductive optical fiber plenum cable.
- 44. OFCR: Conductive optical fiber riser cable.
- 45. OFN: Nonconductive optical fiber general-purpose cable.
- 46. OFNG: Nonconductive optical fiber general-purpose cable.
- 47. OFNP: Nonconductive optical fiber plenum cable.
- 48. OFNR: Nonconductive optical fiber riser cable.
- 49. P: Marine shipboard cable.
- 50. PLTC: Power-limited tray cable.
- 51. PLTC-ER: Power-limited tray cable, exposed run.
- 52. PV: Photovoltaic cable.
- 53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
- 54. RHW: Thermoset rubber, moisture-resistant cable.
- 55. SA: Silicone rubber cable.
- 56. SE: Service-entrance cable.
- 57. SER: Service-entrance cable, round.
- 58. SEU: Service-entrance cable, flat.
- 59. SIS: Thermoset cable for switchboard and switchgear wiring.
- 60. TBS: Thermoplastic cable with outer braid.
- 61. TC: Tray cable.
- 62. TC-ER: Tray cable, exposed run.
- 63. TC-ER-HL: Tray cable, exposed run, hazardous location.
- 64. THW: Thermoplastic, heat- and moisture-resistant cable.
- 65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
- 66. THHW: Thermoplastic, heat- and moisture-resistant cable.
- 67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
- 68. TW: Thermoplastic, moisture-resistant cable.
- 69. UF: Underground feeder and branch-circuit cable.

- 70. USE: Underground service-entrance cable.
- 71. XHH: Cross-linked polyethylene, heat-resistant cable.
- 72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

**D. Abbreviations and Acronyms for Electrical Flexible Cord Types:**

- 1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
- 2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
- 3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
- 4. SEOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
- 5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
- 6. SJEOW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
- 7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
- 8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
- 9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
- 10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
- 11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
- 12. SJOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
- 13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
- 14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
- 15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.

16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
  - a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.
2. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
3. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
4. ne another (multiple-conductor cable).
5. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
6. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.

7. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously.
8. Conduit: A structure containing one or more duct raceways.
9. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 01 8123 "Facility Seismic and Wind Criteria."
10. Direct Buried: Installed underground without encasement in concrete or other protective material.
11. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
12. Duct Raceway: A single enclosed raceway for conductors or cable.
13. Electrical Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
14. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
  - a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
  - b. Concrete Box: A box intended for use in poured concrete.
  - c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
  - d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
  - e. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
  - f. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
  - g. Device Box: A box with provisions for mounting a wiring device directly to the box.
  - h. ly to the box.
  - i. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.

- j. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
  - k. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
  - l. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
  - m. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
  - n. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
  - o. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
  - p. lets above the floor's finished surface.
  - q. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
  - r. Raised-Floor Box: A floor box intended for use in raised floors.
  - s. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
  - t. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
  - u. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
  - v. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
  - w. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.
15. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.

16. equipment in the event of failure of the normal supply for safety to human life.
17. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
18. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
  - a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
  - b. r discussion of classes of electrical energy sources and classes of electrical power sources.
19. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
20. Jacket: A continuous nonmetallic outer covering for conductors or cables.
21. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
22. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
23. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
24. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein. Also called "single-line diagram."
25. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
26. Protective Device: A device that senses when an abnormal current flow, abnormal voltage potential, or other abnormal electrical waveform exists and then disconnects the affected portion of the circuit from the system. Common protective devices include fuses, circuit breakers, relays, ground-fault circuit interrupters, and arc-fault circuit interrupters.
27. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.

28. ssion medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
29. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
30. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
31. Sheath: A continuous metallic covering for conductors or cables.
32. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
33. Voice over Internet Protocol (VoIP): Digital telephone packet technology that uses the internet for its transmission medium.
34. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
  - a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - b. hat is supplied from a battery or other Class 2 or Class 3 power-limited source.
  - c. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
  - d. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
  - e. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
  - f. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
  - g. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
35. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.



**1.3 COORDINATION**

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.
  3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
    - a. Exercising generators.
    - b. Emergency lighting.
    - c. Elevators.
    - d. Fire-alarm systems.
  4. Arrange to provide temporary emergency and standby electrical service or power so facility may remain occupied during the outage in accordance with requirements specified in Section 015000 "Temporary Facilities and Controls." Coordinate power requirements with Owner.
- B. Interruption of Existing Telephone Service: Do not interrupt telephone service to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of telephone service.
  2. Do not proceed with interruption of telephone service without Owner's written permission.
- C. Interruption of Existing Internet Service: Do not interrupt internet service to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of internet service.
  2. Do not proceed with interruption of internet service without Owner's written permission.
- D. Interruption of Existing Fire-Alarm System: Do not interrupt fire-alarm system to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of fire-alarm system.
  2. Do not proceed with interruption of fire-alarm system without Owner's written permission.

## 1.4 EQUIPMENT CONNECTIONS – COORDINATING ELECTRICAL CHARACTERISTICS

- A. Reasonable efforts have been made to coordinate the electrical requirements of the equipment specified in other divisions with the electrical systems serving that equipment. Differences among manufacturers of equipment make it impossible to produce a single electrical design which will satisfy the varying electrical requirements of those manufacturers. Consequently, the Contractor shall coordinate the electrical requirements of the equipment furnished on this Project and provide the electrical systems required by that equipment. This coordination effort shall be completed prior to the installation of either the equipment or the electrical systems serving that equipment. Electrical system revisions required to coordinate with the equipment furnished shall be provided at no additional cost to the Owner.
- B. Submittal Electrical Connection Checklist. Coordinate electrical requirements with work of other trades. Electrical Connection List below shall be filled out by contractor and included for all equipment requiring electrical connection(s). Describe all conflicts.

SUBMITTAL ELECTRICAL CONNECTION CHECKLIST												
UNIT NAME	ELECTRICAL CHARACTERISTICS OF EQUIPMENT SUBMITTAL (ENTER ALL THAT ARE APPLICABLE)							DISCONNECT SWITCH FURNISHED BY	MOTOR CONTROLLER PROVIDED BY	MATCHES HVAC / PLUMB / OTHER TRADES	MATCHES ELECTRICAL CONNECTION	MATCHES EXISTING VOLTAGE, PHASE
	HP	AMP	KW	MOCP	VOLT	PH	SCCR			(YES / NO)	(YES / NO)	(YES / NO)

## 1.5 PREINSTALLATION MEETINGS

- A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
1. Electrical installation schedule.
  2. Status of power system studies.
  3. Value analysis proposals and requests for substitution of electrical equipment.
  4. Utility work coordination and class of service requests.
  5. Commissioning activities.
  6. Sustainability activities, including Measurement and Verification Plan.
- B. Communications Preconstruction Conference: Schedule conference with Architect and Owner not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:

1. Installation schedule for communications systems.
  2. Value analysis proposals and requests for substitution of communications equipment.
  3. Utility services work coordination and monitoring service requests.
  4. Commissioning activities.
  5. Sustainability activities.
- C. Electronic Safety and Security Preconstruction Conference: Schedule conference with Architect and Owner not later than 10 days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
1. Installation schedule for security, fire-alarm, and other life-safety systems.
  2. Value analysis proposals and requests for substitution of electronic safety and security equipment.
  3. Monitoring services work coordination and monitoring service requests.
  4. Commissioning activities.
  5. Sustainability activities.

#### **1.6 SEQUENCING**

- A. Conduct and submit results of power system studies before submitting product data and Shop Drawings for electrical equipment.

#### **1.7 ACTION SUBMITTALS**

- A. Submittal Electrical Connection Checklist.
- B. Sustainable Design Submittals:
1. Refer to Table 1-1 "Sustainable Design Requirements Supplement" for specific credit requirements associated with Work in this Specification Section.
- C. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.
- D. Coordination Drawings for Ceiling Areas: Where indicated on drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Suspended ceiling components.
  2. Structural members to which equipment and suspension systems will be attached.

3. Size and location of access panels on ceilings.
  4. Elevation, size, and route of sprinkler piping.
  5. Elevation, size, and route of plumbing piping.
  6. Elevation, size, and route of ductwork.
  7. Elevation, size, and route of cable tray.
  8. Elevation, size, and route of conduit.
  9. Elevation and size of wall-mounted and ceiling-mounted equipment.
  10. Access panels.
  11. Sprinklers.
  12. Air inlets and outlets.
  13. Control modules.
  14. Luminaires.
  15. Communications devices.
  16. Speakers.
  17. Security devices.
  18. Fire-alarm devices.
  19. Indicate clear dimensions for maintenance access in front of equipment.
  20. Indicate dimensions of fully open access doors.
- E. Coordination Drawings for Cable Tray Routing: Reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Elevation, size, and route of cable trays.
  2. Relationships between components and adjacent structural, electrical, and mechanical elements.
  3. Vertical and horizontal offsets and transitions.
  4. Elevation and size of sleeves for wall, ceiling, and floor cable penetrations.
  5. Elevation of ceilings and size of ceiling tiles.
  6. Locations of access panels on ceilings.
  7. Locations where cable tray crosses or parallels sprinkler piping.
  8. Locations where cable tray crosses plumbing piping.
  9. Locations where cable tray crosses or parallels ductwork.
  10. Locations of access panels on ductwork.
  11. Locations where cable tray crosses conduit.
  12. Items blocking access around cable trays, including the following:
    - a. Light fixtures.
    - b. Speakers.
    - c. Fire-alarm devices.
    - d. Power outlets.
    - e. Wall-mounted equipment.
    - f. Equipment racks.
    - g. Furniture.
    - h. Door swings.

- i. Building features.
  - 13. Indicate clear dimension between cable tray and walls or obstructions that are closer than 10 ft.
  - 14. Highlight locations where cable tray is greater than 3 ft above ceilings. Explain how personnel access will be accommodated for cable tray maintenance.
- F. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
- 1. Structural members in paths of conduit groups with common supports.
  - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- G. Coordination Drawings for Bus Assembly Routing: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
- 1. Scaled bus-assembly layouts and relationships between components and adjacent structural, mechanical, and electrical elements.
  - 2. Vertical and horizontal enclosed bus-assembly runs, offsets, and transitions.
  - 3. Clearances for access above and to the side of enclosed bus assemblies.
  - 4. Vertical elevation of enclosed bus assemblies above the floor or bottom of structure.
  - 5. Support locations, type of support, and weight on each support.
  - 6. Location of adjacent construction elements, including luminaires, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.
- H. Coordination Drawings for Large Equipment Indoor Installations:
- 1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
  - 2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
    - a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
    - b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.
    - c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.

3. Reflected ceiling plans for entry floor and floor where equipment is located, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - a. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways.
  - b. Location of lighting fixtures, sprinkler piping and sprinklers, ducts and diffusers, and other obstructions, indicating available overhead clearance.
  - c. Dimensioned working clearances and dedicated areas above and around electrical equipment where foreign systems and equipment are prohibited.

I. Coordination Drawings for Large Equipment Outdoor Installations:

1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:
  - a. Fences and walls, dimensioned concrete bases, outlines of equipment, conduit entries, and grounding and bonding locations.
  - b. Indicate clear dimensions for fence gates and wall openings.
  - c. Indicate depth and type of ground cover, and locations of trees, shrubbery, and other obstructions in access path.
  - d. Indicate clear height below tree branches, overhead lines, bridges, and other overhead obstructions in access path, or where cranes and hoists will be needed to handle large electrical equipment.
  - e. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways.
  - f. Dimensioned working clearances and dedicated areas around electrical equipment.

J. Coordination Drawings for Duct Banks:

1. Show duct profiles and coordination with other utilities and underground structures.
2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

1.8 INFORMATIONAL SUBMITTALS

- A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of power system studies.
  2. Submission of specified coordination drawings.
  3. Submission of action submittals specified in Division 26.

4. Orders placed for major electrical equipment.
  5. Arrival of major electrical equipment on-site.
  6. Preinstallation meetings specified in Division 26.
  7. Utility service outages.
  8. Utility service inspection and activation.
  9. Mockup reviews.
  10. Closing of walls and ceilings containing electrical Work.
  11. System startup, testing, and commissioning activities for major electrical equipment.
  12. System startup, testing, and commissioning activities for emergency lighting.
  13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
  15. Requests for special inspections.
  16. Requests for inspections by authorities having jurisdiction.
- B. Installation Schedule for Communications Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of the communications Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of specified coordination drawings.
  2. Submission of action submittals specified in Division 27.
  3. Orders placed for major equipment.
  4. Arrival of major equipment onsite.
  5. Preinstallation meetings specified in Division 27.
  6. Telephone and internet service outages.
  7. Telephone and internet service inspection and activation.
  8. Mockup reviews.
  9. Closing of walls and ceilings containing the communications Work.
  10. System startup, testing, and commissioning activities for communications equipment.
  11. System startup, testing, and commissioning activities for the Work specified in other divisions that depends on the Work specified in Division 27.
  12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  13. Requests for special inspections.
  14. Requests for inspections by authorities having jurisdiction.
- C. Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of security, fire-alarm, and the other life-safety Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of specified coordination drawings.

2. Submission of action submittals specified in Division 28.
  3. Orders placed for major equipment.
  4. Arrival of major equipment on-site.
  5. Preinstallation meetings specified in Division 28.
  6. Security and fire-alarm system outages.
  7. Security and fire-alarm system inspection and activation.
  8. Mockup reviews.
  9. Closing of walls and ceilings containing the security and fire-alarm Work.
  10. System startup, testing, and commissioning activities for security and fire-alarm equipment.
  11. System startup, testing, and commissioning activities for fire-alarm interfaces with the Work specified in other divisions.
  12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
  13. Requests for special inspections.
  14. Requests for inspections by authorities having jurisdiction.
- D. Seismic Performance Certificates: Provide special certification for designated seismic systems as required to meet requirements specified in Section 018123 "Facility Seismic and Wind Criteria" for all designated seismic systems identified on the Drawings or in the Specifications.
1. Include the following information:
    - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
    - c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
    - d. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
    - e. Equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the basis-of-design seismic criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
    - f. Equipment manufacturer's written certification that components with hazardous contents maintain containment following the basis-of-design seismic criteria specified in Section 018123 "Facility Seismic and Wind Criteria."
    - g. Evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.
- E. Wind Performance Certificates: Provide special certification for systems and components designated on the Drawings or in the Specifications to be subject to high wind exposure and impact damage.



1. Include the following information:
  - a. Provide equipment manufacturer's written certification for each designated system and component, stating that it will remain in place and operable following the design wind event and comply with requirements of authorities having jurisdiction.
  - b. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction.

**F. Qualification Statements:**

1. For qualified regional manufacturer.
2. For structural professional engineer.
3. For electrical professional engineer.
4. For lighting professional engineer.
5. For EPM specialist.
6. For welder.
7. For ERM-C-S-PVC raceway Installer.
8. For medium-voltage cable Installer.
9. For medium-voltage duct Installer.
10. For medium-voltage equipment Installer.
11. For electrical power monitoring Installer.
12. For switchboard Installer.
13. For EVSE Installer.
14. For generator set Installer.
15. For lightning protection system Installer.
16. For theatrical lighting Installer.
17. For exterior athletic lighting Installer.
18. For power quality specialist.
19. For medium-voltage and low-voltage electrical testing agency and on-site electrical testing supervisor.
20. For power-limited electrical testing agency and on-site power-limited testing supervisor.
21. For structural testing and inspecting agency.
22. For outdoor pole testing and inspecting agency.
23. For luminaire photometric testing laboratory.
24. For lighting testing and inspecting agency.
25. For communications design professional.
26. For communications cable Installer.
27. For communications testing agency and on-site communications testing supervisor.
28. For security design professional.
29. For life-safety professional engineer.
30. For fire-alarm cable Installer.
31. For security testing agency and on-site security testing supervisor.
32. For fire-alarm testing agency and on-site fire-alarm testing supervisor.

**1.9 CLOSEOUT SUBMITTALS****A. Facility EMP Binders:**

1. Complete Set: On approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
2. Volumes 2 and 8: Reproducible hardcopy on archival quality, 28 lb, acid-free, bond paper.

**B. Operation and Maintenance Data:**

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device submitted.
2. Include the following information:
  - a. Manufacturer's operating specifications.
  - b. User's guides for software and hardware.
  - c. Schedule of maintenance material items recommended to be stored at the Project site.
  - d. Detailed instructions covering operation under both normal and abnormal conditions.
  - e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
  - f. List of load-current and overload-relay heaters with related motor name-plate data.
  - g. List of lamp types and photoelectric relays used on the Project, with ANSI and manufacturers' codes.
  - h. Manufacturer's instructions for setting field-adjustable components.
  - i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
  - j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
  - k. Exterior pole inspection and repair procedures.

**C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation in Facility EPM Binders, including the following:**

1. Software operating and upgrade manuals.
2. Names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.
5. Testing and adjusting of panic and emergency power features.
6. For lighting controls, include the following:
  - a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.

b. Operation of adjustable zone controls.

D. Software:

1. Program Software Backup: Provide username and password for approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
2. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.

## **PART 2 - PRODUCTS**

### **2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT**

- A. Substitution requests for electrical equipment will be entertained under the following conditions:
1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
  3. Substitution requests for luminaires may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by the following:
    - a. Working sample of specified and proposed luminaire.
    - b. Typical lighting foot candle calculation using the same operating parameters for both luminaires.
    - c. Value analysis data indicating that substitution will comply with Project performance requirements while significantly increasing value for Owner throughout life of facility.
  4. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

### **2.2 SUBSTITUTION LIMITATIONS FOR COMMUNICATIONS EQUIPMENT**

- A. Substitution requests for communications equipment will be entertained under the following conditions:

1. Substitution requests may be submitted for consideration prior to the Communications Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Communications Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

## **2.3 SUBSTITUTION LIMITATIONS FOR ELECTRONIC SAFETY AND SECURITY EQUIPMENT**

- A. Substitution requests for electronic safety and security equipment will be entertained under the following conditions:
  1. Substitution requests may be submitted for consideration prior to the Electronic Safety and Security Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
  2. Contractor is responsible for sequencing and scheduling equipment procurement. After the Electronic Safety and Security Preconstruction Conference, insufficient lead time for equipment delivery will not be considered a valid reason for substitution.

## **2.4 FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP) BINDERS**

- A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EMP development.
- B. Applicable Standards:
  1. Regulatory Requirements: Comply with requirements in NFPA 70B.
  2. General Characteristics:
    - a. Volume 1 - Introduction:
      - 1) Summarize how Facility EMP analysis was performed, how data were collected, and how volumes are organized.
      - 2) Describe Facility EMP and provide recommended policies and procedures for implementing the program and keeping it current.
      - 3) Provide place for Owner to identify contact information for employees responsible for implementing and maintaining Facility EMP.

- b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:
  - 1) Include training requirements for employees and contractors.
  - 2) Include list of known facility hazards impacting IT&R activities.
  - 3) Include approval and permitting procedures for IT&R activities.
  - 4) Include incident emergency response procedures.
  - 5) Include emergency shutdown procedures.
  - 6) Include electrical disaster recovery procedures.
  - 7) Include procedures for investigating the following incidents:
    - a) Electrical safety incidents.
    - b) Equipment malfunctions.
    - c) Unintended operations or alarms.
    - d) Operation of protective devices.
- c. Volume 4 - Facility Diagrams and Schedules:
  - 1) Include single-line diagrams.
  - 2) Include grounding and bonding diagrams.
  - 3) Include essential wiring diagrams.
  - 4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
  - 5) Include records of switchgear, switchboard, and panelboard schedules.
  - 6) Include time-current curves for overcurrent protective devices.
  - 7) Include list of load-current and overload-relay heaters with related motor nameplate data.
- d. Volume 5 - Inventory of Facility Equipment Using Electrical Power:
  - 1) Include simplified floor plans showing equipment locations.
  - 2) Identify critical equipment (electrical or otherwise).
  - 3) Include identifying designations and nameplate data.
  - 4) Include warranty and maintenance contract information.
- e. Volume 6 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:
  - 1) Include schedules of maintenance material items recommended to be stored at facility.
  - 2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
  - 3) Include calibration and servicing data for each item.
- f. Volume 7 - Inspection, Testing, and Repair (IT&R) Plan:

- 1) Include tables showing frequency of activities for each item.
  - 2) Include annual schedule with activities mapped to specific days of the year.
  - 3) Include exterior pole inspection and repair procedures.
- g. Volume 8 - Spare Parts List:
- 1) Include list of all parts required to perform IT&R procedures.
  - 2) Identify quantities of which parts are recommended to be stored on-site.
  - 3) Include source contact information and budget cost for each item.
- h. Volume 9 - Construction Project Closeout Record Documentation:
- 1) Include records of power system studies and photometric studies.
  - 2) Include records of risk assessment studies.
  - 3) Include records of electrical system startup and commissioning activities.
  - 4) Include records of baseline inspections and tests.
  - 5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
  - 6) Include records of baseline settings for adjustable equipment and devices.

### **PART 3 - EXECUTION**

#### **3.1 DEVELOPMENT OF FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP)**

- A. Facility EMP must be developed by qualified EMP specialist.
- B. Conduct Facility EMP analysis in accordance with NFPA 70B requirements.
  1. Renovation Projects:
    - a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
    - b. Obtain copies of existing operation and maintenance data and existing Facility EMP information from Owner.
    - c. Facility EMP analysis should identify existing equipment that does not have available operation and maintenance data, and should explain Owner's risks because this equipment is not included in Facility EMP.
    - d. Data for existing equipment outside scope of the Project may be inserted in Facility EMP Binders without analysis.

- e. Data for existing equipment impacted by scope of the Project should be analyzed and documented similar to the Project's new equipment data as much as possible.
- C. Compile operation and maintenance data from Facility EMP analysis and submit Facility EMP Binders.

### **3.2 INSTALLATION OF ELECTRICAL WORK**

- A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of electrical Work on the Project. Consult Architect for resolution of conflicting requirements.

### **3.3 CLOSEOUT ACTIVITIES**

- A. Training:
  - 1. Train Owner's maintenance personnel on the following topics:
    - a. How to implement Facility EMP.
  - 2. Provide video recordings of training sessions to Owner.

**END OF SECTION 260010**

**SECTION 274116 – INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Integrated Audio-Video Systems and Equipment as part of the Work.

**1.2 SECTION INCLUDES**

- A. Project instruction for the Contractor, and Audio-Video System description details
- B. Audio-Video System Product description
- C. Project completion instruction for the Contractor

**1.3 RESPONSIBILITY**

- A. Notwithstanding any detailed information in the Contract Documents, it is the responsibility of the Contractor to supply all materials, equipment, transportation, engineering, and labor necessary to provide a fully working, tested, and calibrated system. Supply accessories and equipment (such as, but not limited to power strips, adapters, connectors, mounting hardware, etc.) needed for a complete system, even if not specifically mentioned in these Specifications. Notify the Architect of any discrepancies in part numbers or quantities before bid. Failing to provide such notification, supply items and quantities according to the intent of the Specification and Drawings, without claim for additional payment.
- B. Specifications and drawings are complementary. Work called for by one is binding as if called for by both. Any discrepancies between specifications and drawings shall be brought to the attention of the Owner for clarification during the bidding period. No allowance shall subsequently be made to the Contractor because of their failure to have brought said discrepancies to the attention of the Owner.
- C. Execute all work in accordance with the National Electrical Code (NEC), the National Electrical Safety Code, the Occupational Safety and Health Act (OSHA) and all applicable State and Local codes, ordinances, and regulations. If a conflict develops between the contract documents and the appropriate codes and is reported to the Architect prior to bid opening, the Architect will prepare the necessary clarification. Where a conflict is reported after contract award, propose a resolution of the conflict and, upon approval, perform Work.
- D. Required licenses, insurance, and permits including payment of charges and fees.



- E. Verification of dimensions and conditions at the job site.
- F. Coordinate location and installation of equipment, power, grounding, and raceways with other building elements.
- G. Preparation of submittal information.
- H. Pick-up of Owner Furnished Equipment (OFE) and incorporation into project if applicable.
- I. Development and implementation of AV control system software code and control panel layouts, which will become the property of the Owner.
- J. Installation in accordance with the contract document, manufacturer's recommendation, and in conformity with applicable codes and authority having jurisdiction (AHJ).
- K. Final tests and adjustments, written report, and documentation.
- L. Instruction of operating personnel.
- M. Provision of manuals.
- N. Maintenance services and warranty.

#### 1.4 RELATED WORK

- A. Coordination between disciplines is required to achieve a proper system installation.
- B. Electrical
  - 1. Electrical work shall be coordinated with Division 26.
  - 2. Provide breaker panel and distribution of electrical power from the panel to the equipment as required.
  - 3. A ground point will be provided in each equipment room or enclosure electrical panel. Provide connecting ground point to all equipment in accordance with NEC Code, local codes, and standards specified herein.
  - 4. Provide conduit infrastructure system
    - a. Conduit and Cable Management
      - 1) Install cabling in conduit, provided as shown on the Electrical and AV drawings. If additional conduit/raceway/tray is required for systems, provide at no additional cost.

- 2) Conduit/raceway/tray/wire management not shown on these drawings, but required for a complete system, or by code, is to be included in this scope of work.
- 3) Exterior junction boxes, conduit/raceway, terminations, etc. and those within enclosures where enclosures are exposed to outdoor conditions are to meet NEMA ratings for outdoor electrical applications.

C. Structural

1. The contractor shall be responsible for design and structural engineering for all loudspeaker brackets attaching the loudspeakers (and/or loudspeaker hoisting system) to the building structure at position shown within the drawings. Coordinate device weight loads with the Project's Structural Engineer.

D. Networks

1. Provide network switches, cable plant, and interfaces as required for two discrete audio systems in the venue: Seating Bowl PA and Back-of-House PA.
2. Provide dedicated network cabling and hardware to support control of, and audio feed to, Priority Communications System processors and amplifiers which are part of the seating bowl public address system. Provide diverse pathways for Primary and Secondary cabling.
3. Coordinate with the data network installer and in-house IT department to establish non-conflicting IP addresses for the AV equipment. Ensure that the configuration of the audio distribution and control networks for both seating bowl PA and back of house systems audio are secure, and that all reasonable measures are taken to prohibit unauthorized access to the audio streams, audio routing, and control features of the Digital Audio Network (DAN).

## 1.5 REFERENCES

- A. Published specification standards, tests or recommended methods of trade, industry or governmental organizations apply to Work in this section where cited below:

1. American National Safety Institute (ANSI)
2. American Society of Testing and Materials (ASTM)
3. Electronics Industries Association (EIA)
4. Federal Communications Commission (FCC)
5. National Electrical Manufacturer's Association (NEMA)
6. National Electrical Code (NEC)
7. Underwriters Laboratories (UL)
8. Occupational Safety and Health Administration (OSHA)
9. Society of Motion Picture and Television Engineers (SMPTE)
10. Building Industry Consulting Service International (BICSI)
11. Americans with Disabilities Act (ADA)
12. AVIXA published standards
13. Davis and Davis, Sound System Engineering (3rd Edition) (SSE), Howard W. Sams, 2006
14. Giddings, Audio System Design and Installation (ASDI), Howard W. Sams, 2013

15. AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm (AVIH), 2009
16. Middle Atlantic – Thermal Management White Paper

## 1.6 DEFINITIONS

- A. In addition to those Definitions of Division 1, the following list of terms as used in this specification shall be defined as follows:
  1. Furnish: To purchase, procure, acquire, and deliver complete with related accessories.
  2. Install: To set in place, join, attach, link, set up, or otherwise connect together and test until complete before turning over to the Owner. All parts, items, or equipment supplied by Contractor.
  3. Provide: To furnish and install.

## 1.7 SYSTEMS DESCRIPTIONS AND REQUIREMENTS

- A. The following is intended to provide an overview of the required work details, system features, and design concepts for the Work as shown on the project drawings and is not intended to be an exhaustive description of the systems.
- B. The Work includes provision of a complete and working Seating Bowl Sound System, providing sound to fixed spectator seating areas, public areas, team areas, administrative areas, and broadcast support areas.
- C. The Audio Tech Position will house the mixing console, equipment rack, input sources, wireless microphones, and In-Ear Monitor (IEM) systems. Patching will be provided to the Audio Control Room
- D. An Audio Control Room will house AV Equipment racks, stage box, patch bays and other system equipment.
  1. All essential public address equipment will be provided with UPS backup.
  2. The Audio Control Room is the control center for the two discrete audio systems that serve the venue:
    - a. Priority Communications System
      - 1) The Priority Communications System (PCS) uses dedicated digital audio equipment, cabling and transport protocol via armored Single Mode Fiber (SMF) to distribute audio to equipment serving:
        - a) Spectator seating areas loudspeaker systems
        - b) Broadcasters
        - c) Press/Media Interview Room
        - d) Entry Gates
      - 2) Network equipment associated with the PCS is for use only with the PCS and is not part of the building wide converged network.

- a) Network equipment associated with the PCS provides connectivity between the Audio Control Room and equipment room locations, utilizing fibers from the same armored SMF as the digital audio transport protocol. Provide discrete primary and secondary hardware and cabling.
  - b) Network equipment associated with the PCS is factory configured to transport Ethernet control, QLAN, Dante, and AES67 on the same local area network.
  - c) Network equipment associated with the PCS is to be recessed in the equipment rack and covered with a security panel. The security panel is to be labeled "Priority Communications System Only".
  - 3) The mixing console will manage signal mixing and routing for the main seating bowl.
    - a) Provide connection to building Wifi for iPad control of the mixing console.
      - (1) Setup Wireless router with a hidden SSID, with password access protection
  - 4) The DSP system will handle signal mixing, routing, and other processing duties for Broadcasters, Press/Media interview room, and Entry Gates.
    - a) Isolated Dante networks will be used for exchange with Video Production, Broadcast, and the BOH system. Provide Dante Bridge for these exchanges.
  - 5) Connect PCS equipment to building emergency power.
  - 6) Fiber between devices in the PCS is connected point-to-point. Do not splice, or route through common patch.
  - 7) An IP based KVM extender system extends control of the Control Computers to the Audio Control Room workstations.
  - b. Back of House (BOH) Systems
    - 1) BOH systems utilize QLAN, AES67, and Dante to distribute audio to equipment rooms associated with venue locations outside of the PCS. These locations are, but not limited to:
      - a) Public spaces: concourses, restrooms, exterior plazas, bars, clubs, suites.
      - b) Team spaces: locker rooms, lounges, video room, offices, coaching booths, conference rooms.
      - c) Press spaces: Video Room
- E. An Audio Control Room will house the equipment rack, stage box, patchbay system, and assistive listening system.
- 1. All essential public address equipment in the control room is to be provided with UPS backup.
  - 2. Provide signal level connectivity between the Audio Control Room and JBT's.
- F. A Concourse Audio Tech Position is the control center for audio systems that serve the venue.

1. The mixing console will manage signal mixing and routing for the main seating bowl.
  2. The DSP system will handle signal mixing, routing, and other processing duties for all Back of House systems.
  3. An IP based KVM extender system extends control of the Control Computers to the Audio Control Room workstations.
- G. A Digital Audio Network (DAN) with a Primary and redundant Secondary network equipment and cabling is provided as part of the Work. This DAN will provide control, monitoring, and audio transport capability to each sound system edge device in the control room, amplifier room, and other network drop locations.
1. Network equipment associated with the DAN is for use only with the DAN and is not part of the building wide converged network.
- H. Sound Systems include the following:
1. Main Seating Bowl
    - a. As an aid to the fire alarm system, the Main Seating Bowl systems will receive warning signals and announcements from the main fire command center. Coordinate final configuration with Owner and Authority Having Jurisdiction (AHJ).
      - 1) Provide cabling to interface Audio System with Fire Alarm Panel
      - 2) Provide contact closure(s) interface to the Audio System as needed
      - 3) Provide analog audio input to the Audio System DSP
      - 4) Provide GPIO contact closure points in the Audio System DSP
      - 5) Insert a 24dB/Octave Butterworth 300 Hertz high-pass filter in the DSP Fire Alarm signal path, to reduce Sound System electrical load on the emergency electrical systems
  2. Provide UPS to keep the main bowl sound system active for a minimum of 2 minutes in the event of a power failure and transfer to emergency generator power.
  3. A wireless RF Assistive Listening System will be provided for the seating bowl. The system is to operate on a coordinated frequency to provide interference free operation with other radio-frequency systems and will operate on an FCC approved frequency. The transmitter will be located in the Audio Control Room, with the antenna placed in the seating bowl, providing a clear line of sight to attendees.

~~I. IPTV and Signage System~~

- ~~1. Owner has an existing IPTV headend and system. All work will tie into this existing system.~~

J. BOH systems to include the following:

1. EVENT LEVEL
  - a. Locker Rooms
    - 1) Overhead recessed loudspeakers.
    - ~~2) Wall mounted flat panel display.~~

- 3) Touch Panel will control the sound and video within the space.
- 4) Audio sources include Digital Audio Network (DAN) Feeds
- 5) ~~Multiple~~ video display will be located throughout the room for AV over IP or local video playback.
- b. Video Room
  - 1) Overhead recessed ceiling loudspeakers.
    - a) Zoning to allow for flexible orientation of room.
  - 2) Wall mounted flat panel display for AV over IP or local video playback.
  - 3) AV input plate for video source.
  - 4) Mic/Line input plate for microphone inputs
  - 5) Two channels of wireless microphones
  - 6) Hearing assistance system will be provided.
  - 7) A multi-output press panel will be provided.
  - 8) Touch Panel will control the sound and video within the space.
    - a) Provide presets to allow staff to orient front of room at any of the four walls.
    - b) Front of room zones to have level adjustments to reduce interview mic feedback
  - 9) Audio sources include Digital Audio Network (DAN) Feeds.
- c. Athlete Lounge
  - 1) Overhead loudspeakers with subwoofers.
  - 2) Touch Panel will control the sound and video within the space.
  - 3) Audio sources include Digital Audio Network (DAN) Feeds, local Bluetooth panel, local Mic/Line level IO panel, and local page microphone.
  - 4) Wall mounted flat panel display for AV over IP or local video playback.
- d. Head Coach Office
  - 1) Wall mounted flat panel display for local video playback.
- e. Training / Hydrotherapy Room
  - 1) Overhead recessed ceiling loudspeakers
  - 2) One shared Touch Panel will control the sound and video within each space, the touch panel to be located in the training room and not within humid space.
  - 3) Audio sources include Digital Audio Network (DAN) Feeds.
  - 4) Video display will be located for AV over IP or local video playback.
2. CONCOURSE LEVEL
  - a. Practice Gymnasium
    - 1) Overhead full range loudspeakers
    - 2) Local Bluetooth and aux inputs located at the Gym Control Panel enclosure
    - 3) (2) channels of wireless microphones
    - 4) Touch panel control
    - 5) Audio sources include Digital Audio Network (DAN) Feeds.
  - b. Exterior Entries
    - 1) Wall mounted loudspeakers will be included for 30 ft coverage at each.
    - 2) Control via the Arena Seating Bowl control computer.

- 3) Audio sources include Digital Audio Network (DAN) Feeds.
- c. **Conference 108A and 108B**
  - 1) **Provide ability for room to Combine/divide**
  - 2) Overhead loudspeakers to support event viewing as the space is used for hospitality purposes.
  - 3) Wall mounted flat panel display.
  - 4) AV input plate for video source.
  - 5) Touch Panel will control the sound and video within the space.
  - 6) Ceiling microphone with dante
  - 7) IP based PTZ camera
  - 8) USB I/O device for BYOD video conferencing.
  - 9) Audio sources include Digital Audio Network (DAN) Feeds, local video playback.
- d. **Conference 109D**
  - 1) **Wall mounted flat panel display.**
  - 2) **AV input plate for video source.**
  - 3) **Touch Panel will control the sound and video within the space.**
  - 4) **USB I/O device for BYOD video conferencing.**
  - 5) **All in one soundbar for BYOD video conferencing**
- e. Huddle Conference
  - 1) Wall mounted flat panel display.
  - 2) Touch Panel will control the sound and video within the space.
  - 3) All in one soundbar for BYOD video conferencing
- f. Conference Corridor
  - 1) Overhead loudspeakers
  - 2) Audio sources include Digital Audio Network (DAN) Feeds, IPTV or signage video playback.
- g. Concession Area
  - 1) Flat panel displays connected to concessions network
- 3. **UPPER LEVEL**
  - a. **Think Space**
    - 1) **There will be multiple displays located throughout the space.**
    - 2) **The plan East side will have an All in one soundbar for BYOD video conferencing**
    - 3) **Each side of the space will have a local input**
    - 4) **Each side of the space will have a control panel.**

K. DSP Control System:

- 1. The DSP Control System and Graphic User Interface (GUI) shall be programmed by the QSC Applications Team, or a QSC Approved Independent Q-Sys Programmer.
  - a. Provide this programming service as part of base bid.
- 2. The Graphic User Interface (GUI) should be designed using these general guidelines:
  - a. Use CAD based images of the venue whenever possible to convey geographic information. Include cardinal mapping points to indicate direction in reference to the image used.
  - b. Use Owner approved team logos for Touch Panel backgrounds.
  - c. Reference Part 3.4 of this specification.

3. The DSP Control System includes the following systems:
  - a. IPTV Control
    - 1) Provide a dedicated DSP for control of the IPTV head-end. This DSP will also de-embed audio from the IPTV channel streams for availability on the Digital Audio Network.
  - b. Main Bowl Sound System
    - 1) Create Presets to accommodate the following:
      - a) Basketball
        - (1) Basketball is the primary use of the Main Bowl Sound System and should be the default Sound System configuration.
      - b) Miscellaneous
        - (1) Confirm with Owner additional preset configurations.
      - c) Concert Tie-In
        - (1) Coordinate with the house Sound Team to create a Concert Tie-In GUI page with Level, Mute, and Delay controls for Main Bowl loudspeaker systems necessary to support a Touring Sound System.
        - (2) Concert Tie-In input from designated field wall JBT, analog or Dante.
    - 2) The main Control Screen used by the Audio Control Operator should include:
      - a) An overall graphic of the venue that includes each loudspeaker and loudspeaker array.
        - (1) Overlay an indicator on each loudspeaker, group of loudspeakers that is a summed Fault indicator. Green indicates good, Red indicates a problem. Clicking on the array should take the user to a page with each amplifier channel powering that array for quick troubleshooting.
  - c. Back of House Public Spaces
    - 1) Create a base Back of House Control Page that allows the user to control Volume and Source selection (local, or from the Digital Audio Network) for each of the following Back of House areas:
      - a) Entry Points
        - (1) Each Entry Point is an individual zone, with the potential for separate message repeater feeds to each Entry Point.
        - (2) Each Entry Point is equipped with a paging microphone that pages to the nearest respective Entry Points.
          - (a) The Paging Microphone is to have priority over any other input source, except for emergency signals from the Fire Alarm system.
          - (b) Include a Gain control and Mute control for each paging microphone on this control page.
        - (3) Volume control and Source select managed from the Control Room computer system.
      - 2) Any Back of House space that receives Main Bowl audio is to be time aligned to the Main Bowl Sound System.
  - d. Team Spaces
    - 1) Home Locker Room:



- a) Individual zone, equipped with the following local inputs:
      - (1) Bluetooth receiver from networked wall-mounted device.
    - b) Inputs available from the Digital Audio Network.
    - c) Touch Panel for local Volume control and Source selection
  - e. Video Room
    - 1) Press Interview Room:
      - a) Coordinate feeds from the Digital Audio Network necessary in this space.
      - b) Coordinate feeds from this space out to the Digital Audio Network.
- 4. Common GUI features to all systems:
  - a. Fire Alarm over-ride
    - 1) Provide Fire Alarm over-ride programming as necessary to mute signals from the Audio System, and route any emergency audio signals as directed by Owner
      - a) Provide a bold indicator in DSP Graphic User Interface (GUI) on all computers and Touch Panels to indicate that the Sound System is in an Alarm condition.
  - b. System Health
    - 1) Use a green colored button to indicate "good" and a red colored button to indicate "fault". This is intended to be a system wide fault detector programmed to include:
      - a) Amplifier Fault or Failure
      - b) Amplifier Open/Shorted Load
      - c) Amplifier Online/Offline
      - d) Network Fault or Failure
      - e) DSP Online/Offline
      - f) DSP Fault or Failure
    - 2) Coordinate with the Owner and Operations team if they wish to receive SMS or an email when a fault occurs.
  - c. Access Control
    - 1) The Control computers in the Audio Control Room equipment racks are the only locations where full access, with a password, to the entire system is possible.
    - 2) Access to the system from the Audio Control position is limited to the Main Bowl Sound System.
    - 3) Access to the system from any Touch Panel location is limited to the area that particular Touch Panel is located in.
  - d. Provide manufacturer loudspeaker settings, loaded into the appropriate signal path, for each loudspeaker with manufacturer settings available.
- 5. After receiving Notice to Proceed, coordinate monthly DSP Graphic User Interface (GUI) review sessions with the Owner, Architect, and A/V Consultant.
  - a. Review should include signal flow diagrams, screenshots of control GUI's for computers, wired Touch Panels, and wireless iPads as they are developed.
  - b. 60 days prior to final system commissioning, the Review should include a working demonstration of all computers, Touch Panels, wireless iPad controllers, and networked Volume/Source selectors.

**1.8 SUBMITTALS**

- A. Provide submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated.
- B. Submittals shall contain sufficient information to describe the Work to be performed. Reviewed shop drawings are to be used for final coordination and construction.
- C. Shop drawings must be original work produced by the Contractor responsible for performing the work defined in this specification. Scanning, photographic copying, materially copying, or any other reproducing the contents of the drawings or specifications contained within the Contract Documents will be marked as unacceptable and not reviewed for any content. No claim shall be made for delay, undue burden, or additional costs for the effort to produce shop drawings, schedules, and equipment lists addressing this specification or the overall project manual.
- D. Supplementary submittal requirements:
  - 1. Provide the following in one submission for approval within thirty days of issuance of Notice to Proceed (NTP) and prior to commencement of Work:
    - a. Complete schedule of submittals.
    - b. Chronological schedule of Work in bar chart form.
    - c. Product Data Sheets:
      - 1) Submissions that do not follow the format and configuration described will be returned without review.
      - 2) Provide a complete table of contents with the following information:
        - a) Project title.
        - b) Submittal number. In the case of a resubmittal, use the original submittal number immediately followed by the suffix "R" immediately followed by a unique number and be numbered in consecutive order.
        - c) Date of submission.
        - d) Provide a list of and Manufacturer's data sheets on products to be incorporated with the Work. Arrange data sheets in the same order they appear in this specification. Where a data sheet shows more than one product, indicate the model being proposed with an arrow or other appropriate symbol.
        - e) Submit manufacturer's product literature for each type of firestop material to be used. Literature shall include documentation of UL classifications or approved third party testing. Manufacturer's name and number for each part shall be included. Submit drawings of through penetrations, which include the system to be utilized for the firestopping application. Drawing shall indicate construction of wall or floor assembly; size, number and material of penetrating items; firestop system designation; required F-rating, T-rating and remarks.

- f) Provide high quality copies with all text legible and illustrations of adequate resolution and sharpness for review. Internet web pages, faxed copies or copies with portions of the information missing or smeared not acceptable.
- d. Shop Drawings:
  - 1) Functional Diagrams/Schematics:
    - a) Detailed wiring diagrams showing interconnection of components and products, wiring and cabling diagrams depicting cable types and cable designators, and device designators. Provide connector designations and terminal strip identification, along with color codes for cables connecting to these devices. Give each component a unique designator and use this designator consistently throughout the project.
  - 2) Coordination Drawings:
    - a) Prepare and submit a set of coordination drawings showing major elements, components, and devices of the AV System in relationship with other building components. Prepare drawings to an accurate scale of  $1/8" = 1'-0"$  or larger on suitable sized media.
    - b) Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all equipment. Indicate locations where space is limited, and where sequencing and coordination of installations is of importance to the efficient flow of the work including but not necessarily limited to the following:
      - (1) Equipment housings
      - (2) Ceiling and wall mounted devices
      - (3) Raceways
      - (4) Cabling
- e. Equipment housing: Location of equipment in racks, consoles position on tables or counters. Details to include dimensions; wire routing and cabling within housings; AC power outlet and terminal strip locations.
- f. Patch panel layouts and labeling strips, including color schemes.
- g. Full fabrication details of custom enclosure and millwork indicating size, material, finish and openings required for equipment and enclosures.
- h. Structural rigging and mounting details:
  - 1) Loudspeaker rigging, suspension, and mounting detail drawings shall be signed and sealed by a professional engineer licensed to practice in the state in which the project is located. The signed and sealed drawings noted above to include the following:
    - a) Analysis of all components in the load path and attachment method to building structure for suspended loudspeakers.
    - b) Attachment method for mounting brackets at ceilings, walls, or other building features.
    - c) Detail the product manufacturer, part numbers, and load capacity of the hardware fittings and materials selected for suspended or mounted loudspeakers.
    - d) A copy of the design calculations.

- e) Secondary steel required for attachment to the building structure.
- f) Custom brackets, mounts, suspension grids or trusses, loudspeaker cabinet frames, or loudspeaker brackets.
- g) Loudspeaker brackets or mounts provided by the specific loudspeaker manufacturer being installed that do not include traceability data.
- h) Traceability data and/or ANSI standard compliance data for loudspeaker mounting brackets or rigging provided by the loudspeaker manufacturer.
- 2) Risk analysis data as referenced in Part 3.2, F
- 3) Stamping Engineer post-installation sign-off as described in Part 3.2, F
- 4) Proof of ETCP certification for on-site rigging crew.
- i. Fabricated Plates and Panels
  - 1) Provide complete drawings on custom fabricated plates or panels. Drawings shall include dimensioned locations of components, component types, engraving information, plate material and color, and bill of material. Provide samples of plate color options for review.
- j. Labeling
  - 1) Equipment and cabling labeling scheme. Include font sizes and styles, explanation of scheme, and designator schedule.
- k. Schedules
  - 1) Wiring schedule showing source and destination of wiring and indicating which wiring is in conduit. Junction box schedule showing type of box, size, mounting and location. Include this information with remainder of wiring diagrams.
- l. Control System Software
  - 1) Provide electronic copies of proposed control system user interfaces within sixty (60) days of issuance of Notice to Proceed (NTP).
- m. IP Addresses
  - 1) Coordinated with the venue IT Administrator, provide a list of IP addresses, by device, used in the project.

E. Submittal format:

- 1. Consultant's project documents in electronic format will not be supplied to the Contractor for their use as part of submittals.
- 2. Standards:
  - a. Floor plan drawings executed at an appropriate scale, not less than 1/8" = 1'-0".
  - b. Detail drawings executed at an appropriate scale, not less than 3/8" = 1'-0".
  - c. Plate and panel drawings executed at an appropriate scale, not less than 1/2" = 1".
  - d. Rack, enclosure, and millwork detail drawings executed at an appropriate scale, not less than 1" = 1'-0".
- 3. Electronic Submittals: Submit in non-proprietary PDF format. Combine product literature into a single file for each Part 2 subheading (i.e.: 2.3 Microphones and

Accessories, 2.4 Input Sources, etc.). Shop drawings may be combined into logical sections such as legend, floor plan, section, detail, functional, etc.

4. Hardcopy Submittals: Bind submittal in titled three ring D style binders sized for 150 per cent of the material. Maximum size: three-inch spine. Use multiple volumes as required. Separate major grouping with labeled binder tabs.

F. Resubmission requirements:

1. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
2. Indicate all changes that have been made by clouding and noting with a revision marker. Drawing title block to track all revisions.
3. Also indicate all changes that have been made other than those requested.

**1.9 CONTRACT CLOSE-OUT DOCUMENTS:**

- A. Provide close-out submittals in accordance with Conditions of the Contract and Division 1, Submittal Procedures section unless otherwise indicated, after substantial completion but prior to final observation:

B. Supplementary submittal requirements:

1. Provide the following in one electronic submission for review.
2. Equipment Manuals:
  - a. Manufacturer's owner/instruction manual for each type of Product by manufacturer and model or part number unless specified otherwise herein
  - b. Supply manufacturer's serial numbers for each Product
  - c. For custom circuits or modifications, a description of the purpose, capabilities, and operation of each item
  - d. Separately bind list by manufacturer and model or part number of Products incorporated within the Work, arranged in alpha numeric order. When applicable, bind Manufacturer's warranty statements separately.
3. Test Reports: Recorded findings of Commissioning.
4. System Operation and Instructions: Prepare a complete and typical procedure for the operation of the equipment as a system, organized by subsystem or activity.
  - a. This procedure should describe the operation of system capabilities.
  - b. Assume the intended reader of the manual to be technically inexperienced but unfamiliar with the components and the facility.
5. Service Information, including service phone number(s) and hours; service schedule; description of products recommended or provided for maintenance purposes, and instructions for the proper use of these products.
6. Any other pertinent data generated during the Project or required for future service.
7. Within three weeks of final observation, submit the following in one electronic submission for review. Upon Owners and/or Consultant's request, provide hard copy files of the following:
  - a. Record drawings: Final rendition of Shop Drawings depicting what is actually incorporated within the Work.

- b. Record drawings in AutoCAD editable DWG format and Adobe PDF format. Resolution to be sufficient to permit Owner's technicians to be able to clearly read all notes and text on screen.
- c. One set of signed proof-of-training documents.
- 8. Submittal Format:
  - a. Record Drawings: Drawings executed at an appropriate scale, but not smaller than 1/8 inch = 1'-0".
  - b. Segregate documents into separate folders containing data relevant to operational, maintenance, and warranty issues. Appropriately duplicate data within the separate bindings when it will reasonably clarify procedures, e.g., operational data in a maintenance folder.
  - c. Project Record Manual
    - 1) Provide product data submittal in a single PDF file.
    - 2) Provide an indexed list of major groupings.
    - 3) In the index, provide clickable hyperlinks that lead to the page of that major grouping.
    - 4) Organize index and major groupings in logical signal-flow order.
- 9. Resubmission requirements:
  - a. Make all requested corrections or change in submittals required. Resubmit for review until no exceptions are taken.
  - b. Indicate all changes that have been made other than those requested.

#### 1.10 CUSTOM SOFTWARE

##### A. Introduction:

- 1. Proprietary software provided for the Technical Systems shall be subject to this software license between the Contractor and the Owner as an essential element of the system as defined in the system specification and associated documents, drawings and agreement.
- 2. Contractor shall agree that 3rd party proprietary software provided with the system shall be subject to this agreement.
- 3. Contractor and Owner agree that this software license is deemed to be part of, and subject to, the terms of the Agreement applicable to both parties; and shall supersede any standard manufacturer or Contractor's standard license agreement.
- 4. Proprietary software shall be defined to include, but not be limited to, device and system specific software and firmware designed to run on conventional computer based operating platforms as well as all micro-processor-based hardware used to program, setup, or operate the system or its components.
- 5. For sake of this agreement, MS Windows® shall not be considered "proprietary" software, unless a non-public version of Windows® or any of its components are critical to the operation of the system in which case it shall be deemed proprietary.

##### B. License Grant and Ownership:

- 1. Contractor hereby grants to Owner a perpetual, non-exclusive, site license to all software for Customer's use in connection with the establishment, use,

maintenance and modification of the system implemented by Contractor. Software shall mean executable object code of software programs and the patches, scripts, modifications, enhancements, designs, concepts or other materials that constitute the software programs necessary for the proper function and operation of the system as delivered by the Contractor and accepted by the Owner.

2. Except as expressly set forth in this agreement, Contractor shall at all times own all intellectual property rights in the software. Any and all licenses, product warranties or service contracts provided by third parties in connection with any software, hardware or other software or services provided in the system shall be delivered to Owner for the sole benefit of Owner.
3. Owner may supply to Contractor or allow the Contractor to use certain proprietary information, including service marks, logos, graphics, software, documents and business information and plans that have been authored or pre-owned by Contractor. All such intellectual property shall remain the exclusive property of Owner and shall not be used by Contractor for any purposes other than those associated with delivery of the system.

C. Copies, Modifications, and Use:

1. Source code shall be available to Owner for a period of not less than 10 years.
2. Owner may make copies of the software for archival purposes and as required for modifications to the system. All copies and distribution of the software shall remain within the direct control of Owner and its representatives.
3. Owner may make modifications to the source code version of the software, if and only if the results of all such modifications are applied solely to the system. In no way does this Software License confer any right for Owner to license, sublicense, sell, or otherwise authorize the use of the software, whether in executable form, source code or otherwise, by any third parties.
4. All express or implied warranties relating to the software shall be deemed null and void in case of any modification to the software made by any party other than Contractor.

D. Warranties and Representations:

1. Contractor represents and warrants to Owner that:
  - a. It has all necessary rights and authority to execute and deliver this Software License and perform its obligations hereunder and to grant the rights granted under this Software License to Owner.
  - b. The goods and services provided by contractor under this Software License, including the software and all intellectual property provided hereunder, are original to Contractor or its subcontractors or partners; and
  - c. The software, as delivered as part of the system, will not infringe or otherwise violate the rights of any third party, or violate any applicable law, rule or regulation.
2. Contractor further represents and warrants that, throughout the System Warranty Period, the executable object code of software and the system will perform substantially in accordance with the System Specifications and Agreement. If the software fails to perform as specified and accepted all remedies are pursuant to the policies set forth in the Specification and in the Agreement. No warranty of

any type or nature is provided for the source code version of the software which is delivered as is.

3. Except as expressly stated in this Agreement, there are no warranties, express or implied, including, but not limited to, the implied warranties of fitness for a particular purpose, of merchantability, or warranty of no infringement of third party intellectual property rights.

#### **1.11 QUALITY ASSURANCE**

- A. Qualifications: Contractor to be experienced in the provision of systems similar in complexity to those required for this project, and meet the requirements listed below. Provide documentation at the time of bid to support these qualifications:
  1. Form of corporation.
  2. No less than three years' experience with equipment and systems of the specified types.
  3. Experience with at least three comparable scale projects within the last three years.
  4. Be a franchised dealer and service facility for the manufacturer's products furnished.
  5. Maintain a fully staffed and equipped service facility with full-time field technicians.
  6. Have at least one supervisory on-site employee who has completed and has been certified CTS-I by Infocomm.
  7. Supervision of all rigging by an ETCP certified rigger for all work associated with suspension or mounting of overhead equipment.
  8. Adequate plant capacity and equipment to complete the Work.
  9. Adequate staff with commensurate technical experience.
  10. Suitable financial status (i.e., bonding and materials purchase capacity) to meet the obligations of the Work.
  11. Adequate regional service organization to meet warranty response requirements of the Project.
  12. Provide listing with appropriate explanation regarding the status of Contractor's resolved or unresolved legal disputes within the last six calendar years.
  13. Provide listing with appropriate explanation regarding any projects within the last 3 years where the Contractor has failed to meet construction schedules due to Contractor's cause.
  14. Completed current version of the AIA Contractor's Qualification Form.
- B. Subcontractors: at the time of bid, the Contractor shall provide a list of structural, electrical, sound, or any other subcontractors intended to do the Work, or are being retained as local service providers throughout the warranty period. Subcontractors shall be appropriately state licensed in their specialty and must provide the same qualification documents as the Contractor.
- C. Work: Perform Work in compliance with the applicable standards listed herein and governing codes and regulations of the authorities having jurisdiction and the Contract Documents.



1. Drawings and specification requirements govern where they exceed Code and Regulation requirements.
  2. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
  3. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.
- D. Coordinate exact location and installation of equipment, power, grounding, and raceway requirements with the Architect.

#### **1.12 DELIVERY, STORAGE & HANDLING**

- A. Ship Products in its original container, to prevent damaging or entrance of foreign matter.
- B. Handling and shipping in accordance with Manufacturer's recommendation.
- C. Provide protective covering during construction of all installed devices, to prevent damaging or entrance of foreign matter.
- D. Replace, at no expense to Owner, Products damaged during storage, handling, or through the course of construction.

#### **1.13 PROJECT CONDITIONS**

- A. Verify conditions on the job site applicable to this work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.
- B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the work may be installed.

#### **1.14 WARRANTY**

- A. Warrant labor and equipment for one year following the date of substantial completion to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics. Repair or replace defects occurring in labor or equipment within the Warranty period without charge.
- B. This warranty is in addition to any specific warranties issued by manufacturers for greater periods of time.

- C. Within the warranty period, answer service calls within twenty-four (24) hours during normal working hours and correct the deficiency within forty-eight (48) hours.
- D. Provide Owner with the name and telephone number of the person to call for service. This information to be part of Project Closeout Documents.
- E. Thirty days prior to the end of the warranty period provide a complete checkout of all system components. Repair or replace any defective equipment discovered during the testing. Correct any defects in wiring or other functional problems reported by Owner. Warranty replacement and service of equipment shall not apply to Owner furnished equipment (OFE). Coordinate an observation visit with the Owner.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Products quantity is as required. If a quantity is given, provide at least the given amount. Some product listed may not be required to fulfill the obligations of the Work.
- B. Equipment and materials shall be new and conform to applicable UL or ANSI provisions.
- C. Regardless of the length or completeness of the descriptive paragraph herein, provide Products complying with the specified manufacturer's published specifications.
- D. Remove or blank out all manufacturers' names, logos, or other symbols from loudspeakers or other objects placed in view of the public. If logos are removable, remove and repaint to the color of the adjacent surface and reattach.
- E. Take care during installation to prevent scratches, dents, chips, etc.

### **2.2 ACCEPTABLE MANUFACTURERS**

- A. Model numbers and manufacturers included in this specification are listed as standard of function, performance, and quality, forming the basis of design.
- B. If a specified product has been discontinued by a manufacturer, provide the replacement model (as certified by the manufacturer) at no additional cost.
- C. Where required, provide manufacturer's rack mount adapter or one manufactured by Middle Atlantic or Winstead unless specified elsewhere.

**2.3 ANNOUNCER SYSTEM**

- A. Announcer Microphone – Desktop:
  - 1. Provide Quantity: 2
  - 2. Acceptable Product:
    - a. Electro-Voice RE20
    - b. Sennheiser MD 421-II
    - c. Shure SM7B
- B. Announcer Microphone – Desktop Microphone Stand:
  - 1. Provide Quantity: 2
  - 2. Acceptable Product:
    - a. Atlas Soundolier DS7e
    - b. On-Stage DS7200B
    - c. Gator Frameworks GFW-MIC-0600
- C. Announcer Microphone – Headworn:
  - 1. Headworn noise cancelling microphone
  - 2. Differential Cardioid pickup pattern
  - 3. Included pop-filter
  - 4. Provide Quantity: 2
  - 5. Acceptable Product:
    - a. AKG CM311 XLR
    - b. Approved Equivalent
- D. Audio Tech, DJ and Announcer Headphones:
  - 1. Dynamic, closed
  - 2. Neodymium magnets
  - 3. 40mm driver size
  - 4. 10 Hertz to 20 kHz Frequency Response
  - 5. Provide Quantity: 5
  - 6. Acceptable Product:
    - a. Sony MDR-7506
    - b. Audio-Technica ATH-M50x
    - c. Sennheiser HD 280 Pro
- E. Announcer Control Station:
  - 1. Dante networkable
  - 2. Two inputs via Dante
  - 3. Microphone preamp with selectable gain and 48-volt phantom power
  - 4. Stereo headphone monitoring of selectable sources and integrated sidetone
  - 5. Three rotary headphone output level controls for external sources and sidetone
  - 6. Powered via PoE or external 12VDC source
  - 7. Provide Quantity: 2
  - 8. Acceptable Product:
    - a. Studio Technologies 215A

- b. Glensound Vita BB Plus
- c. Lance Design ADX-120

## 2.4 MICROPHONES AND ACCESSORIES

### A. Wireless Microphone System (WRLS, Type 2):

1. Description: Wireless Microphone System – Dual Channel
2. Transport protocol: Dante Capable
3. Coordination: Band selection with the Owner
4. Acceptable Product:
  - a. Shure; to include the following:
    - 1) Shure ULXD4D Dual Channel Receiver (WRLS)
    - 2) Shure ULXD2/SM58 Handheld Transmitter (Quantity: 2)
    - 3) Shure ULXD1 Beltpack Transmitter (Quantity: 2)
    - 4) Shure WL185 Cardioid Lavalier Microphone (Quantity: 2)
    - 5) Shure UA874 Remote Directional Antennas (ANT WM)
    - 6) Shure MXWNCS4 Four bay Battery charger (Quantity: 1)
    - 7) Shure SB900B Handheld Lithium Ion Battery (Quantity: 2)
    - 8) Shure SB900B Body Pack Lithium Ion Battery (Quantity: 2)
  - b. Sennheiser; to include the following:
    - 1) Sennheiser EM6000-Dante Two Channel Receiver (WRLS) (Quantity to match capability of Shure system above)
    - 2) Sennheiser SKM 6000 Handheld Transmitter (Quantity: 2)
    - 3) Sennheiser MMD 835 BK Cardioid Dynamic Microphone Capsule for use with SKM 6000 Handheld Transmitter (Quantity: 2)
    - 4) Sennheiser SK 6000 Beltpack Transmitter (Quantity: 2)
    - 5) Sennheiser ME 4 Cardioid Lavalier Microphone (Quantity: 2)
    - 6) Sennheiser ADP-UHF Remote Directional Antennas (ANT WM)
    - 7) Sennheiser L 6000 rack mounted battery charger (SBRC)
    - 8) Sennheiser BA 60 rechargeable handheld battery (Quantity: 2)
    - 9) Sennheiser BA 61 rechargeable beltpack battery (Quantity: 2)
    - 10) Sennheiser LM 6060 charging module (Quantity: 2)
    - 11) Sennheiser LM 6061 charging module (Quantity: 2)
    - 12)

### B. Wireless Microphone System (Type 4):

1. Description: Wireless Microphone System – Quad Channel
2. Transport protocol: Dante Capable
3. Coordination: Band selection with the Owner
4. Shure; to include the following:
  - a. Shure ULXD4Q Four Channel Receiver (WRLS)
  - b. Shure ULXD2/SM58 Handheld Transmitter (Quantity: 4)
  - c. Shure ULXD1 Beltpack Transmitter (Quantity: 4)
  - d. Shure WL185 Cardioid Lavalier Microphone (Quantity: 4)
  - e. Shure UA874 Remote Directional Antennas (ANT WLM)
  - f. Shure SBRC rack mounted battery charger (SBRC)
  - g. Shure SBC-AX charging module (Quantity: 4)

- h. Shure SB900B Lithium Ion Battery (Quantity: 4)
  - 5. Sennheiser; to include the following:
    - a. Sennheiser EM6000-Dante Two Channel Receiver (WRLS) (Quantity to match capability of Shure system above)
    - b. Sennheiser SKM 6000 Handheld Transmitter (Quantity: 4)
    - c. Sennheiser MMD 835 BK Cardioid Dynamic Microphone Capsule for use with SKM 6000 Handheld Transmitter (Quantity: 4)
    - d. Sennheiser SK 6000 Beltpack Transmitter (Quantity: 4)
    - e. Sennheiser ME 4 Cardioid Lavalier Microphone (Quantity: 4)
    - f. Sennheiser ADP-UHF Remote Directional Antennas (ANT WLM)
    - g. Sennheiser L 6000 rack mounted battery charger (SBRC)
    - h. Sennheiser BA 60 rechargeable handheld battery (Quantity: 4)
    - i. Sennheiser BA 61 rechargeable Beltpack battery (Quantity: 4)
    - j. Sennheiser LM 6060 charging module (Quantity: 4)
    - k. Sennheiser LM 6061 charging module (Quantity: 4)
- C. Handheld Microphone:
  - 1. Dynamic cardioid microphone
  - 2. Quantity: 6
  - 3. Acceptable Product:
    - a. Shure SM58 (Quantity 4)
- D. Handheld Microphone:
  - 1. Condenser cardioid microphone
  - 2. Quantity: 6
  - 3. Acceptable Product:
    - a. Shure SM86 (Quantity 4)
- E. Stats Announce Microphone:
  - 1. Condenser microphone with integral pop-filter
  - 2. Multi-pattern, selectable on base
  - 3. Program as push-to-talk
  - 4. Acceptable Product:
    - a. Electro-Voice PC Desktop with 18" Gooseneck (Quantity 1)
- F. Press Interview Microphone:
  - 1. Dynamic cardioid microphone
  - 2. Low proximity effect
  - 3. Acceptable Product:
    - a. Shure KSM8 (Quantity 4)
- G. Headphones:
  - 1. Dynamic, closed
  - 2. Neodymium magnets
  - 3. 40mm driver size
  - 4. 10 Hertz to 20 kHz Frequency Response

5. Acceptable Product:
  - a. Sony MDR-7506(Quantity 2)
- H. USB Audio Interface:
  1. Automatic sound device listing in Windows or Mac OSX without need of a driver
  2. 24-bit digital audio converter
  3. Balanced outputs with switchable isolation on XLR connectors
  4. Locate at DJ station in Audio Control Room
  5. Acceptable product:
    - a. Radial USB-Pro (Quantity: 2)
- I. DJ Computer Interface:
  1. RCA, 1/4", and 3.5mm input connectors
  2. Front panel level control
  3. Balanced outputs on XLR connectors
  4. Locate at DJ position
  5. Acceptable Product:
    - a. Radial Trim-Two (Quantity 2)
- J. Ambient Audience Microphone (AM):
  1. Single gang panel mount microphone element
  2. Boundary plate pressure zone microphone
  3. Hemispherical pickup pattern
  4. Acceptable Product:
    - a. AKG PZM-11LLWR
- K. Microphone Cables:
  1. Each cable to be provided with heat-shrink label identifying the facility's name and cable length.
  2. Each cable to be provided with a hook and loop tie strip to keep the cable coiled. Use a different color of tie for cables of each length.
  3. Color: Black.
  4. Provide all of the following:
    - a. 3-foot Microphone Cable (Quantity: 10)
    - b. 6-foot Microphone Cable (Quantity:10)
    - c. 10-foot Microphone Cable (Quantity: 10)
    - d. 25-foot Microphone Cable, (Quantity: 10)
    - e. 50-foot Microphone Cable, (Quantity: 6)
    - f. 100-foot Microphone Cable, (Quantity: 4)
  5. Acceptable Product:
    - a. Whirlwind MK4 Series
- L. Microphone Stands:
  1. Collapsible Tripod Base with Telescoping Boom
  2. Acceptable Product:
    - a. K&M 210/9 (Quantity: 8)

## M. Table Microphone Stands:

1. Short stand with cast iron base with adjustable height stem.
2. Acceptable Product:
  - a. K&M 23325-500-55 Black (Quantity: 4)

## N. Microphone Carry Case:

1. Capacity for 15 microphones plus storage space for microphone clips and accessories
2. Acceptable Product:
  - a. Gator Cases G-tour M15 (Quantity: 1)

**2.5 AV INPUT SOURCES**

## A. Media Player/Recorder (MPR, Type 1):

1. Playback from CD, SD card, or USB
2. Record to CD, SD card, or USB
3. AES/EBU Digital input and output on XLR connectors and S/PDIF
4. Balanced analog inputs and outputs on XLR connectors
5. Unbalanced analog inputs and outputs on RCA connectors
6. Networkable
7. Dante capable
8. 1-RU Rack mountable
9. Acceptable Product:
  - a. Tascam SS-CDR250N with IF-DA2 Dante Card

## B. Radio Tuner (RT, Type 1):

1. DSP Based Triple Tuner
2. AM/FM/WR
3. Emergency Alert System Monitor
4. 1RU Chassis
5. Built-In Remote Control via Internet
6. Acceptable Product:
  - a. Crown Broadcast RFBA-1
  - b. Inovonics Broadcast RK-00-19 Mounting Rack with Inovonics Broadcast Model 676 NOAA Weather Receiver, Inovonics Broadcast Model 674 AM Receiver, Inovonics Broadcast Model 673 FM Receiver
  - c. Approved Equivalent

## C. AM/FM Antenna (ANT):

1. Provide active, high impedance unit to include:
  - a. Amplifier as required, and high pass filter
  - b. Antenna
  - c. Splitters, as required
  - d. Twin Lead Adapter, as required
  - e. Extender Amplifier, as required

- f. Attenuators, as required
    - g. Surge Protector
  - 2. Aluminum tube construction with end-seal elements
  - 3. Wind loading requirement: withstand 100 mph
  - 4. Acceptable Product:
    - a. Pixel Technologies
    - b. Blonder Tongue
    - c. Terk
- D. Internet Radio Tuner (IRT, Type 1):
  - 1. Network streaming audio component.
  - 2. Access to thousands of free Internet Radio Stations
  - 3. Balanced outputs on XLR connectors
  - 4. Unbalanced outputs on RCA connectors
  - 5. Infrared remote control
  - 6. USB and Bluetooth auxiliary inputs
  - 7. Acceptable Product:
    - a. A. C. ProMedia XMP44 with IMP40
    - b. GLFS Internet Radio Tuner
    - c. Ocean Digital WR-10
- E. Message Repeater (MR, Type 1):
  - 1. Playback from SD card or USB
  - 2. Record to SD card or USB
  - 3. MP3 and Wave file compatible
  - 4. AES/EBU Digital input and output on XLR connectors
  - 5. Balanced analog inputs and outputs on XLR connectors
  - 6. Unbalanced analog inputs and outputs on RCA connectors
  - 7. AES-EBU inputs and outputs on XLR connectors
  - 8. SPDIF inputs and outputs on RCA type connectors
  - 9. GPIO
  - 10. Control via front panel, Network, optional remote control, Apple or Android app
  - 11. Dante capable
  - 12. 1-RU Rack mountable
  - 13. Acceptable Product:
    - a. Tascam SS-R250N with IF-DA2 Dante Card
    - b. TOA EV-700PS
    - c. Approved Equivalent
- F. Music Server (MUS, Type 1)
  - 1. 4-zone network music player
  - 2. Playback of locally stored content
  - 3. Playback of streaming services
  - 4. 4 stereo outputs
  - 5. Internal DSP processing
  - 6. Balanced audio output
  - 7. SPDIF optical output



8. Acceptable Product:
  - a. Bluesound Professional B400S
- G. Bluetooth with Analog Input Plate (BT, Type 1):
  1. Bluetooth, RCA, and 3.5MM inputs
  2. 3.5MM outputs
  3. Dante/AES67 connectivity
  4. 2-gang Decora style
  5. Acceptable Product:
    - a. Atterotech unD6IO-BT
- H. Balanced Input Plate (ML, Type 1):
  1. (4) XLR Inputs
  2. Dante/AES67 connectivity
  3. 2-gang Decora style
  4. Acceptable Product:
    - a. Atterotech unDX4I

## **2.6 AUDIO SIGNAL PROCESSING**

- A. Analog to Digital Audio Converter (ADC, Type 1):
  1. Two channel analog audio input
  2. Networked digital audio
  3. Acceptable Product:
    - a. Audinate ADP-DAI-AU-2X0
    - b. Approved Equivalent
- B. USB to Digital Audio Converter (UDC, Type 1):
  1. USB audio input
  2. Networked digital audio
  3. Acceptable Product:
    - a. Audinate ADP-USB-2X2
    - b. Approved Equivalent
- C. Digital to Analog Audio Converter (DAC, Type 1):
  1. Two channel analog audio output
  2. Networked digital audio
  3. Acceptable Product:
    - a. Audinate ADP-DAO-AU-0X2
    - b. Approved Equivalent
- D. Press Audio Distribution (JBP):
  1. 14 Channel isolated output
  2. 2 Channel input
  3. Headphone monitoring

4. Phantom power
  5. Wall back box
  6. Acceptable Product:
    - a. Whirlwind PRESSPOWER WP (Press Wall) Active Press Box
- E. Microphone Preamp (PRE, Type 1):
1. Configuration: Dual channel
  2. Switchable 48-volt phantom power
  3. Variable gain control from 0 dB to 50 dB
  4. Balanced 3-pin (XLR) connectors
  5. 1-RU Rack mountable
  6. Acceptable Product:
    - a. ART; to include the following:
      - 1) ART Tube MP Microphone Preamp
      - 2) Rack shelf
    - b. Behringer Ultragain Pro MIC 2200
- F. Level Attenuation Device (PAD, Type 1):
1. Line input
  2. 30 dB attenuation
  3. Acceptable Product:
    - a. Whirlwind IMPAD30
- G. Mono Summing Amplifier (SUM, Type 1)
1. Configuration: 2 input, 1 output with individual level adjustments
  2. Input: electronically balanced with maximum input level of +18 dBv
  3. Output: electronically balanced with maximum output level of +4 dBv into 600 Ohm load
  4. 1-RU Rack mountable
  5. Acceptable Product:
    - a. ATI; to include the following:
      - 1) ATI SUM100 for balanced inputs
      - 2) ATI SUM100-RCA for unbalanced inputs
      - 3) ATI WA100-1 Power Supply
      - 4) ATI 21075-501 Rack Kit
      - 5) ATI 21097-501 Filler Panel
    - b. Rolls MX122 MiniMix Pro
    - c. Approved Equivalent
- H. Transformers:
1. Frequency response  $\pm 0.25$ dB, 25-20,000 Hz
  2. Maximum input level +18 dBV at >30 Hz
  3. Magnetic and Faraday shield
  4. Acceptable Products:
    - a. Input transformer (1:1): Jensen JT-11P-1 (TFMR, Type 1)
    - b. Input transformer (4:1): Jensen JT-10KB-D (TFMR, Type 2)

- c. Microphone Bridging: Jensen JT-MB-C (TFMR, Type 3)
    - d. Isolation transformer: Jensen Iso-Max (TFMR, Type 4)
  - I. Phase Reverse (PR, Type 1)
    - 1. Female to Male XLR-3 pin inline device
    - 2. Acceptable Product
      - a. Whirlwind IMP PHASE REVERSE
  - J. Distribution Amplifier (DA, Type 1):
    - 1. Configuration: 2 inputs, 8 outputs with individual front panel trim controls
    - 2. Inputs: electronically balanced with RFI filtering, input and clipping indicators
    - 3. Outputs: electronically balanced with automatic ground sensing for connections to balanced or unbalanced loads
    - 4. Peak levels: 26dBu input, 26dBu output
    - 5. 1-RU Rack mountable
    - 6. Acceptable Product:
      - a. ATI ADA 208PH
      - b. Approved Equivalent
  - K. Line Level Isolator (LLI, Type 1):
    - 1. Two channel isolator
    - 2. XLR input and output
    - 3. Maximum Signal Handling: +19dBU
    - 4. Acceptable Product:
      - a. Jensen Iso-Max PI2XX
- 2.7 MIX CONSOLE**
- A. Mixing Console (MIXER, Type 1):
    - 1. Inputs: Capability of up to 72 mono inputs from analog mic/line inputs, AES/EBU, and DANTE sources
    - 2. Frequency response: +.5/-1.5dB, 20 Hz to 20 kHz with less than 0.05% THD at +4 dBm out
    - 3. Maximum output level: at least +24 dBu
    - 4. Input Module: 150 Ohm microphone or 600 Ohm line balanced input
    - 5. Input attenuator to provide attenuation allowing signal levels from -60 to +10 dBm without overload or distortion
    - 6. Input Channel: high pass filter, insert point, gain, parametric EQ, compressor, limiter, and delay
    - 7. System latency: less than 2.5 ms
    - 8. Wireless remote control via iPad
    - 9. Acceptable Product to include the following:
      - a. Yamaha DM7Compact Digital Mixing Console
      - b. Yamaha RIO3224-D2
      - c. Yamaha LA1L Gooseneck console lamps for all lamp ports
      - d. Fitted nylon console dust cover

- e. Current iPad model
- B. Analog Backup Mixer (ABM, Type 1):
  - 1. 1RU, rack mountable
  - 2. Eight microphone inputs
  - 3. Contact Closure on Channel 1 and Channel 5
    - a. Use Contact Closure to create Priority over-ride for microphone input Channel 1
    - b. Configure Channel 1 for Fire Alarm signal input
  - 4. Acceptable Product:
    - a. JBL CSM 28

## 2.8 DANTE BRIDGE (DANBRIG)

- A. Dante Network isolation system:
  - 1. 1RU chassis
  - 2. 64 x 64 capability
  - 3. Acceptable Products to include the following:
    - a. Auvitrans AVBx3/ISM+r with two Auvitrans AxC-DANTE 64x64 DANTE
    - b. Studio Technologies 5482
    - c. Approved equivalent

## 2.9 HEARING ASSISTANCE SYSTEM

- A. Provide Assistive Listening Signage, Receiver, Neck Loop, and Earphone quantities based on current ADA or CBC regulations (CBC if applicable, then base quantities on the more stringent standard), coordinating final quantities with the Owner.
  - 1. For bid purposes, provide receiver quantities based on venue capacity of 4,200 for the Main Seating Bowl.
  - 2. Provide break-out unit pricing for additional Receivers and Earphones
  - 3. Mount Antenna at location with unobstructed coverage to all seats.
  - 4. Acceptable Product:
    - a. Listen Technologies; to include the following:
      - 1) Listen Technologies LT-800-216-01 Wireless Transmitter (ALS)
      - 2) Listen Technologies LA-326 Rack Mount Kit
      - 3) Listen Technologies LR 4200-216 Receiver
      - 4) Listen Technologies LA-481 Charger
      - 5) Listen Technologies LA-405 Dual Ear Buds
      - 6) Listen Technologies LA-430 Neck Loop
      - 7) Listen Technologies LA-107 Remote Antenna (ANT ALS)
    - b. Williams Sound; to include the following:
      - 1) Williams Sound PPA T55 Wireless Transmitter (ALS)
      - 2) Williams Sound RPK 005 Rack Mount Kit
      - 3) Williams Sound PPA R38N Receiver
      - 4) Williams Sound CHG 3512 Charger
      - 5) Williams Sound EAR 042 Dual Earphones

- 6) Williams Sound NKL 001 Neck Loop
- 7) Williams Sound ANT-005 Remote Antenna (ANT ALS)
- c. Approved Equivalent

**2.10 WIRELESS IN-EAR MONITOR SYSTEM**

- A. Provide complete installed system, located in Audio Control Room racks. Mount antenna to exterior wall of Audio Control Room.
- 1. Provide equipment for four mixes of in-ear monitors
- 2. Acceptable product:
  - a. Shure; to include the following:
    - 1) Shure P9T Wireless Transmitter (IEM) (Quantity: 4)
    - 2) Shure RPW504 Dual Rack Mount Kit (Quantity: 2)
    - 3) Shure PA821B Antenna Combiner (AC) (Quantity: 1)
    - 4) Shure PA805SWB Directional Antenna (Quantity: 1)
    - 5) Shure P9RA Wireless Bodypack Receiver (Quantity: 4)
    - 6) Shure SB900B Rechargeable Batteries (Quantity: 8)
    - 7) Shure SBRC Battery Charger (Quantity: 1)
    - 8) Shure SE215-K Earphones (Quantity: 12)
    - 9) Earphone Replacement Sleeves:
      - a) Provide pricing for additional units
      - b) Acceptable Product to include the following:
        - (1) Shure EABKF1-10L (Quantity: 2)
        - (2) Shure EABKF1-10M (Quantity: 2)
        - (3) Shure EABKF1-10S (Quantity: 2)
  - b. Sennheiser; to include the following:
    - 1) Sennheiser SR IEM G4 Wireless Transmitter (IEM) (Quantity: 4)
    - 2) Sennheiser GA 3 Rackmount Kit (Quantity: 2)
    - 3) Sennheiser AC 41 Antenna Combiner (Quantity: 1)
    - 4) Sennheiser A2003-UHF Directional Antenna (Quantity: 1)
    - 5) Sennheiser EK IEM G4 Bodypack Receiver (Quantity: 4)
    - 6) Sennheiser IE 4 Earphones (Quantity: 12)
  - c. Approved Equivalent

**2.11 DIGITAL SIGNAL PROCESSING (DSP) SYSTEM**

- A. Signal processing shall be performed by computer-based system.
- B. The DSP system shall be fully operational 60 days prior to the first use of the installed system.
- C. The system shall have the following capabilities:
  - 1. Digital Signal Processing Unit:
    - a. Interior configuration of signal flow and routing to be fully user configurable
    - b. Unit to permit hardwire connection of external switches for recalling presets

- c. Unit to have no external user adjustable controls
- d. Dante compatible
- e. Provide redundant hardware for each DSP, programmed to seamlessly take over in the case of a primary hardware failure
- f. Acceptable Product to include the following:
  - a) QSC QSYS Core 610i (DSP, Type 1)
  - b) QSC QSYS Core 610 Scaling License
  - c) QSC SLDAN-256-P Software Based Dante 256 x 256
  - d) QSC QIO Series Network Audio Expanders
  - e) Atterotech Synapse DM16Mio (DIOX, Type 2)
  - f) QSC QIO-GP8x8 (RLY IO, Type 3)
  - g) QSC QSYS NV-32-H Video Endpoint
  - h) QSC SL-QUD-610-P UCI Deployment Software License
  - i) QSC SL-QSE-610-P Scripting Engine Software License

## 2.12 AMPLIFIERS

### A. Power Amplifiers:

1. Provide protection of circuit components in the event of input over-drive, output overload, or short circuits
2. Frequency response:  $\pm 1$  dB, 20 Hz to 20 kHz with less than 1 percent THD at rated output
3. Input impedance: 10k ohms balanced
4. Output regulation: 2 dB from no load to full load conditions
5. Noise generation: at least 85 dB below rated output with input shorted
6. Ventilation: variable speed fans that shut off when the amplifier is operating under light or no-load conditions
7. Bowl System: adequate power supply capacity or POE+ supported to maintain DSP power through emergency power take over, should building power be lost. Or, provide adequate UPS to maintain amplifiers needed for sustaining intelligibility standards through emergency power take over, should building power be lost.
  - a. A complete reboot of the amplifiers during transfer to generator backup power is not acceptable.
  - b. Amplifiers must be capable of passing audio on all channels within three seconds from power service being reinstated.
  - c. Subwoofers, and possibly low-frequency sections of multi-way loudspeakers are not required to sustain intelligibility standards. If UPS is required, provide UPS for amplifiers that work in the frequency range of 300 Hertz and higher.
8. Acceptable Products:
  - a. Type 1 Power Amplifier – 4 Channel, 400 Watts Continuous per Channel at 70V/8 Ohms:
    - 1) QSC CX-Q 2K4
  - b. Type 2 Power Amplifier: - 4 Channel, 625 Watts Continuous per Channel at 70V/8 Ohms:
    - 1) QSC CX-Q 4K4

- c. Type 3 Power Amplifier – 4 Channel, 1250 Watts Peak per Channel at 70V/4 Ohms:
  - 1) Dynacord IPX5:4
- d. Type 4 Power Amplifier – 4 Channel, 2500 Watts Peak per Channel at 70V/4 Ohms:
  - 1) Dynacord IPX10:4

## 2.13 LOUDSPEAKERS

### A. Type 1 Loudspeaker:

- 1. 6.5-inch coaxial in-ceiling loudspeaker
- 2. 110-degree conical coverage
- 3. 8 Ohm or 70V selectable with tap points at 30W, 15W, 7.5W, 3.7W, 1.9W
- 4. 89dB 1Watt/1meter Sensitivity
- 5. 104dB Peak SPL
- 6. 65Hz to 20kHz (-10dB)
- 7. Acceptable Product:
  - a. QSC AD-C6T
  - b. JBL Control 26CT

### B. Type 2 Loudspeaker:

- 1. 2-way high output full range loudspeaker 8-inch woofer and 1.4" compression driver
- 2. 120° H x 120° V
- 3. 8 ohms, 70V Taps @ 60W, 30W, 15W, 7.5W
- 4. 61 Hz to 18 kHz, +/- 3dB
- 5. 93 dB SPL, 1W, 1M Sensitivity
- 6. 118 dB SPL
- 7. Acceptable Product:
  - a. QSC AD-C820R SYSTEM
  - b. JBL Control 328 CT with grill and backbox

### C. Type 3 Loudspeaker:

- 1. 6.5-inch coaxial in-ceiling loudspeaker
- 2. 110-degree conical coverage
- 3. 8 Ohm or 70V selectable with tap points at 30W, 15W, 7.5W, 3.8W
- 4. 91dB 1Watt/1meter Sensitivity
- 5. 116dB Peak SPL
- 6. 62Hz to 20kHz (-10dB)
- 7. Acceptable Product to include the following:
  - a. JBL Control 16C/T
  - b. MTC-16WG high humidity grill

### D. Type 10 Loudspeaker:

- 1. 6.5-inch coaxial pendant loudspeaker
- 2. 135-degree conical nominal beamwidth

3. 8 Ohm or 70V selectable with tap points at 60W, 30W, 15W, 7.5W
  4. 88dB 1W/1M sensitivity
  5. 106dB Peak SPL
  6. 55Hz to 20kHz (-10dB)
  7. Acceptable Product:
    - a. QSC AD-P6T
    - b. JBL Control 60PS/T
- E. Type 11 Loudspeaker:
1. 8-inch Pendant ceiling subwoofer
  2. Omni-directional within intended passband
  3. 8 Ohm or 70V tap points at 110W, 55W, 30W, 15W
  4. 88dB 1Watt/1meter Sensitivity
  5. 42Hz to 350Hz (-10dB)
  6. 113dB Peak SPL
  7. Acceptable Product:
    - a. QSC AD-P.SUB
    - b. JBL Control 60PS/T
- F. Type 20 Loudspeaker:
1. Six 3-inch two-way vertical column loudspeaker
  2. Front-loaded components
  3. 140 x 20° coverage
  4. 8 Ohm or 70V selectable with tap points at 60W, 30W, 15W, 7.5W
  5. 94dB 1Watt/1meter Sensitivity
  6. 122dB Peak SPL
  7. 120Hz to 22kHz (-10dB)
  8. Outdoor direct exposure certified IP54
  9. Acceptable Product:
    - a. QSC AD-S802T
    - b. Community Desono ENT206
- G. Type 30 Loudspeaker:
1. 15-inch two-way surface mount loudspeaker
  2. Coaxial horn-loaded components
  3. 60 x 60-degree nominal beamwidth
  4. Single amplifier channel operation: 8 Ohms nominal impedance
  5. 103dB 1W/1M sensitivity
  6. 138dB Peak SPL
  7. 54Hz to 20kHz (-10dB)
  8. Acceptable Product:
    - a. Fulcrum Acoustics FH1566
- H. Type 31 Loudspeaker:
1. 15-inch two-way surface mount loudspeaker
  2. Coaxial front-loaded components



3. 75 x 75-degree nominal beamwidth
4. Single amplifier channel operation: 8 Ohms nominal impedance
5. 99dB 1W/1M sensitivity
6. 131dB Peak SPL
7. 57Hz to 20kHz (-10dB)
8. Acceptable Product:
  - a. Fulcrum Acoustics CX1577

I. Type 40 Amplified Tech Position Monitor:

1. 5.25-inch, two-way, self-powered loudspeaker
2. Front-loaded components
3. Self-Powered
4. 108dB Peak SPL
5. 49Hz to 20kHz ( $\pm 3$ dB)
6. (Quantity 2)
7. Acceptable Product:
  - a. Tannoy Reveal 502
  - b. JBL 305P MkII
  - c. KRK ROKIT 5 G4

## 2.14 INSTANT PLAYBACK (IPB) SYSTEM

- A. The Instant Playback system shall be operational 30 days prior to the first use of the installed system.
- B. Instant Playback System:
1. 5000 Hot Keys over 100 user selected pages
  2. Drag and Drop Audio Files – direct to any Hot Key
  3. Stereo Playback
  4. Turnkey System
  5. Acceptable Product:
    - a. ENCO Hotshot 3
- C. Control Monitor:
1. Viewable Size: 22-inch diagonal
  2. Touchscreen type: Optical
  3. Touchscreen interface: USB
  4. Contrast ratio: 1000:1
  5. Display resolution: 1920 x 1080
  6. Aspect ratio: 16:9
  7. Video Input: DVI, HDMI, VGA
  8. Provide Quantity: 1
  9. Acceptable Product:
    - a. ViewSonic TD2223
- D. Keyboard and Mouse:

1. Normal Keys: 104
2. Function Keys: 5
3. Mouse Tracking: Optical
4. Connection: USB
5. Provide one set for each KVM location
6. Acceptable Product:
  - a. Microsoft Wired Desktop 600 #APB-00001
  - b. Logitech Media Combo MK200
  - c. IOGEAR GKM513

E. USB Input/Output Interface (USB, Type 1):

1. Windows and Mac OS compatible
2. Supported Sample Rates: 44.1kHz, 48kHz, 88.2kHz, 96kHz, 176.4kHz, 192kHz
3. Two inputs, line level or microphone level with 48 volt phantom power
4. Two outputs, balanced line level on TRS quarter-inch connectors, with level control
5. USB interface connectivity
6. Powered via USB
7. Headphone output with level control
8. Acceptable Product:
  - a. Focusrite Scarlett 2i2

F. Analog to Digital Audio Converter (ADC):

1. Two channel analog audio input
2. Networked digital audio
3. Acceptable Product:
  - a. Audinate ADP-DAI-AU-2X0
  - b. Approved Equivalent

## 2.15 AUDIO CONTROL COMPUTER

A. Control Computer (minimum specification) (CC):

1. Provide Microsoft Windows latest professional 64-bit OS
2. Computer must accommodate future Microsoft Windows professional OS for at least 7 years.
3. CPU: Intel Core i5 4-core or current Intel equivalent; 2.6GHz base, 4.2 GHz Turbo
4. Enclosure/Case: Rack Mountable, fanless or fan cooled and rated for <35dBA/1M at highest CPU load.
5. Power supply: 400 watts
6. Memory: 32GB, fastest supported for motherboard
7. Internal Hard Drive: 1.0TB SSD, 1 million hrs MTBF, Sequential write rate >450MBs, Sequential read rate > 500MBs
8. LAN: 2 x GB
9. Video: 2 x HDMI 2.0, or DP 2.0. 2GB RAM.
10. WiFi v5 capable (built in or USB dongle)
11. Bluetooth 5 capable (built in or USB dongle)

12. USB: Minimum 4 USB-A 3.0 ports, 1 front panel and 3 rear panel
13. Software to be included:
  - a. Microsoft Windows
  - b. License all software to the client
  - c. ESET Nod32 Antivirus (coordinate with Owner IT group – ESET listed as performance standard)
14. Warranty: Three-Year Onsite Warranty with 24/7 Phone and Next Business Day Service
15. Computer system shall be completely tested by manufacturer prior to delivery
16. Acceptable Product:
  - a. Dell, HP, Lenovo, Super Logics, Stealth, Intel, Microsoft, Logitech, approved equivalent

B. Rack Mount Keyboard and Monitor (RMK):

1. 1RU integrated Keyboard and Monitor on slides
2. 105 key USB keyboard with integrated keypad
3. 17.3" diagonal LCD display with 1920 x 1080 resolution
4. Acceptable Product:
  - a. Middle Atlantic RM-KB-LCD17HD

## 2.16 KVM EXTENDER SYSTEM

A. IP KVM Extender (KVMET, KVMER):

1. Extend video, audio, USB, RS-232 and Ethernet signals via IP
2. Up to 4K/30Hz video
3. HDMI
4. USB 2.0 ports
5. Acceptable Product:
  - a. ATEN KE8950T with ATEN KE8950R

## 2.17 CONTROL SYSTEMS

A. Touch Panel (TP, Type 1)

1. 10-inch capacitive diagonal touch screen
2. 1280 x 800 pixels resolution
3. 24-bit color depth
4. PoE powered
5. Built-in speaker
6. Ambient light sensor
7. Automatic clock synchronization
8. Fully customizable interface and graphics
9. Coordinate color selection with architect
10. Acceptable Product:
  - a. QSYS TSC-101-G3

B. Volume Select Control (VS, Type 1)

1. One gang assignable controller
2. OLED display with rotary encoder
3. Coordinate color selection with architect
4. Acceptable Product:
  - a. Qsys Axon C1

**C. Control Panel (CP, Type 1)**

1. **One gang assignable controller**
2. **OLED display with rotary encoder**
3. **Coordinate color selection with architect**
4. **Acceptable Product:**
  - a. **Qsys Axon C1**

**D. Control IO (CNT, Type 1)**

1. Network LAN ports
2. Four bidirectional RS-232 serial ports with software handshaking
3. Acceptable Product:
  - a. QSYS QIO-S4

**2.18 VIDEO CONFERENCING**

**A. Video Bar (VB, Type 1):**

1. All-in-one USB conferencing device
2. Stereo loudspeakers, ported enclosure
3. 20 W per channel, < 0.3% distortion over frequency range
4. Frequency Response (-10 dB) 85 – 20,000 Hz
5. Camera and Video
6. Acceptable Product:
  - a. Logitech Rally Bar

**B. Ceiling Array Microphone (CM, Type 1):**

1. Provides automatic dynamic beamforming for voice pickup
2. Supports both Dante and analog audio outputs
3. Offers coverage for larger meeting rooms and lecture spaces
4. Certified for major conferencing platforms (MS Teams, Zoom, DingTalk, Tencent)
5. Power over Ethernet (PoE) capable
6. Ceiling-mountable design (replaces standard ceiling tile)
7. Acceptable Product:
  - a. Sennheiser TeamConnect Ceiling 2 Black

**C. PTZ IP Camera (VC, Type 1):**

1. Provides high-quality video capture for conferencing and streaming
2. Supports resolutions up to 1080p60
3. Features 12x optical zoom and 72° horizontal field of view
4. Offers pan, tilt, and zoom functionality

5. Integrates with Q-SYS ecosystem for control and management
6. Power over Ethernet (PoE) capable
7. Compact design suitable for wall or ceiling mounting
8. Acceptable Product:
  - a. Q-SYS PTZ-IP 12X72 Cam

D. USB I/O (USB, Type 1)

1. Provides USB connectivity for Q-SYS audio and video devices
2. Supports USB 3.0 for high-speed data transfer
3. Offers bidirectional audio and video streaming
4. Power over Ethernet (PoE) capable
5. Compact, surface-mountable design
6. Acceptable Product:
  - a. Q-SYS USB I/O Bridge

## 2.19 AV ENDPOINTS

A. DM Transmitter (DMTX, Type 1):

1. Converts HMI to CAT5e/6.
2. Transmits up to 330 feet (100 meters)
3. Supports computer and video resolutions up to 4K/60 @ 4:4:4
4. Supported HDMI 2.0 specification features include data rates up to 18 Gbps, 3D, and HD lossless audio formats
5. HDCP 2.3 compliant
6. Remote power capability with DTP2 products
7. Decora style wall plate
8. Acceptable Product:
  - a. Extron DTP3 T 101 D

B. DM Receiver (DMRX, Type 1):

1. Receives HDMI plus control and analog audio up to 330 feet (100 meters) over a shielded CATx cable
2. Supports computer and video resolutions up to 4K/60 @ 4:4:4
3. Stereo audio de-embedding
4. Supported HDMI 2.0b specification features include data rates up to 18 Gbps, HDR, Deep Color up to 12-bit, 3D, HD lossless audio formats, and CEC pass-through
5. HDCP 2.3 compliant
6. Remote power capability with DTP3 products
7. Acceptable Product:
  - a. Extron DTP3 R 201

C. AV Encoder (ENC Type 1):

1. Converts HDMI to IP-based AV signal
2. Transmits over standard 1Gb or 10Gb networks
3. Supports video resolutions up to 4K60 4:4:4

4. Supports HDMI
5. Dante/AES67 audio compatible
6. Power over Ethernet (PoE) capable
7. Decora-style double-gang wallplate design
8. Acceptable Product:
  - a. Visionary Solutions DuetE5-WP-H Encoder

D. AV Encoder (ENC Type 2):

1. Converts HDMI to IP-based AV signal
2. Transmits over standard 1Gb or 10Gb networks
3. Supports video resolutions up to 4K60 4:4:4
4. Supports HDMI
5. Dante/AES67 audio compatible
6. Power over Ethernet (PoE) capable
7. Decora-style single-gang wallplate design
8. Acceptable Product:
  - a. Visionary Solutions DuetE5 Encoder

E. AV Decoder (DEC Type 1):

1. Converts IP to HDMI (Decoder)
2. Transmits over standard 1Gb or 10Gb Ethernet networks
3. Supports video resolutions up to 4K60 4:4:4
4. Supported HDMI features include HDR and HDCP 2.2
5. Power over Ethernet capable
6. Compact, rack-mountable design
7. Acceptable Products:
  - a. Visionary Solutions D5100 Decoder

## 2.20 POWER CONDITIONING

A. Power Protection:

1. Provide surge protection devices to maintain clean power to the following equipment:
  - a. All computer CPU's and associated video monitors
  - b. All Audio System Network equipment
  - c. All low level (mic or line) processing equipment with internal microprocessor or DSP chips
  - d. Mixing Console(s)
2. Acceptable Product:
  - a. Surge-X SX-1120RT
  - b. Furman P-1800 PFR
  - c. Juice Goose RX100

B. Backup Power (UPS, Type 1):

1. Provide UPS systems for:
  - a. Computer CPU's and associated video monitors

- b. DSP
    - c. Audio related network equipment
    - d. AV Control Systems
  - 2. UPS's shall be on-line style with sufficient battery reserve to operate for 15 minutes. Size each UPS unit for 25 percent additional capacity.
  - 3. Coordinate make and model with the Owner and/or IT Administrator to provide consistency throughout the venue.
  - 4. Acceptable Product:
    - a. APC SMT2200RM2U
    - b. Juice Goose SCV-30001
    - c. Tripp Lite SM2200RMXL2UP
- C. Mixing Console Backup Power (UPS, Type 2):
- 1. Provide dedicated Mixing Console Backup Power
  - 2. Located under Mixing Console work surface in an area that does not interfere with the operator
  - 3. UPS's shall be on-line style with sufficient battery reserve to operate for at least 10 minutes
  - 4. Acceptable Product:
    - a. APC Back-UPS 650
    - b. Tripp Lite ECO650LCD

## 2.21 POWER DISTRIBUTION

- A. Vertical Rack Power Distribution (VPD)
- 1. Modular raceway power system.
  - 2. Rack mountable vertical distribution.
  - 3. Provide complete system.
  - 4. Coordinate wiring of circuits with electrical contractor.
  - 5. Coordinate raceway length with rack height and modules shown.
  - 6. Acceptable Product:
    - a. Middle Atlantic MPR-xA (x = number of modules)
  - 7. Accessories
    - a. Switched Modules
      - 1) Middle Atlantic RLM-20A (20A RM)
      - 2) Middle Atlantic RLM-30A (30A RM)
    - b. Unswitched Modules
      - 1) Middle Atlantic M-20A (20A MOD)
      - 2) Middle Atlantic M-30A (30A MOD)
    - c. Junction Box
      - 1) MPR Series J-Box (Size based on circuit quantity) (J-BOX)
- B. Rack Power Distribution (RPD)
- 1. Rack mountable distribution.
  - 2. Used for additional outlets as required.
  - 3. Size strip to number of required outlets.
  - 4. Acceptable Product:

- a. Middle Atlantic PDT Series
  - b. Middle Atlantic PD Slim Series
- C. Rack Lighting and Power Strip:
- 1. Nema 20A plug
  - 2. 20 Amp/2400 Watt rating
  - 3. Front panel AC voltmeter
  - 4. Dual front panel pullout dimmable lights
  - 5. Spike and surge suppression with over-voltage shutdown
  - 6. Rack Mountable
  - 7. Acceptable Product:
    - a. Furman PL-Pro C
    - b. Middle Atlantic PDLT-815RVA
    - c. Juice Goose JG 8LEDPower Supplies:
  - 8. As required.

## 2.22 NETWORK EQUIPMENT

- A. Ethernet Switch:
- 1. Managed gigabit switch with PoE+
  - 2. Streaming compatible
  - 3. Network management application included.
  - 4. Compatible and approved by DSP and amplifier system manufacturer
  - 5. Compliant with venue IT Standards
  - 6. Provide Fiber Optic adaptors as required
  - 7. Acceptable Product:
    - a. Cisco SG350-10MP
    - b. Netgear M4250 series
- B. Fiber Patch:
- 1. Rack Mountable Modular System designed for Fiber Optic Termination
  - 2. Acceptable Product:
    - a. Panduit LGX compatible enclosures as required
    - b. Panduit LGX adaptor plates as required
- C. POE Injector (POE):
- 1. 802.3af Compliant
  - 2. 48 VDC @ 0.35 A, 16.8 Watts
  - 3. 120 VAC IEC 320 C14 Mains Power Input
  - 4. Acceptable Product:
    - a. Extron XTP PI 100

## 2.23 MISCELLANEOUS EQUIPMENT

- A. Patch Panel – 96 Point (PB, Type 1):



1. Field verify existing patch points and destination. Provide the quantity of patch panels to accommodate all patch points required
  2. Identification strips to be printed labels of different color for each major connector grouping. Use a combination of colored fonts on white background and black fonts on colored backgrounds. Manufacture colored insert markers are also acceptable to identify normalling and signal types
  3. Non-terminated inputs to be shorted through normalling contacts on rear panel.
  4. Type: Long frame, two rows of 48 jacks
  5. Termination: 18-28 AWG stranded; oversize split cylinder capable of two wires per terminal
  6. Labeling: Standard label strips and color-coded, numbering required for each terminal.
  7. Normals: Sleeve Normals out
  8. Tool: Provide one tool and tip to Stadium Operator
  9. Labeling: Circuit designation strip and title block
  10. 2-U Rack Mountable
  11. Acceptable Product:
    - a. Bittree B96DC- FNSST/E3 M2OU12B
- B. Patch Cords:
1. Patch Cords to be 2, 3 and 4 feet long
  2. Provide different color cords for each cable length
  3. Provide patch cord holder for unused cords
  4. Provide all patch cords from single manufacturer
  5. Provide the following:
    - a. 24" Patchcable; Black (Quantity: 12)
    - b. 36" Patchcable; Red (Quantity: 24)
    - c. 48" Patchcable; Green (Quantity: 6)
  6. Acceptable product:
    - a. Bittree
- C. Patch Cable Holder:
1. Provide in Audio Control Room
  2. Quantity (3)
  3. Acceptable Product:
    - a. Bittree PCHA
    - b. Approved Equivalents
- D. Signal Level Tester:
1. Microphone or Line Level
  2. Phantom Power or Intercom Voltage detection
  3. Output Sources: Internal tone Generator, Internal Microphone
  4. XLR and TT input, XLR output
  5. Headphone output with level control
  6. Belt clip
  7. Acceptable Product:
    - a. Whirlwind Qbox (Quantity 1)

**2.24 EQUIPMENT HOUSING AND ACCESSORIES**

- A. Configure equipment racks for proper airflow and cooling
- B. Middle Atlantic systems listed below are approved for use on this project and are listed to set the acceptable standard of performance. Equipment housing systems from Lowell or other approved equivalents are also acceptable provided they meet the performance specifications of the approved listed equipment housing systems.
- C. Free Standing or Ganged Rack (Type 1):
  - 1. Type: Frame and panel with locking rear door
  - 2. Size: refer to rack schedule
  - 3. Construction: Factory assembled 16-gauge cold-rolled steel frames with all corners welded
  - 4. Black enameled finish
  - 5. Provide all necessary side panels, trim pieces, tops, and blank panels
  - 6. Provide Middle Atlantic VBK-W27-W32 Vent Blocker kit(s) and configure for proper airflow and cooling of rack
  - 7. Perforated front door
  - 8. Acceptable Product:
    - a. Middle Atlantic Products MRK series
- D. Wall Mounted Rack (Type 2):
  - 1. Type: Wall mounted, hinged rack with 90-degree pivot capability
  - 2. Size: refer to rack schedule
  - 3. Construction: Factory assembled 16-gauge cold-rolled steel frames with all corners welded
  - 4. Black enameled finish
  - 5. Provide Middle Atlantic VBK-W27-W32 Vent Blocker kit(s) and configure for proper airflow and cooling of rack
  - 6. Perforated front door
  - 7. Acceptable Product:
    - a. Middle Atlantic Products DWR series
- E. Slide Out Rack (Type 3)
  - 1. Slide out rotating rack
  - 2. Cable management
  - 3. Service stand
  - 4. Acceptable Product:
    - a. Middle Atlantic AX-SXR-20
- F. Rolltop Desk (Type, DESK 1)
  - 1. Engineered core construction, 1" side walls
  - 2. Linear lift system to raise/lower desktop
  - 3. Aluminum tambour with anodized black finish

4. Black laminate finish
5. Dimensions: 72" W x 34" D x 38.5" H
6. Options
  - a. (2) Slide out keyboard/mouse tray
  - b. Institutional lock
7. Acceptable Product:
  - a. HSA Rolltop Desk Ascension Series 1472
  - b. HSA project no. 24109

G. Rolltop Desk (Type, DESK 2)

1. Engineered core construction, 1" side walls
2. Linear lift to raise/lower desktop
3. Aluminum tambour with anodized black finish
4. Black laminate finish
5. Dimensions: 46" W x 34" D x 38.5" H
6. Options
  - a. (1) Slide out keyboard/mouse tray
  - b. Institutional lock
7. Acceptable Product:
  - a. HSA Rolltop Desk Ascension Series 1444
  - b. HSA project no. 24109

H. Rolltop Rack (Type, RT)

1. Engineered core construction, 1" side walls
2. No rack rail, slide out rack to be used.
3. Aluminum tambour with anodized black finish
4. Black laminate finish
5. Dimensions: 21.5" W x 34" D x 38.5" H
6. Options
  - a. Institutional lock
7. Acceptable Product:
  - a. HSA Rolltop Desk Ascension ASC20RU
  - b. HSA project no. 24109

I. Rack Drawer:

1. Spring loaded latch
2. Black textured finish
3. Acceptable Product:
  - a. Middle Atlantic TD series

J. Low Profile Keyboard Shelf:

1. Sliding black laminate shelf
2. Single rack space
3. Acceptable Product:
  - a. Middle Atlantic SSL

K. Computer Shelf:

1. Flanged construction
  2. 16 Gauge steel
  3. Black powder coat finish
  4. Acceptable Product:
    - a. Middle Atlantic U4
- L. Universal Rack Shelf:
1. Black textured powder coat finish
  2. Acceptable Product:
    - a. Middle Atlantic RSU-129
- M. Universal Mounting Trays:
1. Multiple Devices
  2. Acceptable Product:
    - a. Extron RSU 126
  3. Single Device
  4. Acceptable Product:
    - a. Extron RSB 126
- N. Blank Rack Panels:
1. Flanged construction
  2. 16 Gauge steel
  3. Black powder coat finish
  4. Acceptable Product:
    - a. Middle Atlantic SB series
- O. Vent Rack Panels:
1. Flanged construction
  2. 16 Gauge steel
  3. Black powder coat finish
  4. Acceptable Product:
    - a. Middle Atlantic VTF series
- P. Rack Fan:
1. 10" or 4.5"(x4), 115V
  2. Include cord and hardware
  3. Acceptable Product:
    - a. Middle Atlantic FAN10 with GUARD-10
    - b. Middle Atlantic FAN with GUARD
- Q. Fan Thermostat Control:
1. Switched 15A duplex outlet
  2. Temperature Range: 50 – 90 Degrees
  3. On and Stand-by LED indicators
  4. Integral mounting ears

5. Provide for each rack fan assembly
  6. Acceptable Product:
    - a. Middle Atlantic FC-4-1C
- R. Rack Temperature Display:
1. Provide one display in top front panel space of each rack
  2. Decora mount in 1-RU rack panel
  3. Digital readout in Fahrenheit or Celsius
  4. Connect to DSP GPIO for high temperature alarm to the Audio Control Room
  5. Acceptable Products:
    - a. Middle Atlantic TEMP-DEC with DECP-1X1 Panel.
- S. Rack Light:
1. Provide 60W incandescent or 13W fluorescent work light
  2. Located in all equipment racks over 36 RU's high
  3. Acceptable Product:
    - a. Middle Atlantic WL-60
    - b. Lowell RL-1
- T. Copper Bus Bars:
1. Material: Solid copper, 1/8 thick and 2-inches wide with threaded 10/32 holes
  2. Height: 70-inch for 40-RU or larger racks and 21-inch for racks under 40-RU
  3. Wire each circuit ground to bus bar and isolated outlet ground
  4. Terminate two #6 wires between rack and buss bar
  5. Provide with nylon isolation mounts
  6. Provide one bus bar in each rack
  7. Acceptable Product:
    - a. Middle Atlantic BB-40
    - b. Middle Atlantic BB-12
- U. Equipment Rack Screws:
1. Install rack mounted equipment with black 10-32 star post security screws with flat nylon washers
  2. Quantity as required
  3. Provide one spare bit located in a clear plastic bag attached to the inside of each equipment rack in plain view
  4. Acceptable Product:
    - a. Middle Atlantic HTX
    - b. Raxxess PNTX
- V. Wire Duct:
1. Purpose: signal wire routing in rack
  2. Acceptable Product:
    - a. Panduit Type E Slotted
- W. Surface Mount Wire Duct:

1. Signal level cabling, loudspeaker level cabling, electrical
2. Acceptable Product:
  - a. Wiremold 4000 Series

## 2.25 PLATES AND PANELS

- A. Provide plates and panels and as described in Drawings. Engrave as shown on Drawings. Other Plates and Panels may be required to satisfy the requirements of the Work.
- B. Custom panels shall be flanged standard EIA sizes, brushed black anodized finish unless otherwise noted.
- C. Plate finish shall be coordinated with the Architect. Plastic plates are not acceptable.
- D. Panel, plate, and label engraving shall be 1/8-inch block sans serif characters unless noted otherwise. On dark panels or pushbuttons, letters shall be white; on stainless steel or brushed natural aluminum pushbuttons, letters shall be black.
- E. Custom and/or Engraved Panels:
  1. Custom panels constructed of 1/8-inch brushed aluminum
  2. Finish: black anodize
  3. Acceptable Product:
    - a. RCI Custom
    - b. ProCo
    - c. Whirlwind
- F. Patch Panels for Audio/Video plate tie lines:
  1. Flat all-metal Shielded modular patch panels
  2. Mounts to standard cabinets and EIA 19" Racks
  3. 16-ports per 1U panel
  4. Strain relief bar includes cable tie slots for managing and supporting cables
  5. Label area to correspond to unique ID number of AV, AVC, FB plates (Labels to be printed, not hand-written)
  6. Utilizes Mini-Com Shielded snap-in modules
  7. Acceptable Product to include:
    - a. Panduit #CP16WSBLY
    - b. Panduit TX6 10Gig Shielded Modules
    - c. Mounting screws as needed

## 2.26 CABLES & WIRING

- A. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper, and meet appropriate ratings (e.g., CMR, CMP, etc.)

- B. Cable shall carry appropriate fire rating (e.g., CMR, CMP, OFNR, OFNP, etc.) on jacket of cable.
- C. Where cables are routed through cable tray, provide tray rated cable of equal specification.
- D. Where speaker cables are run exposed through a return air plenum, provide plenum rated cable of equal specification.
- E. Where cabling is run through in-grade pathways, provide direct burial cable, underground rated, or cable treated with water blocking. Adjust conduit sizes accordingly to accommodate larger diameter cable.
- F. Shielded cables located in raceways shall have aluminum foil shield with drain wire.
- G. The Belden cables listed below are approved for use on this project and are listed to set the acceptable standard of performance. If field conditions or actual cable pathway requires tray or plenum cable, provide version of cable that meets required rating. Cables from Liberty, Commscope, Gepco, Clark, Windy City, and West Penn are also acceptable provided they meet the performance specifications of the approved listed cables.
- H. Loudspeaker Cables:
  - 1. Rack Cable
    - a. Amplifier to Rack Room Terminals:
    - b. Distance not to exceed 25 feet.
    - c. 12 gauge twisted pair, jacketed.
    - d. Acceptable Product:
      - 1) Belden 5000UP
  - 2. Field Cable
    - a. Rack Room Terminals to Rough-in box or Junction Box – Speaker (JBS) Terminals near loudspeaker, low impedance:
    - b. 10 gauge twisted pair, jacketed.
    - c. Acceptable Product:
      - 1) Non-Plenum: Belden 5T00UP
      - 2) Plenum: Belden 6T00UP
      - 3) In-grade: Belden 1313A
  - 3. Field Cable
    - a. Rack Room Terminals to Junction Box – Speaker (JBS) Terminals near loudspeaker, 70V Zones:
    - b. 12 gauge twisted pair, jacketed.
    - c. Acceptable Product:
      - 1) Non-Plenum: Belden 5000UP
      - 2) Plenum: Belden 6000UE

- 3) In-grade: Belden 1311A
  4. Drop Cable Array
    - a. Drop cable from Junction Box – Speaker (JBS) Terminals to Loudspeaker Array:
    - b. Eight conductors, 10 gauge, twisted pairs, SOOW rubber jacketed.
    - c. Acceptable Product:
      - 1) General Cable-Carrol 09008
  5. Drop Cable
    - a. Junction Box– Speaker (JBS) Terminals to Loudspeaker:
    - b. Distance not to exceed 15 feet.
    - c. 12 gauge, twisted pairs, SOOW rubber jacketed.
    - d. Acceptable Product:
      - 1) General Cable-Carrol 02724 (two-conductor)
      - 2) General Cable-Carrol 02726 (four-conductor)
      - 3) General Cable-Carrol 09208 (eight conductor)
- I. Microphone and Line Level Cable:
  1. Twisted pairs, shielded, jacketed, 110 Ohm cable.
  2. Acceptable Product:
    - a. Single Pair:
      - 1) Non-Plenum: Belden 1696A
      - 2) Plenum: Belden 1801B
      - 3) Riser: Belden 9451
      - 4) In-grade: Belden 9451WB
    - b. Six Pair:
      - 1) Non-Plenum: Belden 1218B
      - 2) Plenum: Belden 1816P
      - 3) Riser: Belden 1816R
      - 4) In-grade: Belden 1816WB
    - c. Twelve Pair:
      - 1) Non-Plenum: Belden 1220B
      - 2) Plenum: Belden 1818P
      - 3) Riser: Belden 1818R
      - 4) In-grade: Belden 1818WB
- J. Wireless Systems Antenna Cable:
  1. RG8/X
  2. Acceptable Product:
    - a. Non-Plenum: Belden 9258
    - b. Plenum: Belden 7733A
    - c. Riser: Belden 7810R
    - d. In-grade: Belden 7810WB
- K. Ethernet Cable:
  1. Category 6 non-bonded pairs
  2. Acceptable Product:
    - a. Non-Plenum / Riser: Belden 2412



- b. Plenum: Belden 1352A
- c. In-grade: Belden OSP6F
- d. Tactical: Belden 1303E

L. Fiber Optic Cable:

- 1. Armored Single Mode Fiber Optic Cable
- 2. Acceptable Product:
  - a. 6 Strand:
    - 1) Non-Plenum / Riser: Belden FDSH0065F
    - 2) Plenum / In-grade: Belden FDSD006A9
  - b. 12 Strand:
    - 1) Non-Plenum / Riser: Belden FDSH0125F
    - 2) Plenum / In-grade: Belden FDSD012A9
  - c. 24 Strand:
    - 1) Non-Plenum / Riser: Belden FDSH0245F
    - 2) Plenum / In-grade: Belden FDSD024A9
  - d. 48 Strand:
    - 1) Non-Plenum / Riser: Belden FDSH048AK
    - 2) Plenum / In-grade: Belden FDSD048AK

M. Intercom Cable:

- 1. Low Capacitance 20AWG twisted pair
- 2. Acceptable Product:
  - a. Non-Plenum: Belden 9207
  - b. Plenum: Belden 89207

N. Category 6A Patch Cables:

- 1. Rack Patch Cables
- 2. Length as required
- 3. Acceptable Product:
  - a. Belden 10GX UTP LSZH series

O. Fiber Patch Cables:

- 1. Rack Patch Cables
- 2. Length as required
- 3. Connector type as required
- 4. Acceptable Product:
  - a. Belden FP series

## 2.27 CONNECTORS

A. XLR Panel mount Connectors:

- 1. Provide panel mount XLR connectors with unified metal shell
- 2. RF-Protector connectors
- 3. Shell Color: Black

4. Contacts: Silver
  5. Terminations: Solder
  6. Acceptable Product:
    - a. Male Connectors: Neutrik NC\*MD-L-1-BAG Series
    - b. Female Connectors: Neutrik NC\*FD-L-1-BAG Series
- B. XLR Cable Connectors:
1. Provide XLR cable connectors with die cast shell
  2. No-screw type assembly
  3. Chuck-type strain relief
  4. Shell Color: Black
  5. Contacts: Silver
  6. Terminations: Solder
  7. Acceptable Product:
    - a. Male Connectors: Neutrik NC\*MX-BAG Series
    - b. Female Connectors: Neutrik NC\*FX-BAG Series.
- C. 1/4" Panel mount Connectors:
1. Provide panel mount 1/4" connectors with unified metal shell
  2. Shell Color: Black
  3. Contacts: Silver
  4. Terminations: Solder
  5. Acceptable Product:
    - a. Female Connectors: Neutrik NJ3FP6C-BAG Series
- D. 1/4" Cable Connectors:
1. Provide 1/4" cable connectors with die cast shell
  2. No-screw type assembly
  3. Chuck-type strain relief
  4. Shell Color: Black
  5. Contacts: Nickel
  6. Terminations: Solder
  7. Acceptable Product:
    - a. Male Connectors: Neutrik NP3C-BAG Series
- E. BNC Cable Connectors:
1. Provide cable mount BNC connectors
  2. Contacts: Brass or copper
  3. Terminations: Crimp
  4. Acceptable Product:
    - a. Kings
    - b. Amp
    - c. Amphenol
    - d. Canare
    - e. Liberty
- F. RCA Male Cable Connectors:

1. Provide RCA cable connectors with die cast shell
2. Shell Color: Silver
3. Contacts: Silver
4. Terminations: Solder
5. Acceptable Product:
  - a. Switchcraft 3502 Series
  - b. Liberty

G. F Connector:

1. Provide commercial style gold plated connector with integral sleeve for F6 Series, F11 Series, and F59 Headend cable
2. Provide seal ring in all moisture intensive environments
3. Install with manufacturer recommended compression tool
4. Provide weatherized boots and seal covers for all antenna connections
5. Verify connector cable type, size and construction with manufacturer
6. Acceptable Product:
  - a. Gilbert Engineering GF-US-6Q series, GF-US-11Q, and GF-US-59Q series respectively
  - b. Gilbert Engineering Seal ring: G-SR-1/2

H. RJ45 Connectors:

1. UTP Category 6, 8-pin wiring inserts T568A/B jacks
2. Acceptable Products:
  - a. Belden PN#AX101320 (color to match plate)

## 2.28 LOUDSPEAKER HARDWARE AND SUPPORT STRUCTURE

- A. Provide a custom modular loudspeaker hardware system as required to mount and suspend loudspeakers in the arrangement as shown on the Drawings.
- B. Attachment system to be supplied by vendor whose primary specialty is fabricating support systems for loudspeakers or similar devices over an audience.
- C. Acceptable Manufacturers:
1. Adaptive Technologies Group
  2. Polar Focus Job No. H14273
  3. Proprietary by loudspeaker manufacturer
- D. Shoulder Type Machinery Eye Bolts:
1. Forged Steel – Shoulder, Quenched and Tempered
  2. Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles
  3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements
  4. Select size of product-based working load limits required
  5. Acceptable Product:

- a. Crosby Group S-279 / M-279 Series
- b. Chicago Hardware Company 261 Series
- c. Approved equal

E. Forged Eye Nuts:

- 1. Forged Steel – Quenched and Tempered
- 2. Tapped with standard UNC class 2 threads after galvanizing
- 3. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements
- 4. Select size of product-based working load limits required.
- 5. Acceptable Product:
  - a. Crosby Group G-400 Series
  - b. Chicago Hardware Company 167 Series
  - c. Approved equal

F. Anchor Shackles:

- 1. Forged - Quenched and tempered, with alloy pin
- 2. Working Load Limit permanently shown on every shackle
- 3. Hot Dip galvanized or Self-Colored
- 4. Product to meet the performance requirements of Federal Specification RR-C-271D Type IVA, Grade A, Class1
- 5. Select size of product-based working load limits required
- 6. Provide all screw pin type shackles with mouse wire
- 7. Acceptable Product:
  - a. Crosby Group G-209 / S-209 Series Screw Pin
  - b. Chicago Hardware Company 201 Series
  - c. Approved equal

G. Turnbuckles:

- 1. Acceptable turnbuckle assembly combinations include Eye and Eye, Jaw and Jaw, Jaw and Eye
- 2. End fittings are Quenched and Tempered; bodies heat treated by normalizing
- 3. Hot Dip galvanized
- 4. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements
- 5. Product to meet the performance requirements of Federal Specifications FF-T-791b, Type 1 Form 1 - CLASS 4, and ASTM F-1145
- 6. Select size of product-based working load limits required
- 7. All end fittings to be moused to the body with mousing cable
- 8. Acceptable Product:
  - a. Eye and Eye:
    - 1) Crosby Group HG-226 Series
    - 2) Chicago Hardware Company 012/013 Series
    - 3) Approved equal
  - b. Jaw and Eye:
    - 1) Crosby Group HG-227 Series
    - 2) Chicago Hardware Company 026 Series

- 3) Approved equal
- c. Jaw and Jaw:
  - 1) Crosby Group HG-228 Series
  - 2) Chicago Hardware Company 030/031 Series
  - 3) Approved equal

H. Swivel Hoist Ring:

- 1. All components are Alloy Steel - Quenched and Tempered
- 2. Rated at 100% of Working Load Limit at 90° angle
- 3. 360 swivel and 180 pivot action
- 4. Product to meet or exceed all the requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements
- 5. Bolt specification to be Grade 8 Alloy socket head cap screw to ASTM A 574
- 6. Fatigue rated at 1-1/2 times the Working Load Limit at 20,000 cycles
- 7. Zinc Plated (Yellow Chromate) finish for increased corrosion protection
- 8. Select size of product-based working load limits required
- 9. Acceptable Product:
  - a. Crosby Group HR-125
  - b. Chicago Hardware Company 860 Series
  - c. Approved equal

I. Wire Rope Thimble:

- 1. Product to meet the performance requirements of Federal Specification FF-T-276b Type II
- 2. Hot Dip galvanized
- 3. Select size of product-based wire rope size required for suspended load
- 4. Acceptable Product:
  - a. Crosby Group G-411 Series
  - b. Chicago Hardware Company 224/225 Series
  - c. Approved equal

J. Wire Rope:

- 1. Strands: 7 x 19 Utility Cable
- 2. Type: Galvanized
- 3. Select size of product-based working load limits required
- 4. Acceptable Product:
  - a. WireCo World Group
  - b. Approved equal

K. Wire Rope Sleeves:

- 1. Type: Copper Duplex
- 2. Select size of product-based wire rope size required for suspended load
- 3. Acceptable Product:
  - a. WireCo World Group SW-740 Series
  - b. Approved equal

**PART 3 - EXECUTION****3.1 GENERAL**

- A. Coordination of the Work specified herein with other project work so as to facilitate a cohesive final Product.
- B. The installation recommendations contained within ASDI and Telecommunications Distribution Methods Manual are mandatory minimum standards and requirements.
- C. Mount equipment and enclosures plumb and level.
- D. Permanently installed equipment to be firmly and safely held in place. Design equipment supports to support loads imposed with a safety factor of at least five. Seismic bracing shall be installed on appropriate equipment where local codes require such installation.
- E. Verify all locations of equipment in all rooms with Owner's Representative, Owner, and Consultant.

**3.2 INSTALLATION**

- A. Installation of cable and wiring
  - 1. Cabling and Wiring:
    - a. Install cable in a manner to adhere to manufacturer's specifications for maximum cable pulling tension, minimum bend radius, and any other restrictions.
    - b. Provide appropriate support at all horizontal-to-vertical transitions in order to keep the weight of the cable from degrading at the point of transition.
    - c. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at a maximum of 48-inch (1.2 meter) intervals. At no point shall the cables rest on light fixtures, acoustic ceiling grids, panels, conduits, sprinkler pipe, water pipe and/or HVAC system ducting.
    - d. Horizontal distribution cables shall be bundled in groups of no more than 50 cables when being supported by J-Hook or trapeze systems. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance. An exception to this rule is when cable is installed in cable tray systems.
    - e. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

- f. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
  - g. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced prior to final acceptance at no cost to the Owner.
  - h. Cables shall be identified by a self-adhesive machine label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
  - i. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
  - j. Provide splice free wiring and cabling from origination to destination. Cables shall be installed in continuous lengths from origin to destination (no splices). Properly designed transition points, or consolidation points are not considered 'splice' points.
  - k. Make joints and connections with rosin-core 60/40 solder or with mechanical connectors specifically intended for the type and class of cable being used. Where spade lugs are used, crimp properly with ratchet type tool.
  - l. Take precaution to prevent and guard against electromagnetic and electrostatic hum. For line-level audio signal, float cable shield at one end. Shield(s) that are not connected are to be folded back over the cable jacket and covered with heat-shrink tubing. Do not cut off unused shield.
  - m. Isolate cables and wires of different signals or different levels are to be separated, organized, and routed in order to restrict channel crosstalk, or create feedback oscillation in any amplifier section. Keep wiring separated into groups for microphone level circuits, line level circuits, loudspeaker circuits, and power circuits.
  - n. Connect cable to active components through XLR connections whenever multiple formats are available. Make connections to speaker transformers with properly sized closed-end connectors crimped with factory approved ratchet type tool. Wire nut or "Scotchlock" connectors are not acceptable. Do not wrap audio cable splices or connections with adhesive backed tape.
  - o. Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.
  - p. Execute wiring in strict adherence to:
    - 1) Phillip Giddings. Audio System Design and Installation. Indianapolis: Howard W. Sams & Co., 1990.
    - 2) Don Davis and Carolyn Davis. Appendix II, Recommended Wiring Practices. Sound System Engineering, 2nd Edition. Indianapolis: Howard W. Sams & Co., 1989.
    - 3) AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems, Infocomm, 2009
2. Equipment Housing Cabling and Wiring:
- a. Lace, tie, or harness wire or cable as required herein, and in accordance with accepted professional practice. Dress, lace, or harness all wire or

cable to prevent mechanical stress on electrical connections; no wire or cable shall be supported by a connection point. Install cable and wire neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable bundles sag.

- b. Provide adequate service loops so that equipment mounted on rack slides may be pulled fully out to their locked position without straining cable.
- c. Neatly bundle excess AC power cable from housing mounted equipment with plastic cable ties.
- d. Provide plastic cable ties or Velcro straps to bundle cabling and wiring. Electrical tape and adhesive backed cable tie anchors are not acceptable.
- e. Install with connections completely visible and labeled.
- f. Provide termination resistors, if required, of 5 percent tolerance. Mount the termination resistors fully visible.

B. Installation of connectors, plates & panels:

- 1. Install panel mounted connectors rigidly attached to panels, plumb and level.
- 2. Custom rack panels shall be flanged standard EIA sizes, brushed black anodized finish unless otherwise noted.
- 3. Custom connector plates (loudspeaker, microphone, etc.lamicoi) are typically stainless steel, unless otherwise noted or specified. However, verify plate finish with the Owner.
- 4. Install XLR type connectors in accordance with IEC-268 standard, with a wiring scheme of pin 2 hot (high), pin 3 (low), and pin 1 screen (shield).
- 5. Other Plates and Panels may be required to satisfy the requirements of the Work.

C. Installation power and grounding:

- 1. Coordinate final connection of power and ground wiring to housings.
- 2. Hardwire power wiring directly to internal AC receptacles to ensure uninterrupted operation.
- 3. Provide 3-conductor, isolated ground, 120 VAC outlets as required within each housing. Provide a minimum of two spare outlets in each rack.
- 4. Provide a copper ground buss top to bottom in each housing, insulated from the housing. Ground equipment chassis not having a three wire power cord to these busses using 6/32 nuts, bolts and lock-washers with No. 12 wire. Connect green ground wire from each AC outlet in housing to this buss bar.
- 5. Replace manufacturers supplied 18 gauge IEC power cords with UL listed 18 gauge pre-molded 6", 12", 18", or 24". Use minimum length required. No looped or cable tied IEC power cords will be permitted within the equipment rack.
- 6. Replace manufacturers supplied 14 gauge IEC power cords with UL listed 14 gauge pre-molded 18" or 36" folamr all equipment IEC capable. Use minimum length required and minimize looped or cable tied IEC power cords present in the equipment rack.

D. Installation of electronic equipment:



1. Take appropriate precautions against electrostatic discharge (ESD). Establish a personal ground before handling electronic equipment through the use of a grounded wrist wrap and/or an anti-static floor pad.
2. Take appropriate precautions to protect the equipment from damage during installation. Equipment to be installed free of damages, scratches, dents, etc.
3. Mount trim potentiometers, custom circuit cards, relays, and transformers (except large 70V units) in shielded enclosures, and mark their function and connections with engraved lamicoid labels.
4. Mount equipment plumb and level, firmly and safely held in place.

E. Installation of equipment housing:

1. Mount equipment in racks or other project specific equipment housing apparatus. Fully wire and test before delivery to job site. If field conditions prevent prior assembly of racks, notify Owner in writing that racks will be fabricated on site and the reasons for the change.
2. Secure rack mounted devices utilizing all available fastener mounting positions on device.
3. Provide rear support for housing mounted equipment greater than 15 inches deep.
4. Provide blank panels to fill unused panel space within the equipment housing.
5. If Key door locks are required, key each housing type alike.
6. Looking at the rack from the rear, locate AC power and speaker wiring on the left; line level audio, video, and RF wiring on the right.
7. Provide shaft locks or security covers on non-user operated equipment having front panel controls. These panels are to be installed at the conclusion of testing.
8. If forced-air active thermal management is used, provide ventilation blocking material on the front, sides, and rear of the equipment rack as needed. Reference Middle Atlantic Products "Controlling the Temperature Inside Equipment Racks". Air temperature inside of the rack is not to exceed 90 degrees Fahrenheit.
9. Panels, or equipment mounted on the rear rack rails, shall not block access to any front mounted components.
10. If equipment rack is not equipped with casters, provide two inch high wood base to isolate equipment rack from floor. Wood base should be capable of supporting the load.

F. Installation of loudspeakers:

1. The Contractor is responsible for final design and engineering of loudspeaker rigging, attachments, brackets, and hoisting.
2. Loudspeakers shall be mounted at the operating position in a safe, secure, and permanent manner.
3. Provide custom rigging as needed. In addition to the ANSI standards below, custom rigging shall be built to include compliance with the following American Welding Society standards:
  - a. AWS-D1.1/D1.1M:2020
  - b. AWS-D1.2/D1.2M:2014

4. Loudspeaker manufacturer supplied mounting brackets or rigging shall be built to the applicable ANSI standards listed below, with testing and/or traceability data provided as part of shop drawings submittal.
  5. Suspension and Mounting:
    - a. Static and dynamic equipment loads shall be suspended or mounted in compliance with the following ANSI/ESTA standards, using the latest available versions of the standards:
      - 1) ANSI E1.4-2-2021 Statically Suspended Rigging Systems
      - 2) ANSI E1.56-2018 Rigging Support Points
      - 3) ANSI E1.6-1-2021 Powered Hoist Systems
      - 4) ANSI E1.8-2012 Loudspeaker Enclosures Intended for Overhead Suspension
    - b. Rigging, mounting, and support systems for overhead suspended loudspeakers shall be reviewed and certified by a registered Professional Engineer (PE), in the employ of the Contractor, licensed to practice in the State in which the project is located. Documentation shall be included as a submittal item. Once the systems are installed, the PE shall physically inspect, at the Contractor's cost, the methods and means used to verify compliance with the original design.
  6. General Guidelines:
    - a. Reference Project structural documents.
    - b. Site and/or special inspections may be required if requested by the Owner.
    - c. Paint loudspeakers, supports, and related hardware color as directed by the Owner.
    - d. The aiming direction of all loudspeakers shall be adjustable by no less than  $\pm 5$  degrees horizontally and vertically.
    - e. Loudspeakers are to be oriented parallel to their mounting surface unless otherwise noted.
    - f. Provide a safety cable connected to a secondary location for each loudspeaker.
    - g. All loudspeakers located in ceiling tiles shall be located in the center of the tile unless noted otherwise.
    - h. Paint loudspeakers to match surroundings. Confirm color selection with the Architect during the submittal phase.
      - 1) Refer to the Loudspeaker Circuit Schedule for Finish Color.
      - 2) Custom Colors to be painted with color and sheen selected by Owner, related exposed hardware to also be painted.
    - i. Exterior loudspeaker cabinets shall be constructed of materials designed for permanent outdoor exposure conditions with a minimum IP 54 rating, and a minimum expected 10-year life span. Exterior and interior surfaces of the cabinets shall be protected from the effects of water, moisture, and humidity. The exterior surface shall also be protected from the effects of ultraviolet radiation to prevent fading and color change. The cabinets shall be shaped and oriented in a manner that minimizes the possibility of water pooling on any cabinet surface. Associated hardware shall be inherently non-corrosive, performing to the standards of 304 Stainless Steel or higher.
- G. Installation of projectors:

1. Confirm distance of specified projection lens before mounting projector.
2. Projectors shall be mounted plumb and level at the operating position in a safe, secure, and permanent manner.
3. All hardware required to locate the mount and projector at the required location shall be provided.
4. Projectors shall be mounted using tamper proof secure hardware.
5. Contractor may be required to adjust projection screen, projection screen upper and lower limit switches, and lifts specified elsewhere not installed as part of this Contract.

H. Installation of flat panel monitors:

1. Confirm location before mounting.
2. Monitors shall be mounted plumb and level at the operating position in a safe, secure, and permanent manner.
3. All hardware required to locate the mount and monitor at the required position shall be provided.
4. Locate monitor on the center line of the room unless noted otherwise.

I. Outdoor mounting of equipment

1. Objects mounted outdoors and within the building bowl structure shall be properly treated for exposure to moisture and temperature extremes.
2. Mounting hardware shall be non-corrosive or be coated with a corrosion inhibiting layer.
3. Structural supports for loudspeakers, or other equipment, shall have inherent corrosion resistance, or be covered with a corrosion inhibiting layer.
4. Speaker components mounted in exterior environments shall be rigidly connected to the structure to prevent movement caused by wind gusts.
5. Speaker and microphone enclosures to include grille capable of breaking up direct water sprays or rain.
6. Seal all exposed electrical connections on speaker enclosure with waterproof silicone sealant.
7. Treat paper cones of outdoor speakers with silicone based moisture repellent if not factory treated.
8. Provide screened cover over all openings in horn type speakers to keep out birds, insects, or small animals. Screened covering to be stretched with no visible wrinkles.

### 3.3 FIRESTOP

- A. A fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire

rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.

- C. Fire-stop systems shall be reviewed by a Professional Engineer (PE) licensed to practice in the State in which the project is located. Stamped drawings showing the fire stop systems shall be included as a submittal item. Once the systems are installed, the engineer of record for the firestop system shall physically inspect the methods and means used to verify compliance with the original design.
- D. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the fire-stop system(s).
- E. All fire-stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for observation by the local authorities prior to cable system acceptance.

### 3.4 CONTROL SYSTEM PROGRAMMING

- A. Transport Control
  - 1. Provide standard Stop, Play, Pause, Fast Forward, and Rewind for each playback device and menu control for DVD players. Buttons should be arranged in a conventional fashion that will be familiar to the normal user.
  - 2. The selected control function should be displayed by showing the appropriate button "pressed". It should remain this way until another function is selected.
  - 3. For devices that will go into a standby mode after a period of time, the control system shall sense this mode and restore normal operating mode once a transport function has been selected. This may require the use of current sensors to determine the state of the unit. No direct user action should be required at the playback device to restore the normal operating mode.
- B. Screen/Shade Control
  - 1. In addition to up-down functions, provide a Stop function to allow the movement to be halted. Once movement has been stopped, the up or down buttons should resume travel in the selected direction.
  - 2. Control system shall not prevent screen/shade wall controls from being used as well.
  - 3. Touch panel controls should be readily accessible to the user to permit direct control of shades or screen with having to navigate through multiple control pages.
- C. Room Combining
  - 1. Combining of adjacent areas shall be done through a graphical representation of the physical areas to be combined. Use of a floor plan metaphor is

recommended with the graphic oriented correctly with respect to control panel location.

2. Use buttons or other appropriate objects placed along the common wall to enable the combining function.
3. When spaces are combined, the graphic appearance of those areas shall change to reflect this configuration. Once an area is separated from a combination, the color of its area should revert to the normal room color.
4. Common control functions between combined rooms shall be linked, allowing control of the combined area from any one of the touch panels. Examples of common functions include:
  - a. Background music selection
  - b. Background music volume
  - c. Background music muting
  - d. Lighting preset recall
  - e. Master volume (not individual channel volume)
5. When combining adjacent rooms, the control system shall force the common functions to a predetermined default configuration so all rooms have the same configuration.
6. To avoid unintentional changes, a control panel will not be able to operate a function in a remote location without also operating that same function in the room where the panel is located.

D. Level Control

1. Objects requiring level adjustment such as volume or tone controls shall be through Up/Down buttons with a graphical representation of the actual level.
2. Increment of level change to be adjusted for reasonable range without the need to push the Up or Down buttons needlessly.

E. Volume Mute

1. Where the ability to mute the sound is needed, the button shall use the label "Vol On" and "VOL OFF" instead of Mute and Unmute. When in a "VOL OFF" mode, pushing the "VOL UP" button shall restore the sound and bring the system out of the muted mode.
2. VOL ON/OFF buttons shall change color to indicate the status of the button.

F. Standard Colors

1. Control functions shall be color coded to add clarity and show relationships between different groups of controls.
2. The color Red shall be reserved to indicate a fault or abnormal condition.
3. Green may be used to indicate normal operation, but may be used for standard control colors as well.
4. Similar controls should maintain the same color scheme across all control pages.
5. When a function is selected, the graphical depiction of that button should appear to be pressed and its color change to a darker shade of the regular button color.
6. Color schemes used for background and foreground objects should be selected to be complimentary and provide a consistent theme throughout the control pages.

## G. Minimum Button Size and Placement

1. Minimum visual size of a button is 3/8" wide by 1/4" high.
2. Spacing between buttons should be no less than 1/16".
3. Where buttons are immediately adjacent, the active selection area of the button should be reduced to 80% of the visual area of the button.

## H. Button Actions

1. When a function on a control page is selected, that button or visual object associated with that function should change to reflect what has been chosen.
2. For functions that are momentary selections (i.e., VOL UP), the change of state is visible for as long as the button is being pressed.
3. For function that are maintained selections (i.e., PLAY), the change of state remains visible until another function is selected and resets the previous function.
4. The state change of a button or visible object should depict real-world objects as much as possible including the appearance of the button be pressed inward, change in shade of the original color, but not a change in hue.

## I. Labels

1. Use of simple words or titles are preferred to indicate functionality, navigation and system status.
2. Use of stylish symbols should be avoided unless their identity is commonly recognized by the general public. Standard symbols for transport functions are acceptable.
3. Labels should be presented in a clear, sans serif type face that will remain legible on lower resolution touch panels.
4. Where physical buttons are present along the side of a touch panel, these buttons should be engraved and filled with a contrasting color.

## J. Power On/Off

1. For panels requiring an ON/OFF control, these functions should be linked through current sensors or other methods for the control system to detect the power on condition of the component being controlled.
2. Powering off a system should not interfere with the ability of a projector to complete its cool down cycle.

## K. Look &amp; Feel

1. Control pages should utilize a clean, elegant but stylish appearance.
2. Use a common graphical template across all control pages for a consistent look.
3. The touch screen layout should utilize graphical elements such as drop shadows, gradient fills and transparency to provide a pleasing overall appearance.
4. Utilize graphical representations of floor plans to convey location information.
5. Include company logos, icons or watermarks to portray the corporate identity.
6. Provide clear navigation tools for moving between control pages.
7. Each sub-page should have a "BACK" button to return to the previous page. This button should appear in the same location on each page.

8. Provide a "HELP" button or icon on each user page to provide clear, non-technical instructions on how to use the functions available to regular users.

L. Security

1. Provide password access to control pages not intended to be accessed by the general public.
2. Unless otherwise noted, provide a minimum of three levels of access
  - a. General User
  - b. Non-Technical Employee
  - c. AV Technician
3. Segregate the control functions to only allow authorized individuals access to more sophisticated control pages.
4. Provide a timeout feature to automatically return the control panel back to the default opening screen after 30 seconds of inactivity. After this reset, passwords must be reentered to return to a previous control page.

M. Presets

1. For systems that have different operating modes or configurations, provide the ability to store and recall preset combinations of system settings.
2. Provide a "Preset" page that permits a minimum of five presets to be recalled. Each button to include a label describing the function or configuration associated with that button.
3. Provide the ability for new presets to be stored over previous settings. New preset to be able to change the label to reflect the new or revised configuration.
4. When a preset has been recalled, the control page should indicate the active configuration.

### 3.5 LABELING OF EQUIPMENT

- A. Provide each terminal strip with a unique descriptor and a numerical designator for each terminal. Show terminal strip descriptor and designator on system schematic drawing.
- B. Provide logical and legible cable and wiring label permanently affixed for easy identification.
  1. Labels on cables to be adhesive strip type covered with clear heat-shrink tubing. Factory stamped heat shrink tubing may be used in lieu of the adhesive strip style.
  2. Wiring designator to be an alpha-numeric code unique for each cable. Actual cable designation assignments to be determined by Contractor. Add cable designation codes to system schematic drawings.
  3. Locate the cable designator at the origination and destination of each circuit within 3 inches of the point of termination or connection. Provide cable designator on circuits with intermediate splice points with an additional suffix to indicate each segment.

**3.6 ENGRAVING**

- A. Text font: 1/8-inch block sans serif characters unless noted otherwise.
- B. On dark materials, provide white characters; on stainless steel or brushed natural aluminum plates, or light-colored materials, provide black characters.
- C. Provide at least two lines of text with first line listing the general device name, e.g., amplifier. Second line to include schematic reference of the device, e.g., AMP-1.
- D. Equipment label: black with white characters except where indicated.

**3.7 COMMISSIONING**

- A. Prior to energizing or testing the system, ensure the following:
  - 1. All products are installed in proper and safe manner according to manufacturer's instructions.
  - 2. Insulation and heat shrink tubing are present where required.
  - 3. Dust, debris, wire trimmings, etc. is removed.
  - 4. Cable is dressed, routed, and labeled; connections are consistent with regard to polarity.
  - 5. Labeling has been provided.
  - 6. Temporary facilities and utilities have been properly disconnected and removed.
  - 7. Products are neat, clean, and unmarred. Parts securely attached.
  - 8. Broken work, including glass, raised flooring and supports, ceiling tiles and supports, walls, doors, etc. have been replaced or properly repaired.
- B. Prior to energizing the System, verify and perform the following tests and adjustments in compliance with applicable EIA standards.
  - 1. Electronic devices are properly grounded.
  - 2. Test each AC power receptacle with a circuit checker for proper hot, neutral, and ground connections.
  - 3. Verify each individual component is operating properly.
  - 4. Verify each individual component's performance meets the manufacturer's published performance for this unit.
  - 5. Measure and record the DC resistance between the technical ground in any equipment rack or console and the main building ground. Resistance should be 0.15 ohms or less.
- C. Loudspeaker Circuit Verification Test
  - 1. Measure the impedance of each loudspeaker line leaving the equipment racks.
  - 2. For constant voltage systems measure the impedance at 100 (or 250) Hz, 1 KHz and 8 (or 10) KHz of each line leaving the equipment rack with the line



disconnected from the driving source. For band limited devices, use a frequency appropriate for the operating range of the transducer.

3. When documenting the results of these tests, include the calculated impedance based on number of units on a line and the size and distance of the run. Correct any field readings that differ more than 20% from the calculated impedance.
4. Include the results of the tests in the Project Record Manual.

D. Loudspeaker Polarity Verification Test

1. Use an electronic polarity checker, SysTune, SMAART, or other two-channel FFT measurement system to test each loudspeaker. All loudspeakers should have the same relative polarity.
2. Follow manufacturer's recommendations in conducting the tests.
3. Include the results of the tests in the Project Record Manual.

E. Audio Signal Paths

1. Verify operation from each source device through all switching, amplification, and distribution devices.

F. System Gain Adjustment

1. Adjust each active device to have proper gain structure from the mixer output to the input of the amplifier.
2. With all amplifiers turned off, connect a sine wave or pink noise generator to the input of the mixer. Using an RMS AC voltmeter with a dB scale, adjust the mixer to an output between -10 and 0 dBu. Note the dBfs level should be -18dB for digital outputs. Once the level has been established, it should remain unchanged throughout the test. All equalizers should be set flat for this test.
3. Follow the signal flow from the mixer to each subsequent component. Measure the input level and output level of each device at the point of connection to the device. The input level reading should differ no more than 0.25 dB from the level recorded for the preceding device. Diagnose and correct the wiring or equipment when any readings exceed this range.
4. Adjust the output of each component to achieve the proper output level.
5. Record the output levels of each device in the Project Record Manual.

G. Signal Delay Adjustment

1. Adjust the delay to each subsystem to ensure proper synchronization between the main speakers and delayed speakers.
2. Using SysTune, SMAART, or other two-channel FFT measurement system, measure the arrival time of the distant signal and then measure the arrival of the local signal.
3. Based on the arrival times measured, adjust the delay applied to the local speakers to synchronize them with the distant speakers. Repeat the test to verify the delay has been set to within 1 ms of the arrival of the distant signal. Once the precise delay time has been determined, provide an additional 10 ms of Haas effect delay to maintain directional orientation toward the original sound source.

4. Continue to test and adjust each separate subsystem with a dedicated delay channel.
  5. Provide hard-copy printout of each delay adjustment showing first the arrival times with no delay set and then the result after the delay has been adjusted. Record the settings of each delay in the Project Record Manual.
- H. Remote Input Verification Test
1. Using a microphone or portable signal generator, connect to each microphone/line level receptacle throughout the facility.
  2. Verify that the receptacle under test appears at the correct input and is operating properly.
  3. In a similar manner, check all remote tielines and media related lines for correct wiring and labeling.
- I. System Equalization
1. Using SysTune, SMAART, or other two-channel FFT measurement system, equalize all loudspeaker systems to provide a suitable frequency response as follows:
    - a. Speech Reinforcement Systems: flat response from 125 Hz to 2.5 KHz, with 2 dB roll off above. Adjust initial settings as necessary for best intelligibility
    - b. Program Reproduction Systems: flat response from 65 Hz to 8 KHz, with 2 dB per octave roll off above. Adjust subwoofer level to +6dB above main speakers from 35Hz to Hz. Adjust initial settings to optimize audio quality.
  2. Verify system gain and amplifier levels.
  3. Provide program levels of at least 95 dB and speech reinforcement levels of at least 70 dB in the seating area without objectionable distortion, buzzes, or rattles.
  4. Provide hard copy printouts of the spectral response with the test data.
- J. RFI and Parasitic Oscillation
1. With systems operating, check to ensure that all systems are free from spurious oscillation and radio frequency interference in the absence of audio signal.
- K. Buzzes, Rattles, and other Distortions
1. Adjust the system for normal operating level in the space. Apply a slow sine wave sweep from 60 Hz to 3 KHz and listen carefully for buzzes, rattles, and other objectionable distortions.
  2. Correct the cause of the defect. If the cause is not from the system, bring the cause to the attention of the Owner, indicating cause and suggestive corrective actions.
- L. Video Systems Test
1. Projected images and screen must be plumb with respect to ceiling line.
- M. Video System Tests. Verify performance of all video equipment, components, and systems, as specified herein.

1. Video (signal):
  - a. S/N (peak to RMS), unweighted DC to 4.2 MHz: 55 dB minimum.
  - b. Crosstalk, unweighted DC to 4.2 MHz: 45 dB minimum.
  - c. Frequency Response: Within plus to minus 0.5 dB to 4.2 MHz.
  - d. Line and Field Tilt: 2% maximum.
  - e. Differential Gain: 2% maximum.
  - f. Differential Phase: 2 degrees maximum.
  - g. Frequency Response: DC to 4.2 MHz within plus or minus 0.5 dB.

N. Video Signal Paths

1. Verify operation from each source device through all switching, amplification, and distribution devices.

O. Video Test Report shall include the following:

1. Test Failures and Notices
  - a. Sink Device EDID Test – Open items or failures shall not be accepted.
  - b. Cable Length Test – Open items or failures shall not be accepted.
  - c. HDCP KSV Limitations – Limitations shall not be accepted.
  - d. Cable Limitations - Limitations shall not be accepted.
  - e. EDID Limitations - Limitations shall not be accepted.
  - f. Cable Length Limits exceeded – Failing cables shall not be accepted.
2. Device Model Number, Serial Number, and Firmware Version for main chassis and each input and output card.
3. Device Model Number, Serial Number, and Firmware Version for connected transmitter and receiver devices.
4. EDID – Input Resolution and 3D support status for each input.
5. EDID – Supported Output Resolution and 3D support status for devices connected to each output.
6. EDID – Supported Audio formats for each input.
7. EDID – Supported Audio formats for devices connected to each output.

P. Control Systems

1. Verify operational functions of the control system and all interfaced devices.
2. Verify operational functionality of any wireless user devices.

### 3.8 CAT5E/CAT6 CABLE CERTIFICATION

A. General Field Test Requirements

1. All CAT5E/CAT6 cabling links installed as part of this scope shall be tested for the following, in accordance with the field test specifications defines in ANSI/TIA-568-C.2 “Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard.” This document will be referred to as the “Category 5e Standard”:
  - a. Wire Map
  - b. Length
  - c. Insertion Loss

- d. NEXT loss
  - e. PS NEXT Loss
  - f. ACR-F Loss
  - g. PS ACR-F Loss
  - h. Return Loss
  - i. Propagation Loss
  - j. Delay Skew
- 2. The installed twisted-pair horizontal links shall be tested from terminated end point to terminated end point for compliance with the "Permanent Link" performance specification as defined in the Category 5e Standard.
  - 3. One hundred percent of the installed cabling links must pass the requirements of the Category 5e standard mentioned above and as further detailed in Section B below. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section C below.
  - 4. The test equipment (tester) shall comply with the accuracy requirements for level IIe field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 2 of ANSI/TIA-1152 (Table 2 in this TIA document also specifies the accuracy requirements for the channel configuration).
  - 5. The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
  - 6. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
  - 7. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
  - 8. The Pass or Fail condition of the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass.
  - 9. A Pass or Fail result for each parameter is determined by comparing the measured values with the specifies test limits for that parameter.

**B. Performance Test Parameters**

- 1. The test parameters are defined by the Category 6A Standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz

through 100 MHz) must meet or exceed the limit value determined in the above mentioned standard.

2. Wire Map - Shall report Pass if the wiring of each wire-pair from end to end is determined to be correct.
3. Length – The field tester shall be capable of measuring length of all pairs of a basic link or channel based on the propagation delay measurement and the average value for NVP. The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the Permanent Link configuration (90 meters – 295 feet) plus 10% to allow for the variation and uncertainty of NVP.
4. Insertion Loss (Attenuation) – Insertion Loss is a measure of signal loss in the permanent link or channel. The term “Attenuation” has been used to designate “Insertion Loss.” Insertion Loss shall be tested from 1 MHz through 100 MHz in maximum step size of 1 MHz. It is preferred to measure insertion loss at the same frequency intervals as NEXT loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk Ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results of the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which the worst case value occurs, and the test limit value at this frequency.
5. NEXT Loss – Pair-to-pair near end crosstalk loss (abbreviated as NEXT loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations). This parameter is to be measured from 1 through 100 MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT loss measurements shall not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
6. Table 1 – Maximum frequency step size as defined in ANSI/TIA-1152

Frequency Range (MHz)	Maximum Step Size (MHz)
1-31.25	0.15
31.26-100	0.25

7. NEXT Loss – Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link under-test (a total of eight results). PS NEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 100 MHz and the step size may not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Maximum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value

- for PS next. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
8. ACR-F Loss, pair to pair – Attenuation Crosstalk Ratio Far-end is calculated from the pair-to-pair FEXT Loss. It shall be measured for each wire-pair combination from both ends of the link under-test. FEXT Loss measures the crosstalk disturbance on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to compute ACR-F Loss that must be evaluated and reported in the test results. ACR-F measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire pair combinations. ACR-F is to be measured 1 through 100 MHz and the maximum step size for FEXT loss measurements shall not exceed the maximum step size defined as the standard as in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst value for ACR-F. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
  9. PS ACR-F Loss – Power Sum Attenuation Crosstalk Ratio Far-end is a calculated parameter that combines the effect of the FEXT disturbance from three wire pairs of the fourth one. This test yields eight wire-pair combinations. Each wire-pair is evaluated from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
  10. Return Loss – Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the Category 5e Standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst value of Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
  11. Propagation Delay – Propagation delay is the time required for the signal to travel from one of the links to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst propagation delay. The report shall include the propagation delay value measured as well as the test limit value.
  12. Delay Skew – [as defined in the Category 5e Standard; Section 6.2.19] This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

## C. Test Result Documentation

1. The test results/measurements shall be transferred into a Windows based database utility that allows for the maintenance, inspection, and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test and that these results cannot be modified at a later time.
2. The database for the completed job shall be stored and delivered electronically, including the software tools required to view, inspect, and print any selection of test reports.
3. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:
  - a. The identification of the link in accordance with the naming convention defined in the overall system documentation.
  - b. The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number.
  - c. The date and time the test results were saved in the memory of the tester.
4. General information to be provided in the electronic data base with the test results information for each link:
  - a. The identification of the customer site as specified by the end-user.
  - b. The identification of the link in accordance with the naming convention defined in the overall system documentation.
  - c. The overall Pass/Fail evaluation of the link-under-test
  - d. The name of the test limit selected to execute the stored test results
  - e. The cable type and value of NVP used for length calculations
  - f. The date and time the test results were saved in the memory of the tester
  - g. The brand name, model, and serial number of the tester.
  - h. The identification of the tester interface
  - i. The revision of the tester software and the revision of the test limits database in the tester
  - j. The test results information must contain information on each of the required test parameters that are listed in Section B and as further detailed below under paragraph C5.
5. For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.
6. The detailed test results data to be provided in the electronic database must contain the following information:
  - a. Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m330 and test limit value.
  - b. Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value.
  - c. Delay Skew: Identify the pair with the largest value for delay skew, the value measured in nanoseconds (ns) and the test limit value.

- d. Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair.
- e. Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link.
- f. NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.
- g. PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link.

### 3.9 FINAL OBSERVATION & TESTING

- A. Upon completion of installation, initial adjustments, tests, and measurements specified in Part 3, and submission and review of the results, a final observation and test will be performed by the Owner or Owner's representative no earlier than two weeks after receipt of the written results.
- B. Provide a minimum of one (1) person for observation and testing familiar with aspects of the System to assist the Owner.
- C. The process of testing the System may necessitate moving and adjusting certain components.
- D. Testing includes operation of each major system and any other components deemed necessary. Perform tests and provide required test equipment, tools and material required to make any necessary repairs, corrections, or adjustments.
- E. The following procedures will be performed on each System:
  - 1. Observation of the methods and means employed to incorporate the System within the facility.
  - 2. Verification of proper operation, from controlling devices to controlled devices.
  - 3. Verification of proper adjustment, balance, and alignment of equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for each level control, and appropriately record these settings within the Record Documents.
  - 4. Other tests on equipment or systems deemed appropriate.
- F. In the event the need for further adjustment or work becomes evident during testing, the Contractor is to continue their work until the System is acceptable at no addition to the contract price. If approval is delayed because of defective equipment, or failure of equipment or installation to meet the requirements of these specifications and any extension of the observation and testing period is required, the Contractor shall pay for additional time and expenses of the Owner at the standard rate in effect at that time.



**3.10 TEST EQUIPMENT**

- A. Thirty days prior to start of testing, provide a list to the Owner of test equipment make, model numbers, and calibration dates that will be used.
- B. The following equipment shall be available on site for the entire test period through final system testing.
  - 1. Sound Level Meter: ANSI S1.4-1971 Type S1A with digital or analog display. Meter to provide ranges of 40 to 120 dBA.
  - 2. Pink Noise Source - Equal energy per octave bandwidth 20 Hz to 20,000 Hz,  $\pm 1$  dB (long-term average) at 0 dBm output. Stability:  $\pm 2$  dB per day.
  - 3. Impedance Meter - Capable of testing audio lines at three frequencies, minimum, between 250 Hz and 5k Hz. Measurement Range: 1 ohm to 100 kohms.
  - 4. Audio Oscillator: bandwidth 20 Hz to 20k Hz  $\pm 0.5$  dB at 0 dBm output. Output to be balanced. Oscillator to include adjustable output level over the range from -30 dBu to +10 dBu.
  - 5. Multimeter - Measurement range, DC to 20k Hz, 100 mV to 300 V, 10 ma to 10 A, dB.
  - 6. NTSC Test generator
  - 7. Sound system measurement and alignment system
    - a. SysTune, SMAART, or other two-channel FFT measurement system, with industry standard measurement microphones. Provide adequate microphone cabling for the venue size, or a wireless microphone system qualified for use with a test measurement system. Provide one microphone stand with each microphone.
  - 8. Video (analog) test generator capable of generating signal up to 1920 x 1200 with audio.
  - 9. Video (digital) test generator capable of generating signal up to 1920 x 1200 with audio.
  - 10. Two-way radios to connect personnel in the equipment room(s) with personnel in other areas of the site for coordinated systems test and setup.
  - 11. Ladders and scaffolding necessary to inspect elevated equipment, junction boxes, etc.

**3.11 INSTRUCTION OF OWNER PERSONNEL**

- A. Provide 8 hours instruction to Owner designated personnel focusing on the use, operation, and maintenance of the systems, scheduled as a minimum of two separate sessions, by an instructor fully knowledgeable and qualified in system operation. The System Reference Manuals should be complete and on site at the time of this instruction. Coordinate schedule of demonstration with Owner's Representative.
- B. Video record all training sessions and compile a training video to be provided to the Owner electronically.
- C. Provide sign in sheet to document the attendee's presence.

- D. If Contractor is not properly equipped to conduct Owner training on particular equipment, arrange for factory representatives of the equipment to be present to provide training at no additional cost to the Owner.
- E. Provide on-site event support for 4 events, chosen at the discretion of the Owner, by a technician fully knowledgeable and qualified in sound system operation, programming, and troubleshooting.

**3.12 CLEANUP AND REPAIR**

- A. Upon completion of the work, remove refuse and rubbish from and about the premises. Leave areas and equipment clean and in an operational state. Repair any damage caused to the premises by the installation of systems at no cost to the Owner.

**END OF SECTION 274116**