TECHNICAL PROVISIONS

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END OF SECTION

SECTION 01 742

The entire scope of the project defined within the contract documents shall be provided with a 1 year warranty. Reference General Conditions Section 3.5 and Specifications Sections 01 740 / 01 741. Extended warranties required by various Sections of the Specifications are listed below. All warranties shall begin at 12:00 p.m. (Noon) on the date of Substantial Completion. Reference individual Specification Sections for additional information concerning extended warranties required.

Spec Section	Product	Extended Warranties	Submitted	Checked Off
02280	Termite Control	5 years w/ renewable option for lifetime guarantee		
06100	Rough Carpentry	50 years (Pressure Treated) 20 years (Fire Treated)		
06620	Cultured Marble	10 years		
07113	Modified Bituminous Waterproofing	2 years		
07175	Water Repellent Coating	10 years Labor and Materials		
07200	Insulation; Spray Applied Cellulose	5 years - Installation		
07532	Fully Adhered Thermoplastic Polyofin Sheet Roofing	20 years no dollar limit Warranty + 2 year Installer guarantee (Comprehensive Companion warranty with flashing endorsement from Section 07 600)		
07600	Flashing and Sheet Metal	20 years no dollar limit Warranty (Comprehensive Companion warranty with TPO roofing from Section 07 532)		
07 610	Sheet Metal Roofing	20 year (Paint Finish)		
07700	Roof Specialties and Accessories	5 years (Custom Curbing)		
07900	Joint Sealants	3 years		
08210	Wood Doors	Lifetime		
08305	Access Doors	5 years (VRF Access Panels)		
08410	Fenestration	5 years - Glass Seal Failure 2 years - Fenestration defects in Materials and workmanship 15 years - Finishes		

Spec Section	Product	Extended Warranties	Submitted	Checked Off
08710	Finish Hardware	2 Years - All hardware with exception of: 10 years Closers		
08741	Electrical Locking Systems	2 years		
08800	Glass and Glazing	5 years - Glass Seal Failure 10 years - Mirrors		
09381	Quartz Surfacing	10 years		
09510	Acoustical Ceilings	5 years		
09650	Resilient Flooring	5 years Discoloration, Mold, Mildew, Algae		
09 656	Sheet Vinyl Flooring	10 years Material and Workmanship		
09685	Carpet	2 years - General, 5 years Surface wear		
10101	Signage	10 years		
10651	Individual Panel Operable Partition	2 years		
11001	Misc Equipment	5 years - Compressors		
13151	Cartridge Swimming Pool	10 years		
13 250	Sun Control Structure	5 years Limited Warranty; Products		
14210	Elevator	Cost for 5 year preventive maintenance (Alternate One)		
15010	Mechanical	5 years - Mechanical Equipment Compressors		
15460	Water Heaters	10 years heat exchanger, 2 years control panels, 2 years (all)		
15700	HVAC Equipment	5 years - Compressors 5 years - Energy Wheel Cassette 5 years - Heating Elements 10 years - Heat Exchanger 25 years - Non-prorated Heat Exchanger		
15861	Air Purification	10 years		
16162	Service Entrance / Main Switchboard	5 years - Transient Voltage Suppression Device		
16500	Architectural Lighting	3 years or greater for ballasts		

Spec Section	Product	Extended Warranties	Submitted	Checked Off
16502	Architectural Lighting Controls	Without Manufacturer Start-up: 5 years parts only - Wireless Sensors 3 years parts only - Ballasts / Drivers and Ballast Modules With Manufacturer Start-up: 2 years parts and labor - Lighting control System components with exceptions (See Specification) 5 years parts only - Wireless Sensors 5 years pars only - Ballasts / Drivers and Ballast Modules		
16726	Two-Way Rescue Communication System for Elevator Lobbies and Stairways	3 years - Master Station and Call Station		
16780	General Voice Paging / Music System	5 years - Preamp/Mixer		

SECTION 07 900

I. PART 1 - GENERAL

1.1 SCOPE

A. This section includes information concerning the provision and installation of sealants and caulking compounds where required by Contract Documents and manufacturers recommendations. Exterior joint sealants are components of an integrated set of building elements including exterior doors and frames, fenestration, louvers, flashing, roofing and EIFS all designed to work together to provide a water tight building. Reference other sections herein for information related to these additional elements and their integration with exterior joint sealants.

B. A sealant is a weatherproof elastomer used for filling and sealing joints which has properties of adhesion, cohesion, extensibility under tension, compressibility and recovery. Sealants shall be designed to make joints air and watertight. The sealant shall have been tested by the sealant manufacturer for compatibility and performance with the exterior finish. Material shall be designed for application to joints at exterior of structures and for other joints subject to movement and/or moisture infiltration at interior and exterior of structures.

C. A caulking compound is an acrylic emulsion used for filling joints and seams, having properties of adhesion and cohesion. Caulking compounds shall not be required to have extensibility and recovery properties.

D. Caulking is the process of filling joints without regard to type of material.

E. Joint failure refers to a caulked joint exhibiting one or more of following characteristics:
   1. Joint leaks air and/or water.
   2. Sealant or caulking compound migrates.
   3. Sealant or caulking compound loses adhesion.
   4. Sealant or caulking compound loses cohesion.
   5. Sealant or caulking compound does not cure.
   6. Sealant or caulking compound discolors.
   7. Sealant or caulking compound stains adjacent work.
   8. Sealant or caulking compound develops bubbles, air pockets or voids.

F. Sealants related to through penetration firestopping systems shall be as specified in Section 07841 herein.

1.2 SUBMITTALS

A. Submit manufacturer's product data indicating product description, compliance with specified requirements and installation instructions for each type caulking compound and sealant. Indicate preparation requirements for each substrate condition.

B. Samples
   1. Submit samples of manufacturer's standard caulking compound/sealant material colors and special colors required at least 30 days prior to application.

2. Samples shall be actual materials or literature depicting actual material colors. Architect reserves the right to reject work not in compliance with selected colors based upon samples submitted.
3. Should Contractor select a manufacturer which produces items in compliance with the specified requirements, except for minimum color range requirements, the Contractor shall be responsible for provision of special colors within color range requirements. Special colors shall be submitted for Architect's review.

C. Exterior Finish Materials Mockup
1. Contractor shall include Exterior Sealants specified herein using the construction and components described herein as a component of the Exterior Finish Materials Mockup required in Section 01100. Reference the text herein for the required colors of sealant materials.
2. Sealant components of the Exterior Finish Materials Mockup shall exemplify the following features:
a. All exterior sealant colors and products required
b. Backup rods and all other sealant accessories
c. Interface with EIFS
d. Interface with aluminum storefront and fixed windows

D. In addition, prepare, caulk and finish one 4'-0" long sample of each interior joint condition for Architect's review. Joints may be a portion of the permanent construction. Sample joints shall be reviewed by Architect prior to beginning work. Retain reviewed samples as a standard for work.

1.3 QUALITY CRITERIA
A. All work specified herein shall comply with the criteria established in the most current versions of the following publications:
1. ASTM C 834 - Standard Specification for Latex Sealants
2. ASTM C 191 - Standard Practice for Use of Sealants in Acoustical Applications
3. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
4. ASTM C 1193 - Standard Guide for Use of Joint Sealants
5. ASTM D 1667 - Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
6. ASTM C 1248 - Standard New Method for Staining of Porous Substrate by Joint Sealants

B. Exterior sealant applications shall be tested for field adhesion in accordance with testing criteria, including frequency, established by the sealant manufacturer. Testing results shall be recorded and submitted to the Architect for review. Contractor shall repair tested sealant applications by removing the tested sections and adjoining sealant entirely and replacing with new sealant.

1.4 DELIVERY, STORAGE AND HANDLING
A. Deliver and store materials in manufacturer's unopened packaging with seals and labels intact. Comply with manufacturer's instructions regarding environmental conditions under which materials may be stored.

B. Handle materials in accordance with manufacturer's printed instructions.

1.5 PROJECT CONDITIONS

A. Environmental Conditions

1. Install no materials under inclement weather conditions or when temperatures are below or above those recommended by manufacturer.
2. Proceed with work only when forecast weather conditions are favorable for joint cure and development of high early bond strength.
3. Wherever joint width is affected by ambient temperature variations, install materials only when temperatures are in lower third of manufacturer's recommended installation temperature.

B. Protection of Adjacent Surfaces

1. Protect adjacent surfaces by applying masking material or manipulating application equipment to keep materials in joint. If masking materials are used, allow no tape to touch cleaned surfaces to receive sealant. Remove tape immediately after caulking, before surface skin begins to form.
2. Remove misapplied materials from surfaces using solvents and methods recommended by manufacturer.
3. Restore surfaces from which materials have been removed to original condition and appearance.

1.6 WARRANTY

A. Warrant work specified herein to be free from defects in materials and workmanship, including joint failure, for a period of 3 years beginning at Date of Substantial Completion except as noted in 1.6.B below. In addition to the warranty of the material suppliers, the contractor shall provide a warranty of the interface between the sealant or caulking compound and adjacent surfaces equal to the greater warranty period of the adjacent materials.

REVISION #1

~~**B. The manufacturers of both the EIFS and joint sealants used to seal the perimeters of EIFS penetrations, control joints and perimeter joints shall provide a combined warranty for a period of 10 years from the Date of Substantial Completion. All joint sealants used in conjunction with EIFS applications shall be specifically approved by the EIFS manufacturer for the intended application. All sealant applications used to seal the perimeters of EIFS penetrations, EIFS control joints and joints between EIFS and other exterior finish materials shall be installed by the contractor responsible for the EIFS application.**~~

II. PART 2 - PRODUCTS

2.1 SILICONE SEALANTS

A. Acceptable mildew resistant (acetoxy) silicone sealant products for installation at plumbing fixtures, countertops, tile surrounds at tubs and showers and interior door frames in toilet areas shall be one part acetoxy silicone. Acid cured, non porous sealant shall comply with

ASTM C920, Type S, Grade NT, Class 25. Acceptable products shall include the following sealants.

1. Tremco “Tremsil 600"
2. Pecora “860 Silicone”
3. Bostik “Chem Calk 1200"

B. Acceptable silicone sealant products for installation at control joints between adjacent EIFS panels and EIFS / masonry veneer shall be one part silicone. Neutral or Moisture cured, non porous sealant shall comply with ASTM C920, Type S, Grade NS, Class 100/50. This product shall not be used as a perimeter seal at EIFS, such as door and window frames (See 2.1.C below). Acceptable products shall include the following sealants:

1. Tremco “Spectrem 1” (mandatory for Dryvit EIFS compound warranty)
2. Pecora “890 NST”
3. Dow Corning “790” (mandatory for STO EIFS compound warranty)

C. Acceptable silicone sealant products for installation at perimeter seals around EIFS penetrations shall be one part silicone. Neutral cured, non porous sealant shall comply with ASTM C920, Type S, Grade NS, Class 50. Acceptable products shall include the following sealants:

1. Tremco “Spectrem 2” (mandatory for Dryvit EIFS compound warranty)
2. Dow Corning “791” (mandatory for STO EIFS compound warranty)

D. Acceptable silicone sealant products for installation at hard tile soft movement joints shall be one part sanded silicone with a shore hardness of 35 or greater. Sealant shall be neutral cured, non porous sealant shall comply with ASTM C920, Type S, Grade NS, Class 25. Color shall match adjacent tile grout. Acceptable products shall include the following sealants:

1. Custom Building Products: “Commercial 100% Silicone Sealant”
2. Similar products from other manufacturers shall be subject to the Architect’s review.

E. Reference Section 08422 for information concerning clear structural silicone sealant required at glass canopy systems.

2.2 ACRYLIC-LATEX CAULKING COMPOUND

A. Caulking compound shall be a flexible, paintable, non-staining, non-bleeding, acrylic emulsion. It shall be a one-part, gun grade product in compliance with ASTM C834. Caulking compound shall be used at the interior perimeter of all interior door and window frames and other joints where indicated on the Working Drawings unless noted otherwise.

B. Acceptable products shall include the following:

1. Tremco “Tremflex 834"
2. Pecora “AC 20"
3. Master Builders Masterseal “NP-520”
4. Bostik “Chem Calk 600"

2.3 POLYURETHANE SEALANTS

A. Acceptable non-sag 2 part polyurethane sealants to be installed in interior and exterior vertical surface concrete joints and masonry

veneer joints shall include the following. Similar products of other manufacturers shall be subject to the Architect's review.

1. Tremco "Dymeric 240 FC"
2. Pecora "Dynatrol II"
3. Master Builders Masterseal "NP 2"
4. Bostik "Chem Calk 505"

B. Acceptable two part polyurethane sealants to be installed in interior and exterior horizontal concrete surface joints (including pedestrian / vehicular traffic bearing concrete joints) shall include the following. Similar products of other manufacturers shall be subject to the Architect's review.

1. Tremco "Vulkem 227"
2. Pecora "NR 200 Urexpan"
3. Master Builders Masterseal "SL2"
4. Bostik "Chem Calk 505"

C. One part polyurethane sealant to be installed and as a general weatherproofing sealant shall comply with the requirements of ASTM C-920. Acceptable products shall include:

1. Tremco "Dymonic 100"
2. Pecora "Dynatrol I-XL"
3. Master Builders Masterseal "NP 1"
4. Bostik "Chem Calk 900"

2.4 BUTYL SEALANTS

A. Non-skinning butyl sealant shall comply with ASTM C919, ASTM E90 and AAMA 809.2 with a maximum of 20% shrinkage when tested in accordance with ASTM D2453. Non-skinning butyl sealants shall be installed as bedding at 3 sides of drainable pan flashing at storefront and mechanical louver sills and under all exterior door thresholds. Acceptable products shall include the following. Similar products of other manufacturers shall be subject to the Architect's review.

1. Tremco "JS-773"
2. Pecora "BA-98"

2.5 COLORS

A. For exposed applications of sealant and caulking compounds provide colors which match adjacent materials to the Architect's satisfaction in all exposed locations, except as specified below.

B. For unexposed applications provide and install black color sealant and caulking compounds.

C. Sealant and Caulking Compound Products specified herein shall be provided and installed in the colors defined below to suit the applicable conditions encountered:

	CONDITION	PRODUCT	COLOR
1	Countertops (Various Materials) / Finished Wall	Acetoxy Silicone Sealant	Match Finished Wall Field Color
2	Backsplashes	Acetoxy Silicone Sealant	Match Synthetic Quartz Color

	CONDITION	PRODUCT	COLOR
3	Interior Aluminum Fenestration Frame Perimeters / Finished Wall	Acrylic Latex Caulking Compound	Match Finished Color
4	Aluminum Storefront Drainable Sill Pan Flashing (Bedding Sealant)	Non-Curing Butyl	Gray
5	Between Exterior Threshold and Concrete Slabs	Non-Curing Butyl	Gray
6	Interior Hollow Metal Door Frame Perimeters / Finished Wall (Non Toilet Areas)	Acrylic Latex Caulking Compound	Match Finished Wall Color
7	Interior Hollow Metal Door Frame Perimeters / Finished Wall (Toilet Areas)	Acetoxy Silicone Sealant	Match Finished Wall Color
8	Stainless Steel Escutcheons at Shower Heads	Acetoxy Silicone Sealant	Clear
9	Water Closet Pedestals Tub and Shower Tile Surrounds	Acetoxy Silicone Sealant	Match Water Closet and Surround Color
10	Interior Tile Movement Joints	Sanded Silicone Sealant	Match Tile Grout Color
11	Exterior Hollow Metal Door Frame Perimeters	One Part Silicone Sealant	Match Door Frame Color
12	Exterior Aluminum Fenestration Frame Perimeters	One Part Silicone Sealant	Match Aluminum Frame Color
13	Exterior Sheet Metal Flashing	One Part Polyurethane Sealant	Match Flashing Color
14	VWC	Acetoxy Silicone Sealant	Match VWC Color
15	VWC terminations at dissimilar surfaces such as door frames, window frames, elevator hoistway entrances.....	Acrylic Latex Caulking Compound	Match VWC Color
16	Exterior General Weatherproofing	One Part Polyurethane Sealant	Match Adjacent Finish Material Color (Unless Noted Otherwise)

	CONDITION	PRODUCT	COLOR
17	Control Joints Between Adjacent EIFS Panels	Silicone Sealant	Match Adjacent EIFS Panels
18	EIFS and Veneer Finish Penetration Perimeters	Silicone Sealant	Match Color of Penetrating Item
19	Interior and Exterior Horizontal Concrete Joints	Two Part Polyurethane Sealant	Match Adjacent Finish Material Color
20	Interior and Exterior Vertical Concrete Surface Joints and Masonry Veneer Joints	Two Part Polyurethane Sealant	Match Concrete Color or Masonry Veneer Color
21	Plumbing Vent Roof Surface Penetrations	One Part Polyurethane Sealant	Match Finish Roof Membrane Color

2.6 ACOUSTICAL SEALANT

A. Acoustical sealant to be used on both sides of all light gauge steel stud walls at GpDw termination points, under top and bottom light gauge steel tracks and at vertical legs of acoustical tile ceiling grid perimeter trim shall be a flexible, water based caulking compound in compliance with ASTM C919. Acceptable products include USG "Acoustical Sealant" or Pecora “AC 20 FTR” acoustical and insulation sealant. Similar products of other manufacturers shall be subject to Architect's review.

2.7 GLAZING SEALANT

A. See Section 08 800 for specified product.

2.8 FIRE BARRIER SEALANT

A. Note that all soft sealant joints at fire rated CMU applications in all areas, including the Parking Structure, shall receive fire barrier sealant specified in Section 07 841.

2.9 ACCESSORY MATERIALS

A. Provide and install joint cleaner recommended by caulking compound/sealant manufacturer for substrates indicated.

B. Provide and install joint primer/sealer recommended by caulking compound/joint sealer manufacturer.

C. Apply plastic bond breaker tape to contact surfaces where bond to substrate or joint filler must be avoided for caulking compound/joint sealer performance. Acceptable products shall include 3M “226, 470, 481, or 710” to suit applicable conditions.

D. Provide and install compressible back-up rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam or neoprene foam as recommended by caulking compound/sealant manufacturer for compatibility with material. Provide size and shape of rod to control joint depth, break bond at bottom of joint, form optimum shape of bead on back side and minimize possibility of

exudation when joint is compressed. Acceptable products shall include Dow “Ethafoam” and Hercules Incorporated “HBR”.

E. Weep tubes are required at 2'-0" o.c. horizontally within all backup rods and sealant at drainable horizontal EIFS joints. Weep tubes shall be as recommended by the backup rod manufacturer.

F. Provide and install tooling agent recommended by caulking compound/sealant manufacturer to ensure contact of material with inner joint faces.

G. Provide and install synthetic rubber or closed cell synthetic foam divider strips not less than 1/16" thick and full depth of caulking compound/sealant where required by the sealant manufacturer to accommodate specific conditions. Strips shall be approved by manufacturers of dissimilar materials as compatible with one another.

H. Provide and install compressed expanding foam sealant composed of moisture cure polyurethane foam where indicated on the Working Drawings. Sealant shall develop a watertight and airtight seal and Foam sealant shall be permanently elastic, mildew resistant non-migratory, nonstaining, compatible with joint substrates and other joint sealants. Acceptable products include “Illbruck “Universal Foam Sealant”. Similar products of other manufacturers shall be subject to Architect’s review.

III. PART 3 - EXECUTION

3.1 JOINT SURFACE PREPARATION

A. Clean joint surfaces immediately before caulking joints. Remove dirt, moisture and other substances which would interfere with bond.

B. Etch surfaces to receive joint sealers prior to application to remove excess alkalinity, unless caulking compound/sealant manufacturer's printed instructions indicate that alkalinity does not interfere with bond and performance. Etch with 5% solution of muriatic acid and neutralize with dilute ammonia solution. Rinse with clean water and allow to dry before caulking.

3.2 APPLICATION

A. Comply with caulking compound/sealant manufacturer's printed installation instructions except where more stringent requirements are shown on the working drawings or specified herein.

B. Prime and seal joint surfaces where recommended by caulking compound/sealant material manufacturer. Do not allow primer/sealer to spill or migrate onto adjacent surfaces.

C. Install backup rod for all caulking compound/sealant materials, except where recommended to be omitted by material manufacturer for application indicated.

D. Apply installation techniques which will ensure that caulking compound/sealant materials are deposited in uniform, continuous ribbons without gaps or air pockets, with complete wetting of joint bond surfaces. Fill joint to concave surface, slightly below adjoining surfaces. Where joints are between a horizontal surface and a vertical surface, fill joint to form slight cove, so that joint will not trap moisture and debris. Install materials to the depths as recommended by their manufacturer. Tool all joints concave.

E. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
F. Perform all installations in accordance with ASTM C 1193.
G. Perform acoustical sealant application work in accordance with ASTM C 919. Prior to attaching GpDw install 3/8" x 3/8" continuous beads of acoustical sealant to face of studs and furring where studs and furring meet walls, ceilings and floors on face of studs and furring to receive gypsum board. Application rate shall be 192 linear ft/gallon.
H. Measure joint dimensions and size joint back up rods to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by sealant manufacturer, except where specific dimensions are indicated on the Working Drawings.
I. Fill gaps too large for backup rods with polyurethane foam sealant and allow to cure properly in accordance with manufacturers written instructions. Maintain joint depth necessary for all caulking compound / sealant applications.
J. Do not allow materials to overflow or spill onto adjacent surfaces. Use masking tape or other precautionary devices to prevent staining of adjacent surfaces.
K. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to eliminate evidence of misplaced materials without damage to adjacent surfaces and finishes.
L. All adjacent finish materials shall be cured prior to caulking compound/sealant applications.
M. Cure caulking compound/sealant materials in accordance with manufacturer's printed instructions to obtain high early bond strength, internal cohesive strength and surface durability.

END OF SECTION

SECTION 08 210

I. PART 1 - GENERAL

1.1 SCOPE

A. This section includes information concerning all labor, materials and equipment necessary to provide and install all wood doors required by the Contract Documents.

1.2 SUBMITTALS

A. Reference Section 01 100 for administrative requirements concerning submittals.
B. Submit Shop Drawings which indicate door sizes, construction and hardware locations. Dimension and detail openings for glass lites.
C. Submit 12" x 12" door corner samples indicating face veneers, edge bands and core construction for each door type specified.
D. Submit manufacturer's literature indicating product description and characteristics, including compliance with specified requirements and manufacturer's recommended maintenance instructions. Mark manufacturer's brochures to include only those products proposed for use.
E. Submit sample manufacturer's warranty.
F. A comprehensive submittal shall be required for all items specified in Sections 08 100, 08 210, 08 710 and 08 741. All items specified therein which require submittal shall be submitted together simultaneously. Partial submittals of any of these sections will be returned to the Contractor without review.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver no wood doors to project until weatherproof, conditioned storage space is available. Store doors in a space having controlled humidity. Stack doors flat and at least 6" off floor. Comply with AWI Quality Standards including Section 100-S “Moisture Content”. Ambient temperature of storage area shall be between 50 degrees and 90 degrees fahrenheit and ambient humidity shall be between 25% and 55%.
B. Provide corrugated cardboard protection for door faces in contact with other surfaces. Cover entire stack of doors with 6 mil polyethylene vented to avoid condensation.
C. Do not walk over or stack other materials on top of stacked doors. Do not drag doors across one another.
D. All doors shall be packaged individually in ventilated polybags.
E. Comply with WDMA I.S-1A Section J-1 “How to Store, Handle, Finish, Install and Maintain Wood Doors”.

1.4 QUALITY CRITERIA

A. Allowable Fabrication Tolerances
1. Overall dimension (WxHxT) may vary plus or minus 1/16" maximum.
2. Maximum warp (bow, cut or twist) allowed shall be ¼" when tested in accordance with WDMA I.S.1A T2.

3. Maximum 1/8" difference in diagonal measurements shall be allowed when tested in accordance with WDMA I.S.1A T3.
4. Maximum telegraph (offset of door core components which are visible on the door face(s) shall be .010" per 3" when tested in accordance with WDMA I.S.1A T1.

B. All aspects of flush wood doors shall comply with applicable standards of the Wood Door Manufacturer's Association WDMA I.S.1-A Industry Standard for Architectural Flush Wood Doors.

C. Construction Characteristics
1. Aesthetic grade for all wood doors shall be Premium.
2. Performance duty level for all wood doors shall be extra Heavy Duty.
3. All solid core wood doors shall be constructed using the hot press method for laminating face veneers and cross banding to the core.
4. Core shall be particle board bonded to Structural composite lumber stiles and rails.
5. Door construction shall included no added urea formaldehyde.

D. Labeled components shall comply with the requirements of Underwriter’s Laboratories, Inc. (UL), the National Fire Protection Association (NFPA 252), and ASTM E152 for the ratings specified. Labels shall be screw or rivet attached metal plate, not adhesive attached paper.

E. Smoke and Draft Control Door Assemblies
1. All doors which open into corridors which are used for a means of egress shall have a smoke and draft control rating. Smoke and draft control assemblies shall be tested for air leakage in accordance with the requirements of UL 1784 and NFPA 105.
2. The maximum amount of air flow allowed shall be 3.0 cfm/sf of door opening at 0.10" of water for both the ambient temperature test and the elevated temperature exposure test.
3. Gaskets which seal the perimeter between the door and the frame at the door head and jambs are required for doors to pass a smoke and draft control test. The requirement for a gasket also includes the meeting stiles at pairs of doors, but not the door threshold; a bottom seal is not required for smoke and draft control assemblies.. The gaskets used in a smoke and draft control assembly shall be fire rated and be listed for use in a smoke and draft control assembly.
4. Smoke and draft control assembly doors shall have an identification mark of “S” which appears on the door label following the hourly rating. The “S” label is not required on the door frame label.
5. Installation of smoke and draft control door assemblies shall comply with the requirements of NFPA 105.

F. All 6 sides of all wood doors specified herein shall be finished as specified herein.

G. Provide each door with a stamp, brand or label which identifies manufacturer, trade association of which he is a member, grade, type of door and industry standard with which it complies. Each door shall be marked with WDMA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of WDMA I.S.1A.

H. All fire rated wood doors shall be Category A when tested in accordance with the requirements of UL10C or NFPA 252 for positive pressure at 40" and greater above finished floor level. All required edge sealing shall be integrated within the door construction. Intumescent edge sealing strips shall be visible on neither the door nor the frame.

1.5 GUARANTEE

A. Flush Wood Doors

1. A written guarantee from the door manufacturer shall be delivered to the Architect before the work will be accepted. Submit a written warranty signed by the Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which display defects in excess of the specified WDMA limits or which display telegraphing of the door substrate through the veneer in excess of WDMA limits. WDMA provisions which allow the door manufacturer to refund the price of the door to the Owners shall not apply. The guarantee shall also include refinishing and reinstallation of doors which may be required due to repair or replacement of defective doors. Guarantee period shall be lifetime for each door beginning on the Date of Substantial Completion.

II. PART 2 - PRODUCTS

2.1 FLUSH SOLID CORE AND TWO PANEL WOOD DOORS WITH AN OPAQUE PAINTED FINISH

A. Recommended door suppliers shall include, but are not limited to the following:
1. Paragon (770) 795-9564

B. Solid core flush doors with an opaque painted finish shall be 1-¾" thick.

C. Fire rated solid core wood flush doors with a field applied opaque painted finish shall be provided with the appropriate fire ratings as required on the door schedule. Labeled components shall comply with the requirements of testing criteria established by UL and NFPA. Label shall be screw or rivet attached metal plate.

D. Core shall be particle board bonded to structural composite lumber stiles and rails at non fire rated and 20 minute fire rated doors. Particle board shall comply with ANSI A208.1 grade 1-LD-2.

E. Core shall be mineral core with bonded close-grained hardwood stiles and rails at 45 minute and 90 minute fire rated doors.
1. Provide 5" top rail blocking on all mineral core doors.
2. Provide 5" bottom rail blocking at mineral core doors indicated to have kick plates.
3. Provide 4-1/2" x 10" lock blocks on all mineral core doors.
4. Provide 5" mid-rail blocking at mineral core doors indicated to have exit devices.

F. Doors shall comply with WDMA Standard I.S.-1A Custom Grade.

G. 5 ply face veneer on opaque painted flush solid core doors shall include HDF bonded construction. The entire door shall be abrasive planed before 2 plies are applied.

H. See Interior Design finish legend for colors required.

I. All 6 sides of all wood doors specified herein shall be field finished in accordance with Section 09 900 over factory applied primer by the door manufacturer.
J. Factory machine doors to match hardware templates from the hardware manufacturers specified in Section 08710. Factory drill pilot holes for hinge fasteners.
K. Adhesive used to manufacture doors shall comply with WDMA I.S.-1A TM-6 Adhesive Bond Durability Test. All adhesives shall be Type I waterproof with no urea formaldehyde.
L. Doors shall include glass lites where indicated on the Working Drawings.
   1. Glass moulding at non-fire rated flush wood doors shall be “Style VT1" manufactured by VT Industries.
   2. Glass moulding at fire rated flush wood doors shall be “Style 110" steel frame primed for field painting.
M. Guestroom bathroom barn doors shall include a 1/4" thick recessed mirror with safety film installed in a face mortise and secured with a glazing bead and mastic.
N. Where applicable, raised wood trim used to simulate painted 2 panel wood doors shall be equal to “P18" applied moulding with mitered corners.
O. Acceptable door products shall include the “Heritage Collection" as manufactured VT Industries (800-827-1615). Similar products of other manufacturers shall be subject to the Architects review.

REV 1

2.2 CUSTOM INVISIBLE DOOR SYSTEM

A. EZJamb Door; EZConcept (888)399-5262.
   1. EzyJamb ISK / Inswing Door Jamb, see cut-sheet located at the end of this section.
   2. Door to be installed flush with the wall and open into the corresponding room.
   3. Wrap the drywall during framing to conceal fixings and incorporate the door into the wall face.
   4. Door to be wrapped in digital wall covering by Momentum.
   5. See Interior Design Drawings for more information.

III. PART 3 - EXECUTION

3.1 PREPARATION

A. Reinforce components for hardware installation in accordance with SDI-107.
B. Factory prepared hardware locations shall be in accordance with locations specified in Section 08 710.
C. All doors shall be factory-machined for the specified hardware, including pilot holes for all wood screws.
D. Door manufacturer's representative shall be responsible for coordinating necessary information received by Contractor from hardware and hollow metal frame manufacturers in order to have doors properly prepared to receive hinges and other hardware and fit hollow metal frames. Contractor shall provide door manufacturer

with 3 copies of revised door frame shop drawings and reviewed hardware schedules. All information shall be in the possession of the door manufacturer in sufficient time prior to the door delivery date to avoid delays.

3.2 INSTALLATION

A. Acclimate doors to average prevailing humidity in the area where they will be installed prior to hanging for a minimum of 48 hours prior to installation.
B. Install wood doors in strict accordance with manufacturer's written installation instructions and WDMA 1.S-1A Section J-1 “How to Store, Handle, Finish, Install and Maintain Wood Doors”.
C. Fit doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining.
D. Clearances around perimeter of wood doors shall be as follows:
   1. On hinge side: 1/16"
   2. On lock side: ⅛"
   3. Between top of wood door and bottom of frame at door head: 1/8"
   4. Meeting edges at pairs of doors: ⅛"
   5. At carpeted floors : ¾" above top of concrete subfloor to bottom of wood door or door bottom hardware
   6. At resilient tile floors without a threshold: 3/8" between top of tile and bottom of wood door or door bottom hardware
   7. At exposed concrete floors without a threshold: ⅜" between concrete and bottom of wood door or door bottom hardware
   8. Guestroom Entry Door: 1/4" between threshold and bottom of door or door bottom hardware
   9. Guestroom Bathroom Door: 3/8" between top of threshold and bottom of wood door
   10. Other typical wood doors with an aluminum threshold: 1/4" from bottom of door to top of threshold
E. Provide cut-outs for glass lites without damaging door faces.
F. Machine doors for hardware using templates provided by the hardware manufacturer.
G. Seal cut-outs immediately after cutting or machining with one coat of solvent type sealer as recommended by the door manufacturer.
H. Replace or rehang doors which bind or sag and doors with improper machining visible in finished work.
I. Clean soil, smudge marks and handling defects from doors. Replace doors from which marks cannot be removed.

3.3 PROTECTION

A. Upon completion of the installation, the subcontractor and the Contractor shall jointly inspect the work and if satisfactory, the Contractor shall accept the work.
B. Upon acceptance of the work, the Contractor shall be responsible for the protection of wood doors.

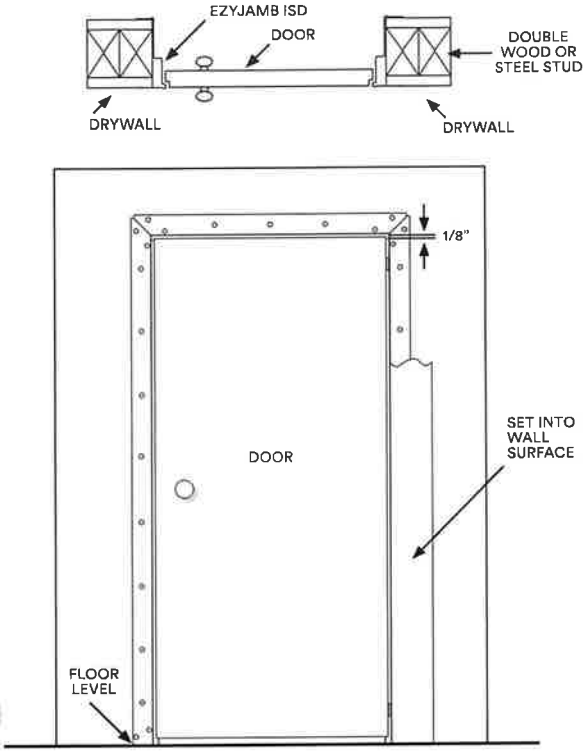
C. Contractor shall touch up all door finishes prior to the Date of Substantial Completion to the Owners satisfaction. If necessary, Contractor shall replace doors which cannot be repaired to the Owners satisfaction.

END OF SECTION

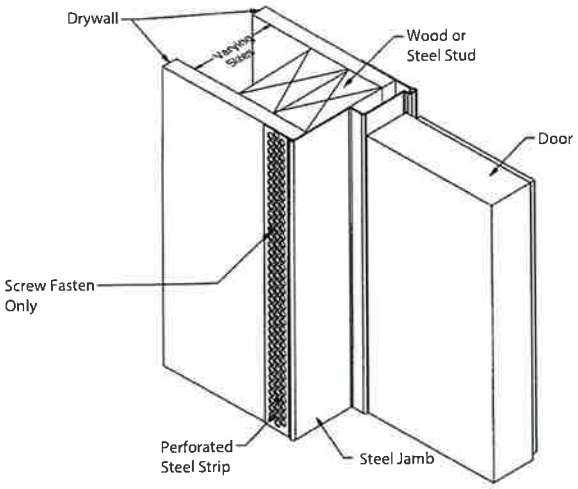
EzyJamb | ISD Inswing Door Frame

Product Datasheet

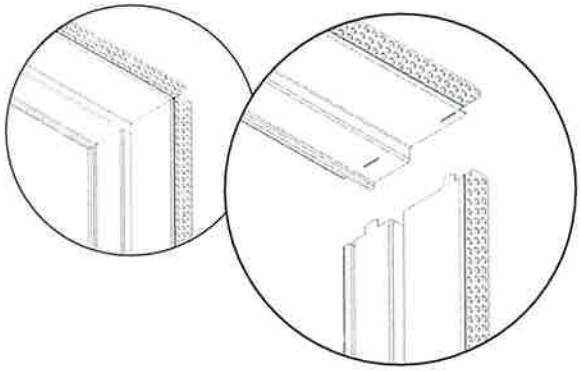
For use with 1-3/4" & 2-1/4" doors



Installation Detail



Typical Corner Assembly



Specification Details

EzyJamb ISD Inswing Door 18 Gauge Door Frame (For 1-3/4" & 2-1/4" Doors)

Strike Height	Standard Strike Height from bottom of frame to centreline	For 6'8" frame 36"	For 7'0" and 8'0" frames - 38"
Specifications	18 Gauge galvanneal steel door frame for wall thicknesses	3-3/4" - 9-7/8" in 1/8" increments	
Hinge Options	**Invisible Hinges** RocYork RY-80, RY-120 Tectus 340, 540 Soss 218	**Mortise Hinges (.134)** 4-1/2" x 4-1/2" Stainless Steel (630)	**Mortise Hinges** 4" x 4" Stainless Steel (630) *For 1-3/4 door thickness only

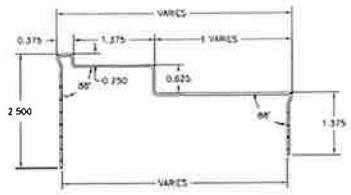
EzyJamb | ISD Inswing Door Frame

Product Datasheet

For use with 1-3/4" & 2-1/4" doors

Preparation Options

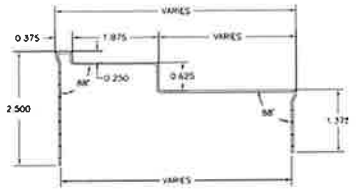
1-3/4"



Strike Options
T-Strike
ASA Strike
DeadBolt

Hinge Options
4" Mortise Hinge
RocYork RY-60

2-1/4"



Strike Options
T-Strike
ASA Strike
Flushbolt
DeadBolt
HES 8300 Electrical Strike
NoHa

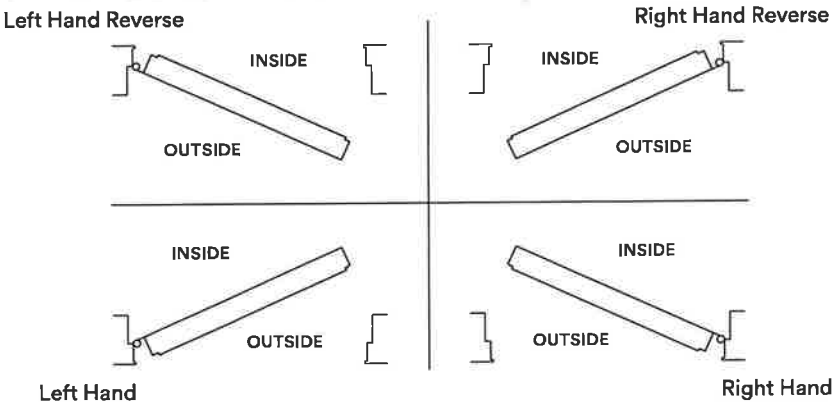
Hinge Options
4-1/2" Mortise Hinge
RocYork RY-80 / RY-120
Soss 218 / 418
Tectus 340 / 540

Power Switch
EPT Power Transfer
Door Position Switch

Pivot Options
Rixson Top Pivot 180
Rixson Intermediate Pivot M19
ABH Top Pivot 018
ABH Intermediate Pivot 019

Closer Options
LCN 3130
Dorma ITS96
RocYork RYCC60950

North America Door Handing



ⓘ Hand all doors by standing outside and facing the door.

SECTION 08 710

I. PART 1 - GENERAL

1.1 SCOPE

A. This section contains information concerning all labor, materials and equipment necessary to provide and install the following work:
   1. All finish hardware for doors including all fasteners and other devices required to complete the work
   2. Hardware provided for shop or factory installation on doors and frames
   3. Keys and Keying

B. Reference Section 08 741 for information concerning Electrical Locking Systems.

1.2 QUALITY CRITERIA

A. Perform all work defined herein in accordance with criteria defined in the following Reference Standards:
   1. ANSI A115.1 and A115.2
   2. ANSI A117.1
   3. ANSI 156.2
   4. ANSI 156.3
   5. ANSI 156.4
   6. NFPA 101
   7. NFPA 80
   8. NFPA 252
   9. UL 10B
   10. UL 305
   11. 2010 ADAAG

B. Regulatory Requirements
   1. Products requiring electrical connections shall be listed and classified by Underwriters' Laboratories, Inc., and acceptable to the jurisdictional permitting authority as suitable for the purpose specified and indicated.
   2. All hardware specified herein subject to usage by disabled persons shall comply with the requirements of the guidelines established by the 2010 ADA (Americans with Disabilities Act)
   3. Hardware for doors used by the disabled shall comply with applicable codes which shall supersede this Section. Notify the Architect of conflicts between regulations and this specification prior to providing hardware.
   4. Only a recognized architectural door hardware supplier that has a record of successful in-service performance for supplying door hardware similar in quantity, type and quality to that indicated for this Project, and that employs an experienced Architectural Hardware Consultant (AHC) who is available at reasonable times during the course of the work for consultation about Project's hardware requirements shall be used.
   5. Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and all additional requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories,

Warnock Hersey, Factory Mutual or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with criteria defined for applicable fire-rated openings.

6. Provide a complete set of specialized tools and maintenance instructions which may be necessary for the continued adjustment, maintenance, removal and replacement of any and all door hardware by the Owner following project completion.

1.3 DELIVERY, STORAGE AND HANDLING

A. Legibly mark and label each hardware package, indicating item and location for which it is intended. Each marking shall correspond to the number shown on the approved hardware schedule. Each package shall contain all the required fasteners necessary for installation of each hardware item.

B. Construction keys shall be tagged and plainly marked with the key change number, door designation and all other required information and delivered directly to the Owner immediately following receipt of the Certificate of Occupancy.

C. Permanent keys shall be identified by lock manufacturer and opening to which they apply. Lock manufacturer shall place each set of keys into an envelope and label same with door numbers for rooms or areas. Mark boxes of keys with project name and location and deliver Change Keys, Master Keys and Grandmaster Keys directly to the Owner.

D. All locksets and cylinders shall be keyed in accordance with instructions to be provided by the Owner.

1.4 WARRANTIES

A. Contractor shall provide a 2 year warranty for all hardware (unless noted otherwise) which includes replacing hardware, including labor and material, which fails to function within warranty period at no additional cost to the Owner.

B. All closers shall be provided with a 10-year manufacturer's written warranty.

1.5 SUBMITTALS

A. No later than 2 weeks following the date of the Owner's Written Notice to Proceed, the Contractor shall submit the finish hardware schedule to the Architect after it has been carefully reviewed for compliance with the requirements of the contract documents.

B. The finish hardware schedule shall be submitted in a format to match the hardware sets defined in the specifications and shall be fully itemized, including manufacturer's name and catalog numbers, dimensions and installation location of each and every item.

C. After the submittal has been reviewed by the Contractor and Architect, a confirmed copy shall accompany the shipment of hardware and the labels on the packages of hardware shall be cross-referenced to corresponding item numbers on the schedule. Final accepted schedule shall be strictly adhered to and no substitutes shall be accepted.

D. For information only, submit to the Architect one copy of manufacturer's data for each item of finish hardware. Include information necessary to verify compliance with specified requirements and include instructions for installation and maintenance of operating parts and exposed finishes.

E. Architect's review of the schedule shall not relieve the hardware supplier of the responsibility to furnish hardware in all quantities required and in compliance with this specification.
F. Provide hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware.
G. Provide the following written certifications concerning hardware for Architect's review:
   1. All hardware shall comply with all applicable Codes for requirements applicable to the work specified herein.
   2. All hardware shall comply with NFPA 80 and NFPA 101 with regard to requirements for fire-rated doors and frames.
H. Submit separate detailed Keying Schedule with clear definition of compliance with Keying Schedule to be defined by the Owner.
I. A comprehensive submittal shall be required for all items specified in Sections 08 100, 08 210, 08 710 and 08 741. All items specified therein which required submittal shall be submitted together simultaneously. Partial submittals of any of these sections shall be returned to the Contractor without review.

II. PART 2 - PRODUCTS

2.1 FINISH HARDWARE

A. Hardware manufacturers are specified for each hardware item to establish a standard of quality and minimum functional requirements. In the hardware schedule at the end of this Section, product model numbers are used as part of this description to assist in identifying individual items.
B. Hardware Suppliers/Manufacturers and Abbreviations (Reference the Hardware Schedule at the end of this section for applications)

1	Aiphone Corporation	800-692-0200	AIP
2	Cavity Sliders USA	888-466-0030	CVS
3	Emtek	800-356-2741	EMT
4	Inox Lock	508-394-2300	INOX
5	McKinney Hinges	800-346-7707	MCK
6	Pemko	800-824-3018	PEM
7	Rejuvenation.com	888-401-1900	REJ
8	Rixson, Inc.	800-457-5670	RIX
9	Rockwood Manufacturing Co.	800-458-2424	ROC
10	Rustica	800-891-8312	RUS
11	Sargent Door Hardware	800-992-3667	SAR
12	Securitron	800-626-7590	SEC
13	Vingcard	800-225-8464	VING
14	Yale	800-378-0965	YAL

C. Recommended Finish Hardware Suppliers shall include, but are not limited to the following:
   1. Contract Hardware, Inc. (Clint Booth 850-580-2495 ext. 2402)
   2. Paragon (Marietta, Georgia (770) 795-9564)

2.2 HINGES

A. All hinges to be installed on the project shall be produced by a single manufacturer unless specifically noted otherwise in the Hardware Sets. Unless otherwise scheduled, all hinges shall be steel base, five-knuckle, full mortise template, ball bearing type with non-rising loose pin, flat button tip. Selected hinges shall have non-removable pins by use of set screw in the barrel. These are identified in the hardware schedule as "NRP". All fasteners shall have a finish to match the hinge. Hinge finish shall be as defined in the Hardware sets at the end of this section. Hinges shall comply with ANSI/BHMA 156.7.

2.3 MECHANICAL LOCKSETS, LATCHSETS AND CYLINDERS

A. All mechanical lock sets, latch sets and cylinders to be installed on the project shall be produced by a single manufacturer, unless specifically noted otherwise on the Hardware Sets. All lock sets and latch sets shall have lever handles only. All lock sets and latch sets shall have a 2-¾" backset. Latch bolts shall be hard drawn brass with a nylon anti-friction device. All locksets and latchsets proposed for installation on fire rated doors shall be UL approved and listed. Finish on all fasteners shall match locksets, latch sets, and cylinders. Finishes on locksets, latchsets and cylinders shall match those defined in the hardware sets at the end of this section.

B. Locksets and latchsets shall utilize standard cutouts to facilitate interchange without further mortising. Strikes for locksets and latchsets shall have only the minimum lip projection required to protect trim. Lock and trim shall comply with ANSI A156.2.

C. See Specification Section 08 741 for Electronic Locking Systems.

2.4 EXIT DEVICES

A. Exit devices shall be listed under "Panic Hardware" in accident equipment lists from Underwriters Laboratories. Where labeled fire doors are used as exits, they shall be equipped with labeled "Fire Exit Hardware". Exit devices shall comply with ANSI A156.3.

B. All touch bar exit devices, where specified, shall have a reinforced decorative touch bar directing usage to the opening side of the door. All exit devices shall be operational over 67% of the clear door width.

C. Exit devices shall be attached with sex nuts and bolts. Exit devices shall be attached to integral blocking at all wood doors. Finish on all exposed fasteners shall match exit devices. Finishes on exit devices shall match those defined in the hardware sets at the end of this section.

D. Exposed door loops are not acceptable. All wiring for exit devices with electrical characteristics shall be concealed.

2.5 THRESHOLDS

A. Thresholds shall be as specified in Hardware Sets. Threshold height shall comply with Section 303 in the 2010 American Disabilities Act Accessible Guidelines.
B. Finish on thresholds and the fasteners used to attach thresholds shall match that defined in the hardware sets at the end of this section.

2.6 DOOR CLOSERS

A. All closers shall be produced by one manufacturer, unless specifically indicated otherwise on the Hardware Sets, and shall be matched in design. Closers shall be adjustable and shall be rack and pinion construction with compressions springs. Closing speed, latching speed and back check shall be controlled by key operated valves. All closers shall be adjustable to require a maximum force for pushing or pulling of a door equal to 5 lb at interior doors and 8.5 lb at exterior doors. The sweep period of all closers shall be adjusted so that the door will take at least 5 seconds to move from an open position of 90 degrees to 12 degrees from the latch, measured to the leading edge of the door.
B. An integral hold open bar shall not be incorporated in any door closers.
C. Closers shall be sized in accordance with manufacturer's recommendations based on applicable conditions.
D. All exposed portions of closers and the fasteners used to attach them shall have a finish defined in the hardware sets at the end of this section.
E. All mineral core doors with closers shall be provided with 5" wood blocking at door head rail.
F. All closers shall have extreme temperature fluid (temperature range from -30° F to 120° F).
G. Provide delayed action closers only where required by applicable codes or as indicated on applicable hardware sets.
H. Hinge face mount closers unless otherwise indicated. Do not mount closers on exterior of building or within public or guestroom corridors. Closers, and the fasteners used to attach them to doors, shall not be visible from within the corridors.
I. Size and mount for units indicated shall comply with manufacturer's recommendations for applicable conditions. Reinforce substrate as recommended by manufacturer.
J. Closers shall be installed to allow door swing as shown on Drawings.
K. Provide mounting or drop plates as required by applicable conditions.
L. Do not use through bolts to attach closers.

2.7 DOOR STOPS

A. Door Stop mounting shall be performed by using methods to suit substrates encountered.
B. Provide gray rubber exposed resilient parts.
C. Adjust height of floor stops to suit undercut of adjacent door.
D. All wall-mounted door stops shall be attached to integral 2 x 10 wood blocking in light gauge steel stud walls.
E. Finishes on door stops and any fasteners used to attach them shall be as indicated in the hardware sets at the end of this section.
F. All overhead door stops mounted on all doors throughout the project shall be concealed rather than surface mounted unless specifically stated otherwise.

2.8 PLATES

A. Plates shall comply with the requirements of ANSI 156.6. Plates shall have a .050 minimum thickness with beveled edges (B4E) four sides with counter sunk fastener holes. Mount mop and kick plates centered, flush with bottom of door. Fasteners shall be countersunk Phillips head screws plated to match plate finish.

B. Finishes on plates and any fasteners used to attach them shall be as indicated in the hardware sets at the end of this section.

2.9 DOOR VIEWERS

A. All viewers shall have a 190 degree angle of view and shall have an integral cover.

B. Finishes on door viewers shall be as indicated in the hardware sets at the end of this section.

2.10 DOOR GUARDS

A. Provide all Guestroom entry doors with the specified door guards.

B. Finishes on door guards and any fasteners used to attach them shall be as indicated in the hardware sets at the end of this section.

2.11 MISCELLANEOUS REQUIREMENTS

A. All hardware shall be appropriate for it’s application and shall fit its intended location. Should any hardware, as specified, fail to meet the intended requirements or require modification to suit the intended location, the issue and any other necessary advance information, shall be brought to the attention of the Architect for correction or decision in ample time to avoid delay in the manufacture and delivery of hardware.

B. The finish hardware listed herein shall not be construed as a complete hardware schedule, but shall be considered a general indication of the hardware requirements desired by the Owner. It shall be the Contractor's responsibility to examine the Contract Documents and provide all necessary or additional hardware as required but not scheduled herein to achieve to intent of the Contract Documents and comply with applicable codes. Such items of hardware shall be of the same type, finish, quality, and quantity as that scheduled for similar doors or similar purposes.

C. In the accompanying hardware sets, catalog numbers used are those of specific manufacturers, used to establish a minimum standard of quality and requirements as to type, weight, mechanical construction and operation with which hardware shall comply.

2.12 FINISHES

A. All hardware items not otherwise scheduled shall have the following finishes unless specifically noted otherwise in the hardware sets:

	Guestroom, Public and Administrative Areas	**Doors subject to exterior exposure**	**Back of House Doors**
Hinges	BSP (Black Suede Powder Coat)	US32D	US26D
Electronic Locksets	Black Titanium	US32D	US26D
Mechanical Latchsets, Locksets and Cylinders	BSP (Black Suede Powder Coat)	US32D	US26D
Kick Plates / Pull Plates / Push Plates / Mop Plates	BSP (Black Suede Powder Coat)	630	630
Door Closers	BSP (Black Suede Powder Coat)	689	689
Thresholds	313AN Dark Bronze Anodized	US27	US27
Door Bottoms/ Sweeps	US27	US27	US27
Miscellaneous	Dark Gray	US32D	US26D
Exit Devices	622 (Matte Black Anodized)	622 (Matte Black Anodized)	622 (Matte Black Anodized)
Viewers	BLK	N/A	N/A
Door Guards	BSP (Black Suede Powder Coat)	N/A	N/A
Holders and Stops	BSP (Black Suede Powder Coat)	US32D	US26D
Electromagnetic Holders	693 (Sprayed Black)	693 (Sprayed Black)	693 (Sprayed Black)

B. Finish and Base Material Designations are U.S. Government Standard.

2.13 CYLINDERS AND KEYING

A. Hotel Keyways

1. All mechanical locksets shall have a restricted keyway, reserved for the Owners use only.

2. All locksets shall be construction master keyed.
3. Owner will define the keying requirements for the system.
4. Locksets and cylinders shall contain 6-pin tumblers.
5. Provide the following quantities of keys:
   a. Construction Master Keys — Ten (10)
   b. Grand Master Keys — Ten (10)(AA key)
   c. Master Keys “AB” Engineering — Five (5) (A2 key)
   d. Master Keys “AD” Housekeeping — Five (5)(A5 key)
   e. Master Keys Administrative Offices — Four (4) (A1 key)
   f. Change Keys per Lock — Three (3)
      Or Change Keys per Keyed Alike Group — Five (5)
6. All mechanical keys shall be nickel silver only.

B. Temporary Construction Keying
1. Provide temporary construction keying in all mechanical locksets and cylinders for use during construction. The General Contractor shall void out the construction keys and remove all construction inserts 24 hours prior to the Owners occupancy of the building,

C. Key Control Box
1. Key control box shall be RWC Series Key Box by Telkee, Inc., Dover, DE (903) 678-7800. Key Box shall be provided and installed by the Contractor in location to be defined by the Owner.
2. Size box for actual quantities of keys, plus 25%, plus additional capacity for twelve housekeeper pouches.
3. One key control log book shall be provided.
4. Color coded and numbered tags for ring identification shall also be provided.

2.14 VIDEO / INTERCOM SYSTEM

A. A Video / Intercom system providing communication between the following facility entrance points and a Master Station located at the Registration Desk area shall be required as defined below at the following door locations:
1. Door 121 Front entry
2. Door 126B Kitchen door

B. Acceptable video / intercom system components shall be manufactured by Aiphone. Specific products and model numbers shall be defined in the individual hardware sets.

C. Each video / intercom shall have 2 way communication with the Front Desk Master Station.

III. PART 3 - EXECUTION

3.1 INSTALLATION

A. Install each hardware item in compliance with manufacturer's written instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place prior to the finish application. After completion of the finish, reinstall each item. Do not install surface-mounted items until finishes have been completed on the substrate.

3.2 All door closers shall be installed out of public sight wherever possible. Unless otherwise noted, all closers shall be adjusted as defined in Part 2.6 herein. There shall be no closers visible in Guestroom Corridors or Public Corridors.

3.3 Hardware mounting heights shall comply with the following unless otherwise indicated in the Contract Documents:

A. Hinges
   1. Top - 5" from head to top of hinge leaf.
   2. Bottom - 10" from bottom of hinge to finished floor.
   3. Intermediates - Equal distance between top and bottom hinges.

B. Locksets/Latchesets shall be mounted 40" from finish floor to center of lock/latch.

C. Deadbolts shall be mounted 48" from finished floor to topmost portion of the latching mechanism when the deadbolt lever is in an upright position.

D. Exit device crossbars shall be mounted 38" from finish floor to center of crossbar.

E. Door guards and wall guards shall be mounted 48" from finished floor to center line.

F. Door viewers shall be mounted 57" from finished floor to center line. At accessible Guestroom doors provide 2 door viewers with mounting at heights of 48" and 57" from finish floor to centerline.

3.4 BLOCKING

A. Provide and install 2 x 10 wood blocking within light gauge steel stud walls to receive door stops and electromagnetic holders.

3.5 CLEANING AND ADJUSTMENT

A. Adjust each hardware item to perform function intended. Lubricate moving parts using lubricant acceptable to hardware manufacturer.

B. Prior to Date of Substantial Completion, re-adjust and relubricate hardware. Repair or replace defective materials. Clean hardware as recommended by manufacturer to remove dust and strains.

C. Instruct Owners designated personnel in the proper adjustment and maintenance of hardware and finishes at the time of final hardware adjustment. All construction inserts in mechanical lockset cylinders shall be removed.

HARDWARE SCHEDULE

GENERAL NOTES

1. THE FOLLOWING DOOR HARDWARE PRODUCTS & FINISHES ARE THE BASIS OF DESIGN FOR THIS PROJECT. ALTERNATE PRODUCTS WHICH COMPLY WITH THE SAME PERFORMANCE AND AESTHETIC REQUIREMENTS OF THE PRODUCTS LISTED BELOW ARE SUBJECT TO REVIEW BY THE ARCHITECT PRIOR TO INCORPORATION WITHIN THIS PROJECT.

2. COORDINATE ALL DOOR HARDWARE COMPONENTS THAT REQUIRE ELECTRICAL POWER WITH THE ELECTRICAL WORKING DRAWINGS.

3. ALL HARDWARE SHALL HAVE A US26D (SATIN CHROME) FINISH UNLESS NOTED OTHERWISE.

HW SET 1 - NON-ACCESSIBLE GUESTROOM ENTRY DOOR

SINGLE DOOR: A
SCWD DOOR / HM FRAME
20 MINUTE FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	ADVANCE TRILLIUM RFID x JEREZ DIRECT KEY ENABLED	US26D	ONI
1 EA	CLOSER	2701	689	YAL
1 EA	WALL STOP	RM860	US26D	ROC
1 EA	DOOR GUARD	PDL	US26D	ROC
1 EA	VIEWER	627	CRM	ROC
1 EA	AUTOMATIC DOOR BOTTOM	STC 411APK	US27	PEM
1 SET	SEALS	S773BL	BLACK	PEM
1 EA	THRESHOLD	236A	US27	PEM

HW SET 2 - ACCESSIBLE GUESTROOM ENTRY DOORS

SINGLE DOOR: B
SCWD DOOR / HM FRAME
20 MINUTE FIRE RATED

3 EA	HINGES	TA 2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	ADVANCE TRILLIUM RFID x JEREZ DIRECTKEY ENABLED	US26D	ONI
1 EA	CLOSER	2701	689	YAL
1 EA	WALL STOP	RM860	US26D	ROC
1 EA	DOOR GUARD	PDL	US26D	ROC
2 EA	VIEWERS	627	CRM	ROC
1 EA	AUTOMATIC DOOR BOTTOM	STC 411APK	US27	PEM
1 SET	SEALS	S773	BLACK	PEM
1 EA	THRESHOLD	236A	US27	PEM

HW SET 3 - TYPICAL GUESTROOM BATHROOM DOOR

SINGLE DOOR: C
SCWD DOOR / HM FRAME
NON FIRE RATED

3 EA	HINGES	TA 2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	28-65U65 KB (Privacy)	US26D	SAR
1 EA	WALL STOP	RM876	US26D	ROC
3 EA	SILENCERS	608	GRAY	ROC
1 EA	THRESHOLD	ALHAMBRA 6.75"W X 3/8"H	HONED NATURAL LIMESTONE	WAL

HW SET 5 - BEDROOM CLOSET PAIR DOORS

PAIR DOORS: D
SCWD DOOR
NON FIRE RATED

6 EA	HINGE	T2714 4-1/2" x 4-1/2"	US26D	MCK
2 EA	ROLLER LATCH	591	US26D	ROC
2 EA	DOOR STOP	518	US26D	ROC
2 EA	SILENCER	608	GRAY	ROC

HW SET 6 - TYPICAL GUESTROOM BEDROOM HINGED DOOR
SINGLE DOOR: E
SCWD DOOR / HM FRAME
NON FIRE RATED

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	LOCKSET	28-65U65 KB (Privacy)	US26D	SAR
3 EA	SILENCERS	608	GRAY	ROC
1 EA	OVERHEAD SURFACE MOUNTED STOP	10-336	652	RIX

HW SET 7 - TYPICAL GUESTROOM COMMUNICATING DOORS

PAIR OF DOORS: F
SCWD DOORS / HM FRAME
45 MINUTES FIRE RATED (ONE DOOR AND FRAME ONLY)

3 EA	HINGES (NON-FIRE RATED DOOR)	TA 2714 4.5 x 4.5	US26D	MCK
3 EA	SPRING HINGES (FIRE RATED DOOR)	1502 4.5 x 4.5	US26D	MCK
2 EA	LOCKSETS	28-65G15-3	US26D	SAR
2 EA	DEADBOLTS	489	US26D	SAR
2 EA	WALL STOPS	RM860	US26D	ROC
2 EA	AUTOMATIC DOOR BOTTOMS	STC 411APK	US27	PEM
2 SETS	DOOR SEALS	S773	BLACK	PEM
2 EA	THRESHOLDS	236A	US27	PEM

HW SET 12 - TYPICAL INTERIOR STAIR DOORS (INSWING)

SINGLE DOORS: 100A, 100F, 127, 200A, 200F, 300A, 300F, 400A, 400F, 500A, 500F, 600
SCWD DOORS / HM FRAMES
90 MINUTE FIRE RATED

3 EA	HINGES	T4A3786 4.5 x 4.5	US26D	MCK
1 EA	EXIT DEVICE	98L-07-F	US26D	VDI
1 EA	CLOSER	2701	689	YAL
1 EA	STOP	406	US26D	ROC
1 SET	SEALS	S773	BLACK	PEM
1 EA	THRESHOLD	171A	US27	PEM
1 EA	KICKPLATE	K1050 X 8" X 2" LDW B4E CSK	US32D	ROC

HW SET 17 - EXTERIOR TO ROOF WELL

SINGLE DOOR: 601, 601A
STAINLESS STEEL DOOR / STAINLESS STEEL FRAME
NON FIRE RATED

3 EA	HINGES	T4A3786 4.5 x 4.5	US32D	MCK
1 EA	LOCKSET	8204 LB	US32D	SAR
1 EA	CLOSER	2701	689	YAL
3 EA	SILENCERS	608	GREY	ROC
1 EA	STOP	7281	US32D	ROC
1 EA	THRESHOLD	171A	US27	PEM

HW SET 18 - EXTERIOR ALUMINUM ENTRANCES

SINGLE DOORS: 100A1, 100F1
PREFINISHED ALUMINUM ENTRANCES
NON FIRE RATED

1 EA	EXIT DEVICE	98L-BE-F-07-E996L-BE-FS	US32D	VDI
1 EA	STOP	406	US26D	ROC
1 SET	SEALS	S773	BLACK	PEM
1 EA	THRESHOLD	171A	US27	PEM
1 EA	OVERHEAD CONCEALED CLOSER	0608-N	626	RIX
1 EA	STOP	7281	US32D	ROC
1 EA	RELAY	---	---	ONI
1 EA	WALL READER	10104338P1	US32D	ONI
1 EA	POWER SUPPLY	PS 902 FA	--	VDI
1 EA	POWER TRANSFER	EPT2	--	VDI
1 EA	BATTERY BACKUP	900BBK-12VDC	--	VDI

ACTIVATION OF BUILDING FIRE ALARM SHALL RELEASE LATCH MECHANISM IN EXIT DEVICES WITH ELECTRIFIED TRIM (FAIL SAFE).

HINGES, WEATHER STRIPPING AND THRESHOLD BY ALUMINUM ENTRANCE MANUFACTURER

DOOR 127 (KITCHEN TO EXIT) TO HAVE INTERCOMTIED TO FRONT DESK WITH PUSH BUTTON AUTO LATCH RELEASE

HW SET 20 - MAIN HOTEL ENTRANCE SWING DOUBLE DOORS

PAIR OAK DOORS WITH GLASS: 121
NON FIRE RATED

2 EA	CONCEALED CLOSER	M0707 105 Degree Max Opening	613	RIX
2 EA	DOOR STOP	471	US10B	ROC
2 EA	POWER TRANSFER	CEPT	US10B	SEC
1 EA	INTERCOM SYSTEM	LEM1-DLS	----	----
1 EA	SET SMOKE SEAL	S773D 20'	----	PEM
2 EA	ASTRAGAL	29324 DNB X 29324 DNB	108	PEM
2 EA	PULLS	8905 ALLMB	POLISHED SS	TAILOCK
1 EA	RELAY	---	---	ONI
1 EA	WALL READER	10104338P1	US32	ONI
1 EA	POWER SUPPLY	PS 902 FA	---	VDI
1 EA	POWER TRANSFER	EPT2	---	VDI
1 EA	BATTERY BACKUP	900BBK-12VDC	---	VID
4 EA	HINGES	T4A3386NRP	POLISHED SS	MCK
2 EA	HINGES	T4A3386QC8	POLISHED SS	MCK
2 EA	MAGNALOCK	M32	US32D	
1 EA	EMERGENCY EXIT BUT.	EEB2		
2 EA	STOP FILLER PLATE	SFP-1/2CL-8	US28	
2 EA	TOUCH SENSE BAR	TSB-CL	US28	
1 EA	MORTISE KEYSWITCH	MKA	US32D	

ACTIVATION OF THE BUILDING FIRE ALARM SHALL FULLY OPEN THE DOOR AUTOMATICALLY. DOOR SHALL REMAIN OPEN UNTIL THE FIRE ALARM IS CANCELED.

INTERCOM MASTER STATION AT REGISTRATION DESK SHALL INCLUDE DOOR RELEASE FEATURE TO UNLOCK DOOR.

HW SET 21 - JANITOR, LUGGAGE, BAR STORAGE, MECHANICAL, ENGINEER, STORAGE, HOUSEKEEPING, WATER HEATERS, MECH PUMPS, PBX

SINGLE DOORS: 107B, 118C
SCWD DOORS / HM FRAMES
NON RATED / 45 MINUTE FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	ADVANCE TRILLIUM RFID x JEREZ DIRECTKEY ENABLED (MINUS ADB)	US26D	ONI
1 EA	CLOSER	2701	689	YAL
1 EA	STOP	406	US26D	ROC
1 SET	SEALS	S773	BLACK	PEM
1 EA	THRESHOLD	171A	US27	PEM

HW SET 23 - ELECTRICAL ROOM, PUMP ROOM, FOOD PREP

SINGLE DOOR: 118A, 118B1, 126B
SCWD DOOR / HM FRAME
90 MINUTE FIRE RATED

3 EA	HINGES	TA2714 NRP 4.5 x 4.5	US26D	MCK
1 EA	EXIT DEVICE	98L-F-07	US26D	VDI
3 EA	SILENCERS	608	GREY	ROC
1 EA	THRESHOLD	171	US27	PEM
1 EA	CYLINDER	6300 SERIES	US26D	SAR
	DOOR SEAL			

HW SET 24 - DRYER PLENUM, LAUNDRY CHUTE, LINEN, ICE

SINGLE DOOR: 100G, 105B, 107A, 107C
HM DOOR / HM FRAME
NON RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	28-7G04 LB	US26D	SAR
1 EA	CLOSER (PASSAGE)	2701	689	YAL
1 EA	STOP	406	US26D	ROC
3 EA	SILENCERS	608	GREY	ROC

PROVIDE ELECTRONIC MAGNETIC HOLDERS 990M, 689, RIX AT DOORS L00G and D00J

HW SET 25 - ADMINISTRATION ENTRANCE, LAUNDRY ENTRANCE, FOOD PREP, GUEST LAUNDRY, FITNESS, MEETING ROOM, ENGINEERING, HOUSEKEEPING, BAR STORAGE, STORAGE, MECHANICAL

SINGLE DOORS:113, 120A, 123C, 124, 200B, 200C, 300C, 400C, 500C
SCWD DOORS / HM FRAME
NON FIRE RATED / 45 MINUTE FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	ADVANCE TRILLIUM RFID x JEREZ DIRECTKEY ENABLED (MINUS ADB)	US26D	ONI
1 EA	CLOSER	2701	689	YAL
1 SET	SEALS	S773	BLACK	PEM
1 EA	STOP	406	US26D	ROC
1 EA	THRESHOLD	171A	US27	PEM

HW SET 25A - MEETING STORAGE

SINGLE DOORS: 114A, 114AB, 116AB
SCWD DOORS / HM FRAME
NON FIRE RATED / 45 MINUTE FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	ADVANCE TRILLIUM RFID x JEREZ DIRECTKEY ENABLED (MINUS ADB)	US26D	ONI
1 EA	CLOSER	2701	689	YAL
1 SET	SEALS	S773	BLACK	PEM
1 EA	STOP	406	US26D	ROC
1 EA	THRESHOLD	171A	US27	PEM
2 EA	ELECTRONIC MAGNETIC HOLDERS	990M	689	RIX
2 EA	VIEWER	627	CRM	ROC

HW SET 26 - HVAC CLOSET

SINGLE DOOR: 114B, 116B
HM DOOR / HM FRAME
NON FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LATCHSET	28-7U15 LB	US26D	SAR
1 EA	CLOSER	2701	689	YAL
1 EA	KICK PLATE	K1050 8" X 2" LDW X 4BE X CSK	US32D	ROC
1 EA	STOP	406	US26D	ROC
3 EA	SILENCERS	608	GREY	ROC
1 EA	THRESHOLD	171A	US27	PEM

HW SET 27 - EMPLOYEE TOILET

SINGLE DOOR: 105A
HM DOOR / HM FRAME
NON FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET (PASSAGE)	28-7U65 LB	US26D	SAR
1 EA	CLOSER	2701	689	YAL
1 EA	STOP	406	US26D	ROC
3 EA	SILENCERS	608	GREY	ROC
1 EA	THRESHOLD	ALHAMBRA 6.75"W X 3/8"H	HONED NATURAL LIMESTONE	WAL

HW SET 28 - PUBLIC TOILET ENTRANCES, EMPLOYEE BREAKROOM

SINGLE DOORS: 105, 115, 117
SCWD DOORS / HM FRAMES
NON FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	PUSH PLATE	70C-RKW 4" X 16"	US32D	ROC
1 EA	PULL	BF111	US32D	ROC
1 EA	MOP PLATE	K1050 4" X 2" LDW X 4BE X CSK	US32D	ROC
1 EA	KICK PLATE	K1050 8" X 2" LDW X 4BE X CSK	US32D	ROC
1 EA	CLOSER	2701	689	YAL
1 EA	STOP	406	US26D	ROC
3 EA	SILENCERS	608	GREY	ROC
1 EA	THRESHOLD	ALHAMBRA 6.75"W X 3/8"H	HONED NATURAL LIMESTONE	WAL

HW SET 30 - ADMINISTRATION OFFICES, PBX, MECHANICAL, STORAGE

SINGLE DOORS: 125C, 125E,126A, 200H, 300B, 300E, 400B, 400H, 500B, 500C, 500E, 500H
SCWD DOOR / HM FRAME
NON FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	US26D	MCK
1 EA	LOCKSET	8204 LB	US26D	SAR
1 EA	CLOSER	2701	689	YAL
3 EA	SILENCERS	608	GREY	ROC
1 EA	STOP	406	US26D	ROC

HW SET 38 - BARN DOORS AT DINING TO PANTRY

DOORS: 126C

1 SET	SLIDING DOOR HARDWARE	H200AX 8' WITH SOFT CLOSE AND 287 TRACK STOP BUMPER	US27	PEM
1 EA	FASCIA	F134C X 8'	US27	PEM
1 EA	DOOR PULL	104.74.066	US32D	HAF
1 EA	MORTISED FLUSH HANDLE	152.00.727	US26D	HAF
1 EA	MORTISED DEADLOCK	5017	N/A	ADA
1 EA	ESCUTCHEON	1016 WITH EMERGENCY OVERRIDE	130	ADA
1 EA	STRIKE BOX	4810	630	ADA
1 EA	THUMBTURN	1004	130	ADA

HW SET 39 - LAUNDRY

HM DOOR/HM FRAME: 107, 125A1, 125A2
PAIR SHALL HAVE

3 EA	HINGES			
1 SET	KEY PAD			
1 SET	CLOSERS	8616-SIS-FC	689	DOR
1 EA	SEALS	S773BL	BLK	PEM
1 EA	THRESHOLD	2005AV	MIL	PEM
1 EA	SWEEP	18061ONB		
1 EA	STOP	1201 CS	US26D	TRIM

HW SET 40 - MEETING ROOM

SINGLE SCWD DOORS / HM FRAMES: 114A, 116A
EACH DOOR SHALL HAVE:

1 EA	OVERHEAD CONCEALED CLOSER	MW0700	625	RIX
1 EA	STOP	1270WV	US26	TRIM
1 EA	SEALS	S733BL	BLK	PEM
1 EA	ELECTROMAGNETIC HOLDER	980	US26	RIX
2 EA	VIEWERS	628	US26	ROC
3 EA	HINGES	BB1279 4.5 X 4.5	US26	HAG

1 EA	RFID REMOTE CARD READER	RCU (RFID / BLE ENABLED)	US26	SAF
1 EA	ELECTRIFIED EXIT DEVICE	EL98L-NL-07-F	US26	VON
1 EA	POWER SUPPLY	175ULT	--	ALT
1 EA	BATTERY BACKUP	990BBK 12VDC	--	VON
1 EA	POWER TRANSFER	EPT2	--	VON
1 EA	RELAY	-----	--	SAF

ELECTROMAGNETIC HOLDERS RELEASE UPON BUILDING FIRE ALARM ACTIVATION

HW SET 41 - PUBLIC TOILET STALL

SINGLE DOORS: 115A, 117A, 117B
SCWD DOORS / HM FRAMES
NON FIRE RATED

3 EA	HINGES	TA2714 4.5 x 4.5	BSP	MCK
1 EA	LOCKSET	8266 LNL - 130B THUMBTURN - V20 - EMB TO INDICATE OCCUPIED / NOT OCCUPIED	BSP	SAR
1 EA	CLOSER	2701	BSP	YAL
3 EA	SILENCERS	608	GRAY	ROC
1 EA	STOP	RM860 (Black Bumper)	BSP	ROC

HW SET 42 - CORRIDOR TO ELEVATOR LOBBY
SINGLE SCWD DOORS / HM FRAMES: 200D1, 200D2, 300D1, 300D2, 400D1, 400D2, 500D1, 500D2
DOOR SHALL HAVE

1 EA	EXIT DEVICES	9847WDC-L-BE-07-F	MATTE BLACK	VON
1 EA	OVERHEAD CONCEALED CLOSER	MW0700	MATTE BLACK	RIX
4 EA	HINGES (Typical)	BB1279 4.5 x 4.5	MATTE BLACK	HAG
1 EA	ELECTROMAGNETIC HOLDERS	997	MATTE BLACK	RIX
1 SET	SEALS	S883BL	MATTE BLACK	PEM

ELECTROMAGNETIC HOLDER RELEASES UPON BUILDING FIRE ALARM ACTIVATION

END OF SECTION

SECTION 09 650

I. PART 1 - GENERAL

1.1 SCOPE

A. This Section includes information concerning all labor, materials and equipment necessary to provide and install the following products:
   1. Vinyl Composition Tile
   2. Rubber Floor Tile
   3. ~~**Sheet Vinyl Flooring**~~
   4. Resilient Base
   5. Application Adhesives
   6. Vapor Reduction Membrane System

1.2 SUBMITTALS

A. Reference Section 01 100 for administrative requirements concerning submittals.
B. Submit product data which includes product characteristics, installation requirements and manufacturer's recommended adhesive and maintenance instructions.
C. Submit full size samples for each type, color and pattern of flooring and accessory required on Interior Design Finish Index.
D. Submit a product schedule for all resilient base and accessory products using the same designations as indicated on the interior design drawings.
E. Submit a report following all concrete slab moisture testing. Note that a Unit Price per square foot of installed vapor reduction membrane system for the concrete slab substrates is required to be submitted on the Bid Form. The contractor shall document the number of square feet of vapor reduction membrane system installed and the relative humidity encountered in the report and submit it with each monthly application for payment.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors, patterns and quality designations legible and intact.
B. Store and protect materials in accordance with manufacturer's printed recommendations.
C. Store materials on a smooth clean floor. Store materials in original containers in a interior area, protected from the elements with temperature between 50 degrees F and 70 degrees F. Limit stacking tile to five cartons high in straight tiers. Do not place heavy weight on top of cartons. Handle cartons carefully and do not drop.

1.4 PROJECT CONDITIONS

A. Store all resilient flooring, base, adhesives and accessories on flat surfaces in a spaces maintained with a temperature range recommended by the manufacturer, but not less than 50 degrees F nor more than 90 degrees F.
B. Environmental Requirements
   1. Maintain temperature in spaces to receive resilient flooring, base, adhesives with a temperature range recommended by the manufacturer, but not less than 70 degrees F nor more than 95 degrees F for not less than 48 hours before, during and 48 hours after installation.

2. Maintain ambient minimum temperature of 55 degrees F and maximum ambient temperature of 95 degrees F thereafter.

C. Protect finished flooring, base and accessories from staining, marring or other physical damage by work of other trades. Cover or mask surfaces as required. Avoid all traffic on finished flooring for a minimum of 24 hours after installation, and restrict to light foot traffic for the following 24 hours.

1.5 QUALITY CRITERIA

A. Variations in substrate shall not exceed ⅛" in 10'-0". Leveling of substrate shall be accomplished using a latex underlayment to fill in low areas.

B. Do not install resilient flooring over defective surfaces. Beginning resilient flooring installation shall be construed as the installers acceptance of the existing substrate and conditions of the work. The resilient flooring installer shall report in writing to the General Contractor any condition which will prevent a satisfactory resilient flooring installation.

C. Concrete surface pH Range shall be between 5 and 9 when subfloor is wetted with potable water and paper is applied.

D. Prior to installation test all concrete slabs that are to receive resilient flooring for moisture emission and relative humidity levels using the following methods:

1. In accordance with ASTM F 1869, Calcium Chloride Method for concrete slabs on grade and elevated concrete slabs. This test is not valid for lightweight aggregate concrete. Provide 3 tests minimum for each area of floor slab of up to 1,000 sf. For each area of floor slab tested provide one additional test for each additional 1,000 sf of concrete slab surface. Concrete subfloor moisture emission rate shall not be more than 3 lb. / 1000 sf / 24 hours in accordance with a calcium chloride moisture test CRI 104 / ASTM F 1869, 62.2.
2. In accordance with ASTM F 2170, In-situ Relative Humidity Testing for slabs-on-grade and elevated concrete slabs. Provide 3 tests minimum for each area of floor slab of up to 1,000 sf. For each area of floor slab tested provide one additional test for each additional 1,000 sf of concrete slab surface. Concrete slab relative humidity shall not exceed 75% or levels as recommended by the adhesive manufacturers.
3. If the Moisture Vapor Emission Rate (MVER) or the Relative Humidity (RH) of the slab exceeds the allowable levels a Vapor Reduction Membrane System shall be installed.
4. Note that a Unit Price per Square foot of installed Vapor Reduction Membrane System is required to be submitted on the Bid Form for two Vapor Reduction Membrane Systems. Submit a cost for the following systems:
   a. System 1
      (1) Vapor Reduction Membrane System to lower the MVER of a concrete slab of up to 12 lbs / 1,000 sf / 24 hours down to 3 lbs / 1,000 sf / 24 hours.
   b. System 2
      (1) Vapor Reduction Membrane System to lower the MVER of a concrete slab of above 12 lbs / 1,000 sf / 24 ours down to 3 lbs / 1,000 sf / 24 hours.
5. Use of the unit pricing presumes full compliance with the specified concrete slab installation requirements including proper curing and joint installation.

E. Engage an installer who employs workers for this Project who are trained or certified by resilient flooring manufacturer for installation techniques required, with minimum three years of successful experience.
F. All resilient flooring products specified herein and indicated on the working drawings shall comply with the following regulatory requirements:
   1. Fire-Test-Response Characteristics shall be as determined by testing identical products in accordance with ASTM E648 or NFPA 253 by a qualified testing agency.
   2. Critical Radiant Flux Classification shall be Class I.
   3. Smoke Density shall comply with ASTM E662 or NFPA 258.

1.6 MAINTENANCE MATERIAL
A. Provide 2% extra materials for all products specified herein and indicated on the working drawings. All materials shall be in the manufacturer's original packaging identified with labels describing contents.

1.7 GUARANTEE
A. Material manufacturers shall guarantee that material shall be free from defects in materials and workmanship for a period of one year from Date of Substantial Completion. Materials shall be free from manufacturing defects and discoloration due to mold, mildew and algae for a period of five years from the date of Substantial Completion.

II. PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS
A. All resilient flooring products specified herein shall match those defined on the Interior Design Finish Index.

2.2 TRANSITION EDGES
A. Color and finish shall match adjacent surface.
B. Reference Interior Design Drawings for information concerning material transition strips and tile termination strips required.

2.3 RESILIENT BASE
A. Acceptable relilient base products shall match those defined on the Interior Design Finish Index.
   1. Resilient base shall comply with the following criteria:
      a. Thickness shall be as defined in the Finish Index.
      b. Base shall be provided in coils in the manufacturers standard lengths.
      c. Outside and inside corners shall be preformed. Job mitering of corners will not be permitted.

2.4 VAPOR REDUCTION MEMBRANE SYSTEM
A. Vapor Reduction Membrane System shall be a product specifically manufactured for installation beneath resilient flooring installed on a concrete slab with high levels of RH or MVER prior to resilient flooring application.
B. Acceptable products shall include the following:
   1. Latapoxy 312 Vapor Reduction Membrane, 3-component epoxy system.

2. Mapei “Planiseal EMB” Premium Epoxy Barrier for concrete substrates, 2-part epoxy system.

2.5 APPLICATION MATERIALS

A. Concrete slab primer shall be non-staining type as recommended by resilient flooring manufacturer.

B. Sealers which may be required over cementious flooring substrates prior to adhesive application shall be as recommended by the resilient flooring manufacturer.

C. Adhesives shall be non-toxic, low odor and solvent free with no alcohol, glycol, or ammonia. Adhesive shall be antimicrobial with no hazardous vapors and contain no carcinogenic materials, in accordance with OSHA Regulation 29 CFR 1910-1200. All containers shall include material safety data sheets (MSDS) and be available at jobsite for inspection. Provide and install adhesives recommended for intended installation, as approved by the resilient flooring manufacturer.

D. Trowelable leveling and patching compounds shall be latex-modified, portland cement-based or blended hydraulic cement-based formulations provided or approved by the resilient product manufacturers for the proposed applications.

E. Provide and apply waxes and cleaners recommended by resilient flooring manufacturer for the particular type of material and installation.

F. Contractor shall ensure compatibility of all primers, sealers and adhesives proposed with the vapor reduction membrane system.

III. PART 3 - EXECUTION

3.1 PREPARATION

A. The subfloor shall be clean, dry, smooth and structurally sound. Remove dirt, oil, grease and other foreign matter from surfaces to receive resilient flooring and accessories. Vacuum substrate immediately prior to installation.

B. Examine the substrates with the installer present for compliance with the specified requirements for maximum moisture content and other conditions which may affect the performance of the work specified herein. Verify that the substrate finishes comply with the specified tolerances and other requirements specified herein. All substrates shall be free of cracks, ridges, depressions, scale and foreign deposits which may interfere with the application of the products specified herein. Proceed with installation only after unsatisfactory conditions have been resolved. Installation of the products specified herein indicates acceptance of all substrate conditions.

C. Prepare substrates in accordance with the manufacturers written instructions to ensure successful installation of the specified products.

D. Prepare concrete substrates in accordance with the requirements of ASTM F170. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring manufacturer. Do not use solvents.

E. Apply vapor reduction membrane system to slab areas where required following applicable testing specified herein. Contractor shall ensure

compatibility of all primers and adhesives with vapor reduction membrane system.

F. Fill cracks, holes and depressions in substrates with trowelable leveling and patching compound. Remove bumps and ridges to produce a uniform and smooth substrate.
G. Prime surfaces and test substrate as recommended by resilient flooring and adhesive manufacturer.
H. Apply the appropriate sealers to cementitious underlayment flooring prior to adhesive application if recommended by the resilient flooring manufacturer.
I. Only install products specified herein after all other finishing operations, including painting, have been completed.
J. All areas to receive resilient flooring shall be acclimated for a minimum of 3 weeks with HVAC in operation prior to resilient flooring installation. The subfloor and room temperature, as well as flooring materials and adhesive, shall be maintained at 65°- 85° F, and the humidity below 65% for 48 hours prior to, during, and after the installation.
K. Close spaces to pedestrian traffic during, and 48 hours after, resilient flooring installation.

3.2 APPLICATION OF ADHESIVES

A. Apply nonstaining concrete slab primer as recommended by flooring manufacturer.
B. Apply sealer to cementitious substrate surfaces prior to adhesive application if recommended by the resilient flooring manufacturer.
C. Contractor shall ensure compatibility of the primer, sealer and adhesives proposed with the vapor reduction membrane system.
D. Mix and apply adhesives to substrate with notched trowel or other tools in accordance with manufacturer's printed instructions.
E. Provide adequate ventilation and other safety precautions during mixing and application of adhesive as recommended by adhesive manufacturer.
F. Apply adhesive only to that area which can be covered by resilient material within the recommended working time of the adhesive.
    1. Remove adhesive which dries or films over.
    2. Do not soil walls, bases or adjacent areas with adhesives.
    3. Remove spilled or misplaced materials.

3.3 RESILIENT FLOORING INSTALLATION

A. Test substrate and install resilient flooring in accordance with the resilient flooring manufacturers written recommendations.
B. Cut resilient flooring to fit within 1/32" of abutting surfaces. Butt tightly to vertical surfaces and edges.
C. Install tiles starting at the geometric center of each room in the configurations indicated on the working drawings. Tiles shall be installed such that there are no edge tiles less than ½ tile width at the room perimeter.
D. Fit flooring material into recesses, against bases, around pipes and penetrations, under saddles and thresholds and around built-in casework and equipment. Extend flooring into toe spaces of base cabinets.
E. Lay adjacent tiles with grain or pattern running in the same direction. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged. Cut neatly in all around all fixtures. Broken cracked, chipped, or deformed tiles are not acceptable.

F. Provide continuous metal division strips at all points of intersection between resilient tile and non-resilient types of flooring which finish flush with resilient tile, except where quartz or aluminum thresholds are required. Cut strips to exact required lengths. Division strips at doorways shall center under the doors. Piercing of division strips will not be allowed.
G. All resilient flooring shall be installed in strict compliance with manufacturer's instructions.
H. Flooring terminations at doors shall be under the doors.

3.4 INSTALLATION OF ACCESSORIES

A. Workmanship
1. All installations shall comply with the manufacturers written installation instructions.
2. Unroll base material and cut into lengths for minimum number of joints. Double cut adjoining lengths.
3. Install base with tight butt joints with no joint widths greater than 1/64".
4. Base shall be set plumb, level and straight with a full backing of adhesive.
5. Apply adhesive and adhere base to wall surfaces, columns, pilasters, casework and cabinets in toe spaces and other permanent fixtures in areas where base is required.
6. Install base in the longest practical length without seam gaps and with tops of adjacent sections aligned.
7. Base shall be tightly adhered to substrate throughout the length of each piece with the base in continuous contact with horizontal and vertical substrates.
8. Do not stretch the base during installation.
9. Fill voids along the top edge of base at irregular substrates with the manufacturers recommended adhesive filler material.
10. Press down so that bottom edge follows floor profile.
11. Form inside and outside corners using premolded material. Install all preformed corners prior to straight sections.
12. Scribe base to abutting materials.

3.5 CLEANING AND FINISHING

A. Upon completion of resilient flooring and accessory installations, clean surfaces using a neutral cleaner acceptable to material manufacturers.
B. Finishing
1. Remove factory finish from resilient tile floors using a product equal to Johnson Wax Company's "Step Off Stripper". This material must be used in strict accordance with the manufacturer's instructions.
2. Reseal resilient tile floors with two (2) coats of a product equal to Johnson Wax Company's "Over and Under" sealing material. Apply in accordance with the manufacturer's instructions. Allow ½ hour drying time between coats.
3. Apply two (2) coats of a product equal to Johnson Wax Company's "Complete" over sealed resilient tile floors. Install material in accordance with the manufacturer's instructions, allowing a minimum of 1 hour drying time between coats. Do not apply a second coat of finish until the first coat is thoroughly dry.

4. After installation and until the Date of Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 50 deg F or more than 85 deg F.
5. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period until the Date of Final Completion. Use protection methods indicated or recommended by manufacturer of resilient product installed.

END OF SECTION

SECTION 16 502

I. PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Digital-network lighting control system and associated components:
   1. Fluorescent electronic dimming ballasts.
   2. LED drivers.
   3. Power interfaces.
   4. Lighting control modules (Lutron Energi Savr Node).
   5. DIN rail power modules.
   6. Digital dimming ballast and switching modules (Lutron EcoSystem).
   7. Lighting management hubs.
   8. Lighting management system software.
   9. Control stations.
   10. Low-voltage control interfaces.
   11. Wired sensors.
   12. Wireless sensors.

1.2 RELATED REQUIREMENTS

A. Building automation system, for interface with lighting control system.
B. Section 16140 - Wiring Devices - Lutron:
   1. Finish requirements for wall controls specified in this section.
   2. Accessory receptacles and wallplates, to match lighting controls specified in this section.
C. Section 16500 - Luminaires, Ballasts, and Drivers - Lutron.
D. Section 16500 - Luminaires, Lamps, and Accessories - Ketra: Tunable LED luminaires/lamps for interface with lighting control system.
E. Section 16780: Audio-video system, for interface with lighting control system.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.
B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2017.
C. ANSI/ESD S20.20 - Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices); 2014.
D. ASTM D4674 - Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments; 2019.
E. CAL TITLE 24 P6 - California Code of Regulations, Title 24, Part 6 (California Energy Code); 2016.
F. CSA C22.2 No. 223 - Power Supplies with Extra-low-voltage Class 2 Outputs; 2015 (Updated 2017).

G. IEC 60669-2-1 - Switches for Household and Similar Fixed Electrical Installations - Part 2-1: Particular Requirements - Electronic Switches; 2015.
H. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015.
I. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.
J. IEC 61000-4-5 - Electromagnetic Compatibility (EMC) - Part 4-5: Testing and Measurement Techniques - Surge Immunity Test; 2014, with Amendments, 2017.
K. IEC 61347-2-3 - Lamp Control Gear - Part 2-3: Particular Requirements for A.C. and/or D.C. Supplied Electronic Control Gear for Fluorescent Lamps; 2016
L. IEEE 1789 - Recommended Practice for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers; 2015.
M. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
N. ISO 9001 - Quality Management Systems-Requirements; 2015.
O. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
P. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
Q. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2016.
R. NEMA SSL 7A - Phase Cut Dimming for Solid State Lighting: Basic Compatibility; National Electrical Manufacturers Association; 2015.
S. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2015).
T. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
U. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.
V. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
W. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
X. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
Y. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
Z. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
AA. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.
BB. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.
CC. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate placement of wall controls with actual installed door swings.
3. Coordinate placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
4. Where motorized window treatments are to be controlled by lighting control system provided under this section, coordinate work to provide compatible products.
5. Coordinate work to provide luminaires and lamps compatible with lighting controls to be installed.
6. Notify Architect of conflicts or deviations from contract documents to obtain direction prior to proceeding with work.

B. Preinstallation Meeting: Conduct on-site meeting with lighting control system manufacturer prior to commencing work as part of manufacturer's standard startup services. Manufacturer to review with installer:

1. Low voltage wiring requirements.
2. Separation of power and low voltage/data wiring.
3. Wire labeling.
4. Lighting management hub locations and installation.
5. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require deviation from locations indicated.
6. Control locations.
7. Computer jack locations.
8. Load circuit wiring.
9. Network wiring requirements.
10. Connections to other equipment.
11. Installer responsibilities.

C. Remote Prewire Visit; Lutron LSC-PREWIRE-RMTE: Include as part of base bid (2) additional 4-hour sessions of remote prewire support from Lighting Control Manufacturer.

D. Sequencing:

1. Do not install sensors and wall controls until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 100 - Special Project Procedures for submittal procedures.

B. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.

C. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.

D. Shop Drawings:
   1. Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.
   2. Provide detailed sequence of operations describing system functions.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. System Performance-Verification Documentation; Lutron LSC-SPV-DOC: Include as part of base bid additional costs for manufacturer's enhanced documentation detailing start-up performance-verification procedures and functional tests performed along with test results.

G. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in Part 3 under "COMMISSIONING".

H. Project Record Documents: Record actual installed locations and settings for lighting control system components.

I. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

J. Warranty: Provide sample of manufacturer's warranty as specified in Part 1 under "WARRANTY". Submit documentation of final execution completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at project site one copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:
   1. Company with not less than ten years of experience manufacturing lighting control systems of similar complexity to specified system.

2. Registered to ISO 9001, including in-house engineering for product design activities.
3. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.
4. Title 24 Acceptance Testing Technician Qualifications: Certified by California approved Acceptance Test Technician Certification Provider as Acceptance Test Technician (ATT) in accordance with CAL TITLE 24 P6.

D. Maintenance Contractor Qualifications: Manufacturer's authorized service representative.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.
   1. Lutron System Requirements, Unless Otherwise Indicated:
      a. Ambient Temperature:
         (1) Lighting Control System Components, Except Those Listed Below: Between 32 and 104 degrees F.
         (2) Fluorescent Electronic Dimming Ballasts: Between 50 and 140 degrees F.
      b. Relative Humidity: Less than 90 percent, non-condensing.

1.9 WARRANTY

A. See Section 01 700 - Contract Closeout for additional warranty requirements.

B. Use the following paragraph if there will be no manufacturer start-up, or use the standard warranty paragraph below if Lutron Startup services will be specified in Part 3 under "FIELD QUALITY CONTROL". Keep in mind however that without Lutron Startup services, warranty coverage is significantly reduced. Verify warranty details with manufacturer.

C. Manufacturer's Standard Warranty, Without Manufacturer Start-Up:
   1. Manufacturer Lighting Control System Components, Except Wireless Sensors, Ballasts/Drivers, and Ballast Modules: One year 100 percent parts coverage, no manufacturer labor coverage.
   2. Wireless Sensors: Five years 100 percent parts coverage, no manufacturer labor coverage.
   3. Ballasts/Drivers and Ballast Modules: Three years 100 percent parts coverage, no manufacturer labor coverage.

D. Manufacturer's Standard Warranty, With Manufacturer Start-Up; Lutron Standard 2-Year Warranty; Lutron LSC-B2:
1. Manufacturer Lighting Control System Components, Except Wireless Sensors, Ballasts/Drivers and Ballast Modules:
   a. First Two Years:
      (1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose lighting issue.
      (2) First-available on-site or remote response time.
      (3) Remote diagnostics for applicable systems.
   b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
2. Wireless Sensors: Five years 100 percent parts coverage, no manufacturer labor coverage.
3. Ballasts/Drivers and Ballast Modules: Five years 100 percent parts coverage, no manufacturer labor coverage.

II. PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Athena; www.lutron.com.
B. Other Acceptable Manufacturers:
1. Crestron
2. Acuity
3. Wattstopper
C. Substitutions: See Specification Section 01 630 - Product Options and Substitutions
1. Proposed substitutions (clearly delineated as such) must be submitted in writing for approval by Architect a minimum of 10 working days prior to bid date and must be made available to all bidders. Proposed substitutes must be accompanied by review of specification noting compliance on line-by-line basis.
2. Proposed substitutions to be reviewed by Architect at Contractor's expense at rate of $150 per hour.
3. By using pre-approved substitutions, Contractor accepts responsibility and associated costs for required modifications to related equipment and wiring. Provide complete engineered shop drawings (including power wiring) with deviations from original design highlighted in alternate color for review and approval by Architect prior to rough-in.
D. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.2 DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS

A. Sensor Layout and Tuning: Include as part of base bid additional costs for Lighting Control Manufacturer's Sensor Layout and Tuning service; Lutron LSC-SENS-LT:
   1. Lighting Control Manufacturer to take full responsibility for wired or wireless sensor layout and performance for sensors provided by Lighting Control Manufacturer.
   2. Lighting Control Manufacturer to analyze reflected ceiling plans, via supplied electronic AutoCAD format, and design detailed sensor layout that provides adequate occupancy sensor coverage and ensures occupancy and daylight sensor performance per agreed upon sequence of operations. Contractor to utilize layouts for sensor placement.
   3. During startup, Lighting Control Manufacturer to direct Contractor regarding sensor relocation, as required, should conditions require deviation from locations specified in drawings.
   4. Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits within one calendar year from Date of Substantial Completion to fine-tune sensor calibration per agreed upon sequence of operations.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. as suitable for purpose indicated.

C. Unless specifically indicated to be excluded, provide required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for complete operating system that provides control intent indicated.

D. Shade Control Requirements:
   1. Capable of operating shades and recalling shade presets via keypad, contact closure input, lighting management system software, or other lighting control system interface.
   2. Capable of operating any individual, group, or subgroup of shade electronic drive units within system without requiring separate group controllers.
   3. Capable of assigning and reassigning individual, groups, and subgroups of shades to any control within system without requiring additional wiring or hardware changes.
   4. Capable of controlling shade speed for tracking within plus or minus 0.125 inch throughout entire travel.

5. Provide 10-year power failure memory for preset stops, open and close limits, shade grouping and sub grouping and system configuration.
6. Capable of synchronizing multiple shade electronic drive units to start, stop, and move in unison.
7. Capable of stopping shades within accuracy of 0.125 inch at any point between open and close limits.
8. Capable of storing up to 250 programmable stop points, including open, close, and any other position.
9. Capable of controlling lights and shades from single wall control button.
10. Capable of adjusting shade limits from user interface.

E. Design lighting control equipment for 10-year operational life while operating continually at any temperature in ambient temperature range of 32 degrees F to 104 degrees F and 90 percent non-condensing relative humidity.

F. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

G. Dimming and Switching/Relay Equipment:
1. Designed so that electrolytic capacitors operate at least 36 degrees F below capacitor's maximum temperature rating when device is under fully loaded conditions at maximum rated temperature.
2. Inrush Tolerance:
   a. Utilize load-handling thyristors (SCRs and triacs), field effect transistors (FETs) and isolated gate bipolar transistors (IGBTs) with maximum current rating at least two times rated operating current of dimmer/relay.
   b. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer/relay.
3. Surge Tolerance: Designed and tested to withstand surges of 6,000 V, 200 amps according to IEEE C62.41.2 without impairment to performance.
4. Power Failure Recovery: When power is interrupted and subsequently restored, within 3 seconds lights to automatically return to same levels, e.g. dimmed setting, full on, or full off, as prior to power interruption.
5. Dimming Requirements:
   a. Line Noise Tolerance: Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage (plus or minus 2 percent change in RMS voltage per cycle), frequency shifts (plus or minus 2 Hz change in frequency per second), dynamic harmonics, and line noise.
      (1) Systems not providing integral cycle-by-cycle compensation to include external power conditioning equipment as part of dimming system.
   b. Incorporate electronic "soft-start" default at initial turn-on that smoothly ramps lights up to appropriate levels within 0.5 seconds.
   c. Utilize air gap off to disconnect load from line supply.

d. Control light sources in smooth and continuous manner. Dimmers with visible steps are not acceptable.
e. Load Types:
(1) Assign load type to each dimmer that will provide proper dimming curve for specific light source to be controlled.
(2) Provide capability of being field-configured to have load types assigned per circuit.
f. Minimum and Maximum Light Levels: User adjustable on circuit-by-circuit basis.
g. Line Voltage Dimmers:
(1) Dimmers for Magnetic Low Voltage (MLV) Transformers:
(a) Provide circuitry designed to control and provide symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472.
(b) Dimmers using unipolar load current devices, e.g. FETs or SCRs, to include DC current protection in event of single device failure.
(2) Dimmers for Electronic Low Voltage (ELV) Transformers: Operate transformers via reverse phase control. Alternately, forward phase control dimming may be used if dimming equipment manufacturer has recommended specific ELV transformers being provided.
(3) Dimmers for Neon and Cold Cathode Transformers:
(a) Magnetic Transformers: Listed for use with normal (low) power factor magnetic transformers.
(b) Electronic Transformers: Must be supported by ballast equipment manufacturer for control of specific ballasts being provided.

6. Switching Requirements:
a. Rated Life of Relays: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
b. Switch load in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
c. Provide output fully rated for continuous duty for inductive, capacitive, and resistive loads.

H. Device Finishes:
1. Wall Controls: Match finishes specified for wiring devices in Section 16140, unless otherwise indicated on drawings.
2. Standard Colors: Comply with NEMA WD1 where applicable.
3. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
4. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

2.3 FLUORESCENT ELECTRONIC DIMMING BALLASTS

A. General Requirements:
1. Designed for 10-year operational life while operating at maximum case temperature and 90 percent noncondensing relative humidity.
2. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
3. Lamp Starting Method: Programmed rapid start.
4. Maximum Inrush Current: 7 amperes for 120V ballasts and 3 amperes for 277V ballasts.
5. Current Crest Factor (CCF): Less than 1.7.
6. Comply with ANSI C82.11 and list and label as complying with UL 935.
7. Designed to not interfere with infrared devices operating at frequencies between 38 kHz and 42 kHz.
8. Manufactured in facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
9. Inaudible in 27 dBA ambient.
10. No visible change in light output with variation of plus or minus 10 percent line voltage input.
11. Actively prevent overheating in T5-HO linear fluorescent lamp applications.
12. Ballasts to track evenly across multiple lamp lengths and all light levels.
13. Comply with IEC 61347-2-3 as applicable.

B. 3-Wire Control:
1. Provide integral fault protection to prevent ballast failure in event of miswire.

C. Digital Control:
1. Monitor and report lamp and ballast status.
2. Lights automatically return to setting prior to power interruption.
3. Averages two independent daylight harvesting inputs internally.
4. Responds to digital load shed command, i.e. if light output is at 30 percent and load shed command of 10 percent is received, ballast automatically sets maximum light output at 90 percent and lowers current light output by three percent to 27 percent.

D. Products:
1. 3-Wire Control, One Percent Dimming; Lutron Hi-lume:
a. Dimming Range: 100 percent to one percent relative light output for T4 compact and T5-HO lamps.
b. Surge Tolerance: Designed and tested to withstand Category A surges of 6,000 V according to IEEE C62.41.2 without impairment of performance.
c. Total Harmonic Distortion (THD): Less than 10 percent.

2. 3-Wire and Digital Control, One Percent Dimming; Lutron Hi-lume 3D:
   a. Dimming Range: 100 percent to less than one percent relative light output for T8, T5 and T5HO, and five percent relative light output for T5 twin-tube lamps.
   b. Surge Tolerance: Designed and tested to withstand Category A surges of 6,000 V according to IEEE C62.41.2 without impairment of performance.
   c. Total Harmonic Distortion (THD): Less than 10 percent typical (15 percent for select models).
3. 3-Wire and Digital Control, Ten Percent Dimming; Lutron EcoSystem:
   a. Dimming Range: 100 to ten percent relative light output for T8, T5, T5HO, and T5 twin-tube, and five percent relative light output for T4 compact lamps.
   b. Surge Tolerance: Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
   c. Total Harmonic Distortion (THD): Less than 10 percent typical (15 percent for select models).
4. Digital Control, One Percent Dimming; Lutron EcoSystem H-Series:
   a. Dimming Range: 100 to less than one percent relative light output for T8, and one percent relative light output for T5 and T5HO lamps.
   b. Surge Tolerance: Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.\
   c. Total Harmonic Distortion (THD): Less than 10 percent typical (15 percent for select models).

2.4 LED DRIVERS

A. General Requirements:
1. Operate for at least 50,000 hours at maximum case temperature and 90 percent noncondensing relative humidity.
2. Provide thermal protection by automatically reducing power output to protect LED driver and LED light engine/fixture from damage due to over-temperature conditions that exceed the LED driver's maximum operating temperature at calibration point (tc).
3. Provide integral recording of operating hours and maximum operating temperature to aid in troubleshooting and warranty claims.
4. Designed and tested to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
5. Manufactured in facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
6. UL 8750 recognized or listed as applicable.
7. UL Type TL rated or UL Class P listed where possible to allow for easier fixture evaluation and listing of different driver series.
8. Suitable for field replacement as applicable; listed in accordance with UL 1598C or UL 8750, Class P as indicated.

9. Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
10. Class A sound rating; Inaudible in 27 dBA ambient.
11. Demonstrate no visible change in light output with variation of plus or minus 10 percent change in line-voltage input.
12. LED drivers of same family/series to track evenly across multiple fixtures at all light levels.
13. Offer programmable output currents in 10 mA or smaller increments within designed driver operating ranges for custom fixture length and lumen output configurations, while meeting low-end dimming range of 100 to 0.1 percent, 100 to 1 percent or 100 to 5 percent as applicable.
14. Meet NEMA 410 inrush requirements for mitigating inrush currents with solid state lighting sources.
15. Employ integral fault protection up to 277 V to prevent LED driver damage or failure in event of incorrect application of line-voltage to communication link inputs.
16. LED driver may be remote located up to 100 feet (30 m) from LED light engine depending on power outputs required and wire gauge utilized by installer.

B. 3-Wire Control:
1. Provide integral fault protection to prevent driver failure in event of miswire.
2. Operate from input voltage of 120 V through 277 V at 50/60 Hz.

C. Digital Control (when used with compatible Lutron lighting control systems):
1. Employ power failure memory; LED driver to automatically return to previous state/light level upon restoration of utility power.
2. Operate from input voltage of 120 V through 277 V at 50/60 Hz.
3. Automatically go to 100 percent light output upon loss of control link voltage and lock out system commands until digital control link voltage is restored. Manufacturer to offer UL 924 compliance achievable through use of external Lutron Model LUT-ELI-3PSH interface upon request.
4. Responds to digital load shed command, i.e. if light output is at 30 percent and load shed command of 10 percent is received, ballast automatically sets maximum light output at 90 percent and lowers current light output by three percent to 27 percent.
5. Digital low-voltage control wiring capable of being wired as either Class 1 or Class 2.

D. Products:
1. Digital Control, 0.1 Percent Dimming with Soft-On and Fade-to-Black Low End Performance; Lutron Hi-lume Premier 0.1% Constant Voltage (L3D0-Series):
   a. Dimming Range: 100 to 0.1 percent measured output current.
   b. Features smooth fade-to-on and fade-to-black (Lutron Soft-On, Fade-to-Black™) low end dimming performance for incandescent-like dimming experience.

c. Typically dissipates 0.25 W standby power at 120 V and 0.40 W standby power at 277 V.
d. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277 V and residential applications at 120 V.
e. Total Harmonic Distortion (THD): Less than 20 percent at maximum power; complies with ANSI C82.11.
f. Class 2 output designed to withstand hot swap of LED loads; meets UL 1310 and CSA C22.2 No. 223.
g. Driver outputs to be short-circuit protected, open-circuit protected, and overload protected.
h. Constant Voltage Drivers:
(1) Support for cove and under-cabinet fixtures at 24 V.
(a) Support LED arrays from 2 W to 96 W.
(b) Pulse Width Modulation (PWM) dimming frequency meets IEEE 1789.
(c) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
(d) UL listed.

2. 3-Wire Control, 0.1 Percent Dimming; Lutron Hi-lume Premier 0.1% Constant Voltage (L3D0-Series):
a. Dimming Range: 100 to 0.1 percent measured output current.
b. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277 V and residential applications at 120 V.
c. Total Harmonic Distortion (THD): Less than 20 percent at maximum power; complies with ANSI C82.11.
d. UL Class 2 output designed to withstand hot swap of LED loads.
e. Driver outputs to be short-circuit protected, open-circuit protected, and overload protected.
f. Constant Voltage Drivers:
(1) Support for cove and under-cabinet fixtures at 24 V.
(a) Support LED arrays from 2 W to 96 W.
(b) Pulse Width Modulation (PWM) dimming frequency meets IEEE 1789.
(c) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
(d) UL listed

3. Digital Control, 0.1 Percent Dimming with Soft-On and Fade-to-Black Low End Performance; Lutron Hi-lume Premier 0.1% Constant Current (PEQ0-Series):
a. Dimming Range: 100 to 0.1 percent measured output current.

b. Features smooth fade-to-on and fade-to-black (Lutron Soft-On, Fade-to-Black™) low end dimming performance for incandescent-like dimming experience.
c. Typically dissipates less than 0.5 W standby power at 120/277 V.
d. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120/277 V.
e. Class 2 output designed to withstand hot swap of LED loads; meets UL 1310 and CSA C22.2 No. 223.
f. Driver outputs to be short-circuit protected and open-circuit protected.
g. Constant Current Drivers:
(1) Support for downlights and pendant fixtures from 150 mA to 1.05 A to ensure compatible driver exists.
(a) Support LED arrays up to 20 W.
(b) Constant Current Reduction (CCR) dimming method.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
(2) Support for troffers, linear pendants, and linear recessed fixtures from 150 mA to 1.05 A to ensure compatible driver exists.
(a) Support LED arrays up to 20 W.
(b) Constant Current Reduction (CCR) dimming method.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

4. Digital Control, 1 Percent Dimming with Soft-On and Fade-to-Black Low End Performance; Lutron Hi-lume Premier 1% Constant Current (PEQ1-Series):
a. Dimming Range: 100 to 1 percent measured output current.
b. Features smooth fade-to-on and fade-to-black (Lutron Soft-On, Fade-to-Black™) low end dimming performance for incandescent-like dimming experience.
c. Typically dissipates less than 0.5 W standby power at 120/277 V.
d. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120/277 V.
e. Class 2 output designed to withstand hot swap of LED loads; meets UL 1310 and CSA C22.2 No. 223.
f. Driver outputs to be short-circuit protected and open-circuit protected.

g. Constant Current Drivers:
(1) Support for downlights and pendant fixtures from 150 mA to 1.05 A to ensure compatible driver exists.
(a) Support LED arrays up to 20 W.
(b) Constant Current Reduction (CCR) dimming method.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
(2) Support for troffers, linear pendants, and linear recessed fixtures from 150 mA to 1.05 A to ensure compatible driver exists.
(a) Support LED arrays up to 20 W.
(b) Constant Current Reduction (CCR) dimming method.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

5. Forward Phase (Neutral Wire Required), One Percent Dimming; Lutron Hi-lume 1% (LTE-Series):
a. Dimming Range: 100 to one percent relative light output.
b. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial and residential applications at 120 V.
c. Total Harmonic Distortion (THD): Less than 20 percent at full output for 40 W loads; complies with ANSI C82.11.
d. Constant Current Drivers:
(1) Support for downlights and pendant fixtures from 200 mA to 2.1 A to ensure compatible driver exists.
(a) Support LED arrays up to 40 W.
(b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.
(2) Support for troffers, linear pendants, and linear recessed fixtures from 200 mA to 2.1 A to ensure compatible driver exists.
(a) Support LED arrays up to 40 W.
(b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.

(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

(3) Support for cove and under-cabinet fixtures from 200 mA to 2.1 A to ensure compatible driver exists.
(a) Support LED arrays up to 40 W.
(b) Pulse Width Modulation (PWM) or Constant Current Reduction (CCR) dimming methods available.
(c) UL listed.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

e. Constant Voltage Drivers
(1) Support for downlights and pendant fixtures from 10 V to 60 V (in 0.5 V steps) to ensure compatible driver exists.
(a) Support LED arrays up to 40 W.
(b) Pulse Width Modulation (PWM) dimming method.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

(2) Support for troffers, linear pendants, and linear recessed fixtures from 10 V to 60 V (in 0.5 V steps) to ensure compatible driver exists.
(a) Support LED arrays up to 40 W.
(b) Pulse Width Modulation (PWM) dimming method.
(c) UL listed Class P.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

(3) Support for cove and under-cabinet fixtures from 10 V to 60 V (in 0.5 V steps) to ensure compatible driver exists.
(a) Support LED arrays up to 40 W.
(b) Pulse Width Modulation (PWM) dimming method.
(c) UL listed.
(d) Meets solid state requirements for power factor, transient protection, start time, and operating frequency in Energy Star for Luminaires Version 2.0.

6. Digital Control, Five Percent Dimming; Lutron 5-Series (LDE5-Series):
   a. Dimming Range: 100 to five percent measured output current.
   b. Typically dissipates 0.2 W standby power at 120 V and 0.3 W standby power at 277 V.
   c. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277 V.
   d. Constant Current Reduction (CCR) dimming method.
   e. Total Harmonic Distortion (THD): Less than 21 percent at full load; complies with ANSI C82.11.
   f. Constant Current Drivers:
      (1) Lutron K-Case Form Factor: Support for downlights and pendant fixtures in currents from 220 mA to 1.4 A to ensure compatible driver exists.
         (a) Support LED arrays up to 40 W.
         (b) UL listed Class P.
      (2) Lutron M-Case Form Factor: Support for troffers, linear pendants, and linear recessed fixtures from 150 mA to 2.1 A to ensure compatible driver exists.
         (a) Support LED arrays up to 75 W.
         (b) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.0.
         (c) Models available to meet DesignLights Consortium (DLC) power line quality requirements.
         (d) UL listed Class P.
7. Digital Control, One Percent Dimming with Soft-On and Fade-to-Black Low End Performance; Lutron Hi-lume 1% Soft-on Fade-to-Black (LDE1-Series):
   a. Dimming Range: 100 to one percent measured output current.
   b. Features smooth fade-to-on and fade-to-black (Lutron Soft-On, Fade-to-Black™) low end dimming performance for incandescent-like dimming experience.
   c. Typically dissipates 0.2 W standby power at 120 V and 0.3 W standby power at 277 V.
   d. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120-277 V.
   e. Employs true Constant Current Reduction (CCR) dimming method from 100 to five percent light level and Pulse Width Modulation (PWM) dimming method from five percent to off.
   f. Pulse Width Modulation (PWM) frequency of 240 Hz.
   g. Total Harmonic Distortion (THD): Less than 20 percent at full output for drivers greater than 25 W; complies with ANSI C82.11.
   h. UL Class 2 output.

i. Driver outputs to be short-circuit protected, open-circuit protected, and overload protected.
j. Constant Current Drivers:
(1) Lutron K-Case Form Factor: Support for fixtures from 220 mA to 1.4 A over multiple operating ranges.
(a) Support LED arrays up to 40 W.
(b) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.0.
(c) UL listed Class P.
(2) Lutron M-Case Form Factor: Support for fixtures from 150 mA to 2.1 A over multiple operating ranges.
(a) Support LED arrays up to 75 W.
(b) Meets solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.0.
(c) Models available to meet DesignLights Consortium (DLC) power line quality requirements.
(d) UL listed Class P.

8. Digital Control, Tunable White, One Percent Dimming; Lutron T-Series (PSQ0-Series):
a. Dimming Range: 100 to one percent measured output current.
b. Support for tunable white fixtures with LED light sources having color temperatures between 1500 Kelvin and 6500 Kelvin.
c. Color temperature programmable in 50 Kelvin increments.
d. Output current programmable in 5 mA increments.
e. Dissipates less than 0.5 W standby power at 120 V and 277 V.
f. Complies with FCC requirements of CFR, Title 47, Part 15, for commercial applications at 120 and 277 V.
g. Employs true Constant Current Reduction (CCR) dimming method from 1.5A to 0.2A and Pulse Width Modulation (PWM) dimming method below 0.2A to off.
h. Pulse Width Modulation (PWM) frequency of 3.6 kHz
i. Total Harmonic Distortion (THD): Less than 20 percent at full output; complies with ANSI C82.11.
j. UL Class 2 output.
k. UL listed Class P.
l. Driver outputs to be short-circuit protected, open-circuit protected, and overload protected.
m. Constant Current Drivers:
(1) Support for fixtures from 200 mA to 1.5 A.
(a) Support LED arrays up to 50 W.

(b) Models available to meet solid state requirements for power factor, transient protection, standby power consumption, start time, and operating frequency in ENERGY STAR for Luminaires Version 2.1.

(c) Models available to meet DesignLights Consortium (DLC) V4.3 power line quality requirements.

2.5 POWER INTERFACES

A. Provide power interfaces as indicated or as required to control loads as indicated.

B. General Requirements:
1. Phase independent of control input.
2. Rated for use in air-handling spaces as defined in UL 2043.
3. Utilize air gap off to disconnect load from line supply.
4. Diagnostics and Service: Replacing power interface does not require reprogramming of system or processor.

C. Products:
1. Phase-Adaptive Power Module; Lutron PHPM-PA: Provides interface for phase control input to provide full 16 A circuit output of forward/reverse phase control for compatible loads.
2. 3-Wire Fluorescent Power Module; Lutron PHPM-3F: Provides interface for phase control input to provide full 16 A circuit output for compatible line-voltage control fluorescent electronic dimming ballasts or LED drivers.
3. Switching Power Module; Lutron PHPM-SW: Provides interface for phase control or switched input to provide full 16 A circuit output of switching for compatible nondim loads.
4. Phase-Adaptive Power Module with 3-Wire Fluorescent/LED Input; Lutron PHPM-WBX: Provides interface for fluorescent ballast/LED driver control input to provide full 16 A circuit output for compatible loads.
5. Ten Volt Interface; Lutron GRX-TVI: Provides interface for phase control input to provide full 16 A circuit output of switching and 0-10 V low voltage control for compatible fluorescent electronic dimming ballasts or LED drivers.

2.6 LIGHTING CONTROL MODULES (LUTRON ENERGI SAVR NODE)

A. Provide lighting control modules as indicated or as required to control loads as indicated.

B. General Requirements:
1. Listed to UL 508 as industrial control equipment.
2. Delivered and installed as listed factory-assembled panel.
3. Passively cooled via free-convection, unaided by fans or other means.
4. Mounting: Surface.
5. Connection without interface to wired:
   a. Occupancy sensors.
   b. Daylight sensors.
6. Connects to lighting management hub via RS485.

7. LED status indicators confirm communication with occupancy sensors and daylight sensors.
8. Contact Closure Input (select models):
    a. Directly accept contact closure input from dry contact closure or solid-state output without interface to:
        (1) Activate scenes.
            (a) Scene activation from momentary or maintained closure.
        (2) Enable or disable after hours.
            (a) Automatic sweep to user-specified level after user-specified time has elapsed.
            (b) System provides occupants visual warning prior to sweeping lights to user-specified level.
            (c) Occupant can reset timeout by interacting with lighting system.
        (3) Activate or deactivate demand response (load shed).
            (a) Load shed event reduces lighting load by user-specified amount.
9. Emergency Contact Closure Input:
    a. Turn all zones to full output during emergency state via direct contact closure input from UL 924 listed emergency lighting interface, security system or fire alarm system.
    b. Allow configurable zone response during emergency state.
    c. Disable control operation until emergency signal is cleared.
10. Supplies power for control link for keypads and control interfaces (select models).
11. Distributes sensor data among multiple lighting control modules.
12. Capable of being controlled via wireless sensors and controls.

C. Switching Lighting Control Modules:
1. Products:
    a. Lutron SoftSwitch Energi Savr Node; Model QSN-4S16-S: 16 A continuous-use per channel.
    b. Lutron SoftSwitch Energi Savr Node; Model QSN-4S20-S: 20 A (16 A ballast) continuous-use per channel; capable of switching 20A receptacles.
2. Switching:
    a. Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
    b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
    c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
    d. Module to integrate up to four individually controlled zones.
    e. Utilize air gap off, activated when user selects "off" at any control to disconnect load from line supply.

D. Phase Adaptive Lighting Control Modules:
   1. Products:
      a. Lutron PRO LED+ Phase Adaptive Energi Savr Node; Model QSN-4A5-S; 4-zone.
         (1) Zone 1: Rated for incandescent/halogen (800 W, 120/277 V), electronic low voltage (800 W, 120/277 V), magnetic low voltage (800 VA/525 W, 120/277 V), or neon/cold cathode (800 VA/525 W, 120/277 V), Lutron Hi-lume 1% 2-wire LED Driver (120 V, maximum of 20 drivers), NEMA SSL 7A forward phase LED (400 W, 120 V), reverse phase LED (6.6 A at 120 V and 2.9 A at 277 V).
         (2) Zones 2 through 4: Each zone rated for incandescent/halogen (500 W, 120/277 V), electronic low voltage (500 W, 120/277 V), magnetic low voltage (500 VA/375 W, 120/277 V), or neon/cold cathode (500 VA/375 W, 120/277 V), Lutron Hi-lume 1% 2-wire LED Driver (120 V, maximum of 13 drivers), NEMA SSL 7A forward phase LED (200 W, 120 V), reverse phase LED (4.2 A at 120 V and 1.8 A at 277 V).
   2. Provides leading-edge or trailing-edge dimming; automatic or manual configuration.
   3. Output Zones: One load type per zone.
   4. Manual Mode Operation: Provide buttons to turn loads on/off or dim loads up/down for each zone.
   5. Manual Override Contact Closure Input: Provides activation of manual override mode; turns all loads on and disables control from other device.
   6. Provide cycle-by-cycle compensation for incoming line voltage variations, including changes in voltage, frequency shifts, harmonics, and line noise; accommodate up to plus/minus two percent change in frequency per second.
   7. Comply with NEMA SSL 7A.
   8. Capable of withstanding high-inrush LEDs, bulb blowouts, and direct shorts utilizing RTISS-ICM technology.

E. 0-10V Lighting Control Modules
   1. Products:
      a. Lutron 0-10V Energi Savr Node; Model QSN-4T16-S: 16 A continuous-use per channel.
      b. Lutron 0-10V Energi Savr Node; Model QSN2-4T16-S-347V: 16 A continuous-use per channel.
      c. Lutron 0-10V Energi Savr Node; Model QSN-4T20-S: 20 A (16 A ballast) continuous-use per channel; capable of switching 20A receptacles.
      d. Lutron 0-10V Energi Savr Node; Model QSN2-4T20-S: 20 A (16 A ballast) continuous-use per channel; capable of switching 20A receptacles.

2. Coordination Between Low Voltage Dimming Module and Line Voltage Relay: Capable of being electronically linked to single zone.
3. Single low voltage dimming module; capable of controlling the following light sources:
   a. 0-10V analog voltage signal.
      (1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
      (2) Sink current per IEC 60929.
   b. 10V-0V analog voltage signal.
      (1) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
      (2) Sink current per IEC 60929.
4. Switching:
   a. Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
   b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
   c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
   d. Module to integrate up to four individually controlled zones.
   e. Utilize air gap off, activated when user selects "off" at any control to disconnect load from line supply.

F. Digital Fixture Lighting Control Modules:
1. Products:
   a. One EcoSystem digital link; Lutron EcoSystem Energi Savr Node; Model QSN-1ECO-S.
   b. Two EcoSystem digital links; Lutron EcoSystem Energi Savr Node; Model QSN-2ECO-S.
   c. Two EcoSystem digital links; Lutron EcoSystem Energi Savr Node; Model QSN2-2ECO-S.
   d. Two T-Series digital links; independent correlated color temperature and light intensity control; Lutron T-Series Energi Savr Node; Model QSN-TW.
2. Provides two-way feedback with digital fixtures for energy monitoring, light level status, lamp failure reporting, and ballast/driver failure reporting.
3. Provide testing capability using manual test buttons
4. Each low-voltage digital communication link to support up to 64 addresses capable of NFPA 70 Class 1 or Class 2 installation.

G. DALI Lighting Control Modules:
1. Product: Lutron DALI Power Module; Model QSN-2DALUNV-S; provides bus power and control for two DALI buses.
2. Provide testing capability using manual test buttons.
3. Each DALI bus supports:
   a. Control of up to 64 DALI compliant addressable loads, grouped into up to 64 zones.
   b. Up to 250 mA bus power.

2.7 DIN RAIL POWER MODULES

A. Power Module General Requirements:
1. Surge Tolerance: Designed and tested to withstand surges of 6,000 V, 3,000 amps according to IEEE C62.41.2 and IEC 61000-4-5 without impairment to performance.
2. Power: 120 VAC, 50/60 Hz; provide connection as indicated or as required.
3. Communications: Utilize RS485 wiring for low-voltage communications link.
4. Passively cooled via free-convection, unaided by fans or other means.
5. Provide LED indicators for displaying diagnostic information.

B. Switching Power Modules:
1. Product(s): Lutron Switching Power Module; Model QSN-4S8-120-D; 4-zone.
2. Output Zones: Each zone rated at 8 A for resistive, inductive, or capacitive lighting loads as defined by IEC 60669-2-1 and NEMA 410, or 1/3 HP motor load; maximum of 16 A per module.
3. Manual Mode Operation: Provide buttons to turn loads on/off for each zone.
4. Emergency Contact Closure Input:
   a. Provides activation of emergency mode; turns all loads on and disables control from other devices
   b. UL 924 listed.
5. Contact Closure Output:
   a. Single contact closure output including both normally open and normally closed dry contacts.
   b. Maintained or momentary output.
   c. Inductive Loads: Provide flyback diode wired per manufacturer's instructions to control unclamped inductive loads such as relays, solenoids, and motors.

C. Phase Adaptive Power Modules:
1. Products:
   a. Lutron Adaptive Power Module; Model QSN-4A5-D; 4-zone.
      (1) Zone 1: Rated for incandescent/halogen (800 W, 120/277 V), electronic low voltage (800 W, 120/277 V), magnetic low voltage (800 VA/525 W, 120/277 V), or neon/cold cathode (800 VA/525 W, 120/277 V), Lutron Hi-lume 1% 2-wire LTE LED Driver (maximum of 20 drivers), NEMA SSL 7A forward phase LED (400 W, 120 V), reverse phase LED (6.6 A, 120 V; 2.9 A, 277 V).
      (2) Zones 2 through 4: Each zone rated for incandescent/halogen (500 W, 120/277 V), electronic low voltage (500 W, 120/277 V), magnetic low voltage (500 VA/375 W, 120/277 V), or neon/cold cathode (500 VA/375 W, 120/277 V), Lutron Hi-lume 1% 2-wire LED Driver (maximum of 13 drivers), NEMA SSL 7A

forward phase LED (200 W, 120 V), reverse phase LED (4.2 A, 120 V; 1.8 A, 277 V).

2. Provides forward phase or reverse phase dimming; automatic or manual configuration.
3. Output Zones: One load type per zone.
4. Manual Mode Operation: Provide buttons to turn loads on/off or dim loads up/down for each zone.
5. Emergency Contact Closure Input:
   a. Provides activation of emergency mode; turns all loads on and disables control from other devices.
   b. UL 924 listed.
6. Provide cycle-by-cycle compensation for incoming line variations, including changes in voltage, frequency, harmonics, and line noise; accommodate up to plus/minus two percent change in frequency per second.
7. Systems not providing cycle-by-cycle compensation to include external power conditioning equipment as part of dimming system.
8. Comply with NEMA SSL 7A.

D. 0-10 V Power Modules:
1. Product: Lutron 0-10 V Power Module; Model QSN-4T5-120-D; 4-zone.
2. Output Zones:
   a. Each zone provides 50 mA of 0-10 V dimming control conforming to IEC 60929 Annex E.2; source or sink automatically configures.
   b. Relay: Each zone rated for 5 A for switching of incandescent, electronic low voltage, magnetic low voltage, and LED lighting loads.
3. Manual Mode Operation: Provide buttons to turn loads on/off or dim loads up/down for each zone.
4. Emergency Contact Closure Input:
   a. Provides activation of emergency mode; turns all loads on and disables control from other devices.
   b. UL 924 listed.

E. Digital Fixture Control Modules:
1. Product: Lutron Power Module with EcoSystem; Model QSN-2ECO-120-D; two EcoSystem Digital Links.
2. Provide testing capability using manual test buttons.
3. Each low-voltage digital communication link to support up to 64 ballasts or LED drivers capable of NFPA 70 Class 1 or Class 2 installation.

F. DALI Fixture Control Modules:
1. Product: Lutron DALI Power Module; Model QSN-2DALUNV-D; provides bus power and control for two DALI buses.
2. Provide testing capability using manual test buttons.
3. Each DALI bus supports:
   a. Control of up to 64 DALI compliant addressable loads, grouped into up to 64 zones.
   b. Up to 250 mA bus power.

4. Contact Closure Input: Directly accept contact closure input from dry contact closure or solid-state output without interface.
5. Emergency Contact Closure Input:
    a. Provides activation of emergency mode; turns all loads on and disables control from other devices.
    b. UL 924 listed.

G. DIN Rail Feed-Through Panels: Provide as indicated or as required to house system components.
1. Rated for feed-through, 120/277 VAC applications.
2. Surface or flush mounting.
3. Products:
    a. Lutron Model PD2-S-ASM Factory Assembled Satellite Panel; 16 inches (40.7 cm) high, nominal; for housing up to two DIN rail power modules and one wire landing board.
    b. Lutron Model PD4-C-ASM Factory Assembled Control Panel; 42 inches (107 cm) high, nominal; for housing up to four DIN rail power modules, four wire landing boards, two power supplies, and two low-voltage interfaces or processors.
    c. Lutron Model PD6-S-ASM Factory Assembled Satellite Panel; 42 inches (107 cm) high, nominal; for housing up to six DIN rail power modules and one wire landing board.
    d. Lutron Model PD8-C-ASM Factory Assembled Control Panel; 65 inches (165 cm) high, nominal; for housing up to eight DIN rail power modules, four wire landing boards, two power supplies, and two low-voltage interfaces or processors.
    e. Lutron Model PD10-S-ASM-Factory Assembled Satellite Panel; 65 inches (165 cm) high, nominal; for housing up to ten DIN rail power modules and one wire landing board.

H. DIN Rail Breaker Panels: Provide as indicated or as required to house system components.
1. Rated for 120 VAC applications.
2. Surface or flush mounting.
3. 15 A and 20 A branch circuit breakers available.
4. Single-phase, 3-wire and three-phase, 4-wire feed types available.
5. Products:
    a. Lutron Model PD8-B-ASM Factory Assembled Breaker Panel; 65 inches (165 cm), nominal; for housing up to eight DIN rail power modules, eight branch circuit breakers, and one wire landing board.
    b. Lutron's EcoSystem® is a commercial lighting control system that is comprised of digitally addressable dimming ballasts, controls, and environmental sensors. These components provide businesses with energy savings from 40 to 70%, while increasing space flexibility, improving occupant comfort and productivity, and reducing maintenance costs.

2.8 DIGITAL DIMMING BALLAST AND SWITCHING MODULES (LUTRON ECOSYSTEM)

A. Provide digital dimming ballast and switching modules as indicated or as required to control loads as indicated.

B. General Requirements:

1. Provide continuous 3-wire signal dimming to compatible 3-wire electronic dimming ballasts.
2. Utilize air gap off to disconnect load from line supply.
3. Generate digital communication commands to distribute ballast and sensor data on digital bus.
4. If power is interrupted and subsequently restored, lights automatically return to setting prior to power interruption.
5. Unique internal reference number visible displayed on module cover.
6. Averages two independent daylight harvesting inputs internally.
7. Responds to digital load shed command.
   a. Sets high end trim.
   b. Automatically scales light output proportional to load shed command, i.e. if light output is at 30 percent and load shed command of 10 percent is received, ballast to automatically set maximum light output at 90 percent and lower current light output by 3 percent to 27 percent.
8. Provide integral fault protection to prevent ballast module failure in event of miswire.

C. Products:

1. 3-Wire Ballast Module, 2 Amp; Lutron EcoSystem Model C5-BMF-2A:
   a. Integrates up to 2 amps of 3-wire electronic dimming ballasts into EcoSystem digital control system as single zone.
2. 3-Wire Ballast Module, 16 Amp; Lutron EcoSystem Model C5-BMJ-16A:
   a. Integrates up to 16 amps of 3-wire electronic dimming ballasts into EcoSystem digital control system as single zone.
3. Switching Power Module, 16 Amp; Lutron EcoSystem Model C5-XPJ-16A:
   a. Integrates up to 16 amps of high in-rush lighting load (magnetic fluorescent ballast, electronic fluorescent ballast, HID, incandescent, magnetic low-voltage, electronic low-voltage, neon/cold cathode and motor loads) into EcoSystem digital control system as single zone.

2.9 LIGHTING MANAGEMENT HUBS

A. Products:

1. Lutron Athena Light Management Hub (QP5).
   a. 1-link hub; Lutron Model QP5-1L-POE; one Athena Edge processor and one QS link.

b. 2-link hub; Lutron Model QP5-2L-POE; one Athena Edge processor and two QS links.
c. 4-link hub; Lutron Model QP5-4L-POE; two Athena Edge processors and four QS links.

2. Lutron Athena Small Area Hub (QP6).
a. 1-link hub; Lutron Model QP6-1L; one Athena Edge processor and one QS link.

3. Accessories:
a. Ethernet range extender; Lutron Model Q-POE-PNL; required for connections that exceed 328 feet (100m) between hubs or to Athena Clear Connect Gateway - Type X wireless gateways; required for connection between Athena Small Area Hub (QP6) and Athena Clear Connect Gateway - Type X wireless gateway.
b. LTE modem; Lutron Model LUT-LTE-1; required where internet connection will not be available at time of system startup; supports connection of up to 16 Athena Edge processors via system Ethernet link.
c. Wire Landing Boards; Lutron Model QS-WLB: Provide as indicated or as required for terminating wiring.

B. Supports connection to QS wired devices via QS links; supports connection to Athena Edge processors and Athena Clear Connect Gateway - Type X wireless gateways via system Ethernet link.
C. Supports communication with Clear Connect - Type X wireless devices, including Ketra intelligent light sources, via Athena Clear Connect Gateway - Type X wireless gateways.
D. Supports internet connection for automated firmware updates and remote access, diagnostics, and service.
E. Provided in pre-assembled NEMA listed enclosure with terminal blocks listed for field wiring.
F. Connects to controls via RS485.
G. Integrates control station devices, shades, and external inputs into single customizable lighting control system with:
1. Multiple Failsafe Mechanisms:
a. Power failure detection via emergency lighting interface.
b. Protection: Lights go to full on if ballast wires are shorted.
c. Distributed architecture provides fault containment. Single hub failure or loss of power does not compromise lights and shades connected to other lighting management hubs.
2. Manual overrides.
3. Automatic control.
H. Furnished with astronomical time clock.
I. Maintains backup of programming in non-volatile memory capable of lasting more than ten years without power.

2.10 LIGHTING MANAGEMENT SYSTEM SOFTWARE

A. Include the following paragraph to ensure a single point of contact for system operation. Some interaction between hardware and software requires a high level of integration and compatibility.

B. Provide system software and hardware that is designed, tested, manufactured, and warranted by single manufacturer.

C. Configuration Setup Software:

1. Product: Lutron Athena Designer.
2. Suitable to make system programming and configuration changes.
3. Windows-based, capable of running on either central server or remote client over TCP/IP connection.
4. Back-Up Project Database: Allows user to back up project database that holds configuration information for system, including keypad programming, area scenes, daylighting, occupancy programming, emergency levels, night lights, and time clock.
5. Publish Project Database: Allows user to send new project database to processors and devices. Project database holds configuration information for system, including keypad programming, area scenes, daylighting, occupancy programming, emergency levels, night lights, and time clock.
6. Allows hotel management (with training) to:
   a. Capture system design:
      (1) Geographical layout.
      (2) Load schedule zoning.
      (3) Shade grouping.
      (4) Equipment schedule.
      (5) Equipment assignment to lighting management hubs.Daylighting design.
   b. Define configuration for the following in each area:
      (1) Lighting scenes.
      (2) Shade group presets.
      (3) Control station devices.
      (4) Interface and integration equipment.
      (5) Occupancy/after hours.
      (6) Partitioning.
      (7) Daylighting.
      (8) Emergency lighting.
      (9) Night lights.
   c. Startup:
      (1) Addressing.
      (2) Daylighting.
      (3) Provide customized conditional programming.

D. API Integration:

1. Support communication, without requiring interface, between lighting control system and third-party systems via RESTful API.
2. API Integration Capabilities:
   a. Discovery:
      (1) Areas: Area and scene names.

(2) Zones: Zone names, minimum and maximum light levels.
(3) Shade Groups: Shade group and preset names

b. Monitoring:
(1) Area Information:
(a) Occupancy status.
(b) Occupancy enabled.
(c) Lighting zone status.
(d) Active scene.
(e) Instantaneous and maximum lighting power.
(2) Zone Information:
(a) Light intensity.
(b) Switch level.
(c) Contact closure output status.
(d) Correlated color temperature, where controllable.

c. Control:
(1) Lighting Control:
(a) Activate scene.
(b) Set lighting zone level and correlated color temperature, where controllable.
(2) Shade Group Control:
(a) Set shade group level.
(b) Activate shade group preset.

E. Mobile Application:
1. Product: Lutron App.
2. Supports on-site and remote programming and control of multiple systems from iOS mobile device.
3. Supports 10,000 user accounts and 20 concurrent users.
4. Control:
a. Lighting Control:
(1) Modify lighting zone levels and activate scenes, reflected in space in real time.
(2) Make and save adjustments to scenes.
(3) Ketra Intelligent Light Sources:
(a) Control intensity, correlated color temperature, saturated color, and vibrancy, reflected in space in real time.
(b) Save adjustments to intensity, correlated color temperature, saturated color, and vibrancy to scenes.
b. Shade Group Control:
(1) Modify shade group levels and activate shade group presets, reflected in space in real time.
(2) Make and save adjustments to shade presets.
c. Make and save adjustments to timeclock events.

2.11 CONTROL STATIONS
A. Provide control stations with configuration as indicated or as required to control loads as indicated.
B. Touchscreen Control Stations:
1. Product: Lutron Athena Touchscreen; Model Q-TOUCH5.

2. Touchscreen Interface: 5-inch (127 mm) capacitive touch display; 800 x 400 resolution; touch gesture navigation support; dark and light user interface mode options.
3. Connects to lighting management hubs via system Ethernet link; powered by Athena QP5 hub or Q-POE-PNL Ethernet range extender; up to 5 touchscreens per processor; maximum of 328 ft (100 m) between touchscreen and lighting management hub with PoE switch or Ethernet range extender.
4. Control:
   a. Lighting Control: Area, scene, and zone-level control, including intensity, color temperature, and full color with fine-tune adjustment.
   b. Shade Control: Area-level control.
   c. Supports access control via admin and user PINs.
5. Programming: On-screen setup through user-guided interface; requires no additional software.
6. Global Language Support: English, Spanish, French, German, Italian, Portuguese, Simplified Chinese.

C. Wired Control Stations:
1. General Requirements:
   a. Power: Class 2 (low voltage).
   b. UL listed.
   c. Provide faceplates with concealed mounting hardware.
   d. Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.
2. Multi-Scene Wired Control:
   a. General Requirements:
      (1) Allows control of any devices part of lighting control system.
      (2) Allows for easy reprogramming without replacing unit.
      (3) Communications: Utilize RS485 wiring for low-voltage communication.
      (4) Engrave keypads with button, zone, and scene descriptions as indicated on drawings.
      (5) Software Configuration:
         (a) Customizable control station device button functionality:
            a) Buttons can be programmed to perform single defined action.

b) Buttons can be programmed to perform defined action on press and defined action on release.
c) Buttons can be programmed using conditional logic off of state variable such as time of day or partition status.
d) Buttons can be programmed to perform automatic sequence of defined actions.
e) Capable of deactivating select keypads to prevent accidental changes to light levels.
f) Buttons can be programmed for raise/lower of defined loads.
g) Buttons can be programmed to toggle defined set of loads on/off.

(6) Status LEDs:
(a) Upon button press, LEDs to immediately illuminate.
(b) LEDs to reflect true system status. LEDs to remain illuminated if button press was properly processed or LEDs to turn off if button press was not processed.
(c) Support logic that defines when LED is illuminated:
a) Scene logic (logic is true when all zones are at defined levels).
b) Room logic (logic is true when at least one zone is on).
c) Pathway logic (logic is true when at least one zone is on).
d) Last scene (logic is true when spaces are in defined scenes).

b. Wired Keypads; Lutron seeTouch QS Keypads
(1) Style: Architectural Non-Insert Style
(2) Communications: Utilize RS485 wiring for low-voltage communications link.
(3) Mounting: Wallbox or low-voltage mounting bracket; provide wall plates with concealed mounting hardware.
(4) Button/Engraving Backlighting:
(a) Utilize backlighting for buttons and associated engraving to provide readability under all light conditions.
(b) Backlight intensity adjustable via programming software.
(5) Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.

(6) Contact Closure Interface: Provide two contact closure inputs on back of unit which provide independent functions from front buttons; accepts both momentary and maintained contact closures.
(7) Terminal block inputs to be over-voltage and miswire-protected against wire reversals and shorts.

c. Wired Keypads; Lutron Architrave QS Keypads:
(1) Mounting: Wallbox; Lutron Architrave Wallbox; provide wall plates with concealed mounting hardware.
(2) Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
(3) Contact Closure Interface: Provide two contact closure inputs on back of unit which provide independent functions from front buttons; accepts both momentary and maintained contact closures.
(4) Terminal block inputs to be over-voltage and miswire-protected against wire reversals and shorts.

d. Wired Keypads; Lutron Signature Series QS Keypads:
(1) Mounting: Wallbox; Lutron Signature Series Wallbox; provide wall plates with concealed mounting hardware.
(2) Button/Engraving Backlighting:
(a) Utilize backlighting for buttons and associated engraving to provide readability under all light conditions.
(b) Backlight intensity adjustable via programming software.
(3) Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
(4) Contact Closure Interface: Provide two contact closure inputs on back of unit which provide independent functions from front buttons; accepts both momentary and maintained contact closures.
(5) Terminal block inputs to be over-voltage and miswire-protected against wire reversals and shorts.

e. Wired Keypads; Lutron QS Wired Palladiom Wallstations:
(1) Style: Architectural Style
(2) Mounting: Wallbox; provide wall plates with concealed mounting hardware.
(3) Buttons and Faceplate:
(a) Buttons to be greater than 0.65 inch in height to provide large target area for ease of use and actuation.

(b) Front of buttons to be flush with faceplate.
(c) Buttons and faceplate to be of same material, e.g. plastic/plastic, glass/glass, metal/metal.
(d) Buttons to depress and provide tactile feedback of successful button push. Controls utilizing capacitive or resistive touch technology are not acceptable.
(e) Gaps to be less than 0.007 inch between buttons and less than 0.15 inch between buttons and faceplate.

(4) Button/Engraving Backlighting:
(a) Backlighting to be visible through engraved text to provide clear readability in variety of lighting conditions.
(b) Indicate active scene through intensity of backlighting (brighter backlit text indicates active state).
(c) Backlight intensity adjustable via programming software; capable of dynamic adjustment during usage based on conditional logic (time of day, button press, etc.).
(d) Backlight intensity automatically adjusts based on room ambient light level.

(5) Design keypads to allow field-customization of button color and engraving using field-changeable replacement kits.
(6) Terminal block inputs to be over-voltage and miswire-protected against wire reversals and shorts.

3. Single-Scene or Zoned Wired Control:
a. Product: Lutron Pico Wired Control.
b. Turn individual fixture or group of fixtures on and off.
c. Raise and lower light levels.
d. Recall favorite light levels.

4. Wired Keyswitch:
a. Product: Lutron QS Keyswitch.
b. Configuration:
(1) Three position, momentary, center position key removal; Lutron Model QSWS2-KSI-3MOC.
(2) Three position, maintained, center position key removal; Lutron Model QSWS2-KSI-3MAC.
(3) Two position, maintained, center position key removal; Lutron Model QSWS2-KSI-2MAC.
(4) Two position, maintained, any position key removal; Lutron Model QSWS2-KSI-2MAA.
c. Allows control of any devices part of lighting control system.

d. Communications: Utilize RS485 wiring for low-voltage communications link.
e. Functionality:
(1) Allows for easy reprogramming without replacing unit.
(2) Requires key insertion to activate actions.
f. Engrave keypads with button, zone, and scene descriptions as indicated on drawings.
g. Software Configuration:
(1) Customizable control station device button functionality:
(a) Key positions can be programmed to perform single defined action.
(b) Key positions can be programmed using conditional logic off of state variable such as time of day or partition status.

5. Single Touch Slider Control:
a. Product: Lutron GrafikT QS Slider.
b. Allows control of any single lighting zone in system.
c. Communications: Utilize RS485 wiring for low-voltage communications link.
d. Switch Control: Single-touch LED bar for on/off operation.
e. Dimmer Control: Single touch LED bar with one portion of bar for on/off operation and one portion for dimmer adjustment.
(1) Single touch of light level adjustment control portion of LED bar raises/lowers lights, with new level becoming current preset level.
(2) When off, single touch of on/off control portion of LED bar raises lights to preset level.
f. When on, single touch of on/off control portion of LED bar initiates long fade to off.
(1) Provides audible feedback for touch control confirmation.
(2) LED bar indicates on/off status and current light level, and functions as locator light when dimmer is off.
(3) Provides for customized adjustment of dimmer functions via programming software:
(a) High/low end trims.
(b) LED brightness.
(c) Sound on/off.
(d) Off fade time.
(e) On fade time.
(f) Preset lock capability.

6. Analog Slider Control:
a. Product: Lutron QS Slider Control.
b. Allows control of any lighting zone in system via intuitive analog slider control.
c. Communications: Utilize RS485 wiring for low-voltage communications link.
d. Available in 1 to 16 zone configurations.

e. Available with or without take command switch to activate slider scene.
f. Optional keypad ganging.
g. Slider zones can be chained in partitioned spaces.
h. Engrave keypads with button, zone, and scene descriptions as indicated on drawings.
i. Functionality:
(1) Full range dimming of individual zones or groups of zones.
(2) Zone levels indicated by slider position.
(3) Integrates with multi-scene wired control.

D. Wireless (Radio Frequency) Controls:
1. Products:
a. 2-Button Control; Lutron Pico Wireless Control Model PJ2-2B.
b. <<Type_____- >>2-Button Control with Night Light; Lutron Pico Wireless Control Model PJN-2B.
c. 2-Button with Raise/Lower Control; Lutron Pico Wireless Control Model PJ2-2BRL
d. 3-Button Control; Lutron Pico Wireless Control Model PJ2-3B.
e. 3-Button with Raise/Lower Control; Lutron Pico Wireless Control Model PJ2-3BRL.
f. <<Type_____- >>3-Button with Raise/Lower Control and Night Light; Lutron Pico Wireless Control Model PJN-3BRL.
g. 4-Button; Lutron Pico Wireless Control Model PJ2-4B.

h. Single Pedestal; Lutron Pico Pedestal Model L-PED1.
i. Double Pedestal; Lutron Pico Pedestal Model L-PED2.
j. Triple Pedestal; Lutron Pico Pedestal Model L-PED3.
k. Quadruple Pedestal; Lutron Pico Pedestal Model L-PED4.
l. Screw Mounting Kit; Lutron Model PICO-SM-KIT.
m. Wallbox Adapter; Lutron Model PICO-WBX-ADAPT.

2. Quantity: As indicated on drawings.
3. Communicates via radio frequency to compatible dimmers, switches, and plug-in modules.
4. Does not require external power packs, power or communication wiring.
5. Allows for easy reprogramming without replacing unit.
6. Button Programming:
   a. Single action.
   b. Toggle action.
7. Includes LED to indicate button press or programming mode status.
8. Mounting:
   a. Capable of being mounted with table stand or directly to wall under faceplate.
   b. Faceplates: Provide concealed mounting hardware.
9. Power: Battery-operated with minimum ten-year battery life.
10. These interfaces enable the lighting control system to receive or send a control signal to or from another system (Partitioning, Occupancy, A/V, BMS, shades). Include this article if control over the system through external inputs such as contact closure, Ethernet, RS232, building management systems (BMS), etc. is required.

2.12 LOW-VOLTAGE CONTROL INTERFACES

A. Provide low-voltage control interfaces as indicated or as required to control loads as indicated.
B. UL listed.
C. Contact Closure Interface:
   1. Product: Lutron Model QSE-IO.
   2. Connects to lighting management hub via RS485.
   3. The contact closure input device to accept both momentary and maintained contact closures.
   4. The contact closure output device can be configured for maintained or pulsed outputs.
   5. Contact closure can be programmed using conditional logic off of state variable such as time of day or partition status.
D. Wallbox Input Closure Interface:
   1. Product: Lutron Model QSE-CI-WCI.
   2. Connects to lighting management hub via RS485.
   3. Mounts in wallbox behind contact closure keypad to provide interface for up to eight contact closure inputs.

4. The contact closure input device to accept both momentary and maintained contact closures.

E. RS232 and Ethernet Interface:
1. Product: Lutron Model QSE-CI-NWK-E.
2. Connects to lighting management hub via RS485.
3. Provide ability to communicate via Ethernet or RS232 to audiovisual equipment, touchscreens, etc.
4. Provide control of:
   a. Light scene selections.
   b. Fine-tuning of light scene levels with raise/lower.
   c. Shade group presets.
   d. Fine-tuning of shade preset levels with raise/lower.
   e. Simulate system wall station button presses and releases.
5. Provide status monitoring of:
   a. Light scene status.
   b. Shade group status.
   c. Wall station button presses and releases.
   d. Wall station LEDs.
6. Provide ability to send custom output strings.

F. DMX Interface:
1. Product: Lutron Model QSE-CI-DMX.
2. Connects to lighting management hub via RS485.
3. Provide ability to:
   a. Map single zone intensity to single DMX512 lighting channel.
   b. Map single zone intensity to three DMX512 channels for RGB/CMY color control.
   c. Map a single zone intensity to a single DMX512 integration channel.
   d. Smoothly transition from one color to another in crossfade.
   e. Automatically sequence through variety of colors.

G. Sensor Modules:
1. Products:
   a. Sensor module with both wired and wireless inputs; Lutron Model QSM2-4W-C.
   b. Sensor module with wired inputs only; Lutron Model QSMX-4W-C.
   c. Sensor module with wireless inputs only; Lutron Model QSM2-XW-C.
2. Connects to lighting management hub via RS485.
3. Wired Modules:
   a. Provide wired inputs for:
      (1) Occupancy sensors.
      (2) Daylight sensors.
      (3) Wired wall stations.
4. Wireless Modules:
   a. Provide wireless communication inputs for:
      (1) Occupancy sensors.
      (2) Daylight sensors.
      (3) Manual controls.
   b. RF Range: 30 feet between sensor module and compatible RF transmitting devices.

c. RF Frequency: 434 MHz; operates in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.

5. Communicate sensor information to wired low-voltage digital link for use by compatible devices.

H. Wireless Gateway:
1. Product: Lutron Athena Clear Connect Gateway - Type X; Model Q-RF.
2. Connects to lighting management hub via system Ethernet link; powered by Athena QP5 hub or Q-POE-PNL Ethernet range extender.
3. Enables lighting control system to communicate with up to 50 Clear Connect - Type X wireless devices, including Ketra intelligent light sources.
4. RF Range: Maximum of 71 feet between wireless gateway and compatible Clear Connect - Type X wireless devices on same floor; maximum of 25 feet between each Clear Connect - Type X wireless device and at least two other Clear Connect - Type X wireless devices.

I. Automatic Demand Response Interface:
1. Product: Lutron Automated Demand Response Kit; Model LUT-Q-OPNADR-CPN8064.
2. Connects to lighting management hub via RS485; requires internet connection to connect to utility demand response server.
3. Supports automatic demand response for load shedding via OpenADR® 2.0b compliant utility command.

2.13 WIRED SENSORS

A. Wired Occupancy Sensors:
1. General Requirements:
a. Connects directly to compatible ballasts and modules without need of power pack or other interface.
b. Turns off or reduces lighting automatically after reasonable time delay when room or area is vacated by last person to occupy space.
c. Accommodates conditions of space utilization and irregular work hours and habits.
d. Comply with UL 94.
e. Self-Adaptive Sensors: Continually adjusts sensitivity and timing to ensure optimal lighting control for any use of the space; furnished with field-adjustable controls for time delay and sensitivity to override adaptive features.
f. Provide capability to:
(1) Add additional timeout system-wide without need to make local adjustment on sensor.
(2) Group multiple sensors.
g. Power Failure Memory:
(1) Settings and learned parameters to be saved in nonvolatile memory and not lost should power be interrupted and subsequently restored.
h. Furnished with necessary mounting hardware and instructions.
i. Class 2 devices.

j. Ceiling-Mounted Sensors: Indicate viewing directions on mounting bracket.
k. Wall-Mounted Sensors: Provide swivel-mount base.
l. Color: White.

2. Wired Passive Infrared Sensors:
   a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   b. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
   c. Products:
      (1) Ceiling-Mounted Passive Infrared Sensor, 450 square feet; Lutron Model LOS-CIR-450-WH: Coverage of 450 square feet with ceiling height of 8 to 12 feet; 360 degree field of view; self-adaptive.
      (2) Ceiling-Mounted Passive Infrared Sensor, 1500 square feet; Lutron Model LOS-CIR-1500-WH: Coverage of 1500 square feet with ceiling height of 8 to 12 feet; 360 degree field of view; self-adaptive.
      (3) Wall-Mounted Passive Infrared Sensor; Lutron Model LOS-WIR-WH: Coverage of 1600 square feet with ceiling height of 8 to 12 feet; 110 degree field of view; self-adaptive.
      (4) High Bay Passive Infrared Sensor, Surface-Mounted, 180 Degree; Lutron Model LUT-WSPSM24V-180-CPN6111: Coverage radius of 42 feet at mounting height of 30 feet and 50 feet at mounting height of 45 feet ; 180 degree field of view; field-adjustable timeout.
      (5) High Bay Passive Infrared Sensor, Surface-Mounted, 360 Degree; Lutron Model LUT-WSPSM24V-360-CPN6111: Coverage radius of 42 feet at mounting height of 30 feet and 50 feet at mounting height of 45 feet ; 360 degree field of view; field-adjustable timeout.
      (6) High Bay Passive Infrared Sensor, End-Mounted, 180 Degree; Lutron Model LUT-WSPSM24V-180-CPN6112: Coverage radius of 42 feet at mounting height of 30 feet and 50 feet at mounting height of 45 feet; 180 degree field of view; field-adjustable timeout.

(7) High Bay Passive Infrared Sensor, End-Mounted, 360 Degree; Lutron Model LUT-WSPSM24V-360-CPN6112: Coverage radius of 42 feet at mounting height of 30 feet and 50 feet at mounting height of 45 feet; 360 degree field of view; field-adjustable timeout.

3. Wired Ultrasonic Sensors:
   a. Utilize an operating frequency of 32 kHz or 40 kHz, crystal-controlled to operate within plus/minus 0.005 percent tolerance.
   b. Products:
      (1) Ceiling-Mounted Ultrasonic Sensor, 500 square feet (46 sq m); Lutron Model LOS-CUS-500-WH: Coverage of 500 square feet with ceiling height of 8 to 12 feet; 180 degree field of view; self-adaptive.
      (2) Ceiling-Mounted Ultrasonic Sensor, 1000 square feet (93 sq m); Lutron Model LOS-CUS-1000-WH: Coverage of 1,000 square feet with ceiling height of 8 to 12 feet; 180 degree field of view; self-adaptive.
      (3) Ceiling-Mounted Ultrasonic Sensor, 2000 square feet; Lutron Model LOS-CUS-2000-WH:
      Coverage of 2000 square feet with ceiling height of 8 to 12 feet; 360 degree field of view; self-adaptive.
4. Wired Dual Technology Sensors:
   a. Passive Infrared: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   b. Ultrasonic: Utilize operating frequency of 32 kHz or 40 kHz, crystal-controlled to operate within plus/minus 0.005 percent tolerance.
   c. Ceiling-Mounted Sensors: Provide customizable mask to block off unwanted viewing areas.
   d. Isolated Relay: Provide internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options where indicated.
   e. Integral Photocell: Provide integral photocell with adjustable sensitivity to prevent lights from turning on when there is sufficient natural light where indicated.

f. Products, Without Isolated Relay and Integral Photocell:
   (1) <Ceiling-Mounted Dual Technology Sensor, 500 square feet (46 sq m); Lutron Model LOS-CDT-500-WH: Coverage of 500 square feet with ceiling height of 8 to 12 feet; 180 degree field of view; self-adaptive.
   (2) Ceiling-Mounted Dual Technology Sensor, 1000 square feet (93 sq m); Lutron Model LOS-CDT-1000-WH: Coverage of 1000 square feet with ceiling height of 8 to 12 feet; 180 degree field of view; self-adaptive.
   (3) Ceiling-Mounted Dual Technology Sensor, 2000 square feet (186 sq m); Lutron Model LOS-CDT-2000-WH: Coverage of 2000 square feet with ceiling height of 8 to 12 feet; 360 degree field of view; self-adaptive.
   (4) Wall-Mounted Dual Technology Sensor; Lutron Model LOS-WDT-WH : Coverage of 1600 square feet with ceiling height of 8 to 12 feet; 110 degree field of view; self-adaptive.

g. Products, With Isolated Relay and Integral Photocell:
   (1) Ceiling-Mounted Dual Technology Sensor, 500 square feet; Lutron Model LOS-CDT-500R-WH; Coverage of 500 square feet with ceiling height of 8 to 12 feet; 180 degree field of view; with isolated relay and integral photocell; self-adaptive.
   (2) Ceiling-Mounted Dual Technology Sensor, 1000 square feet (93 sq m); Lutron Model LOS-CDT-1000R-WH: Coverage of 1000 square feet with ceiling height of 8 to 12 feet; 180 degree field of view; with isolated relay and integral photocell; self-adaptive.
   (3) Ceiling-Mounted Dual Technology Sensor, 2000 square feet; Lutron Model LOS-CDT-2000R-WH: Coverage of 2000 square feet with ceiling height of 8 to 12 feet;

360 degree field of view; with isolated relay and integral photocell; self-adaptive.

(4) Wall-Mounted Dual Technology Sensor; Lutron Model LOS-WDT-R-WH:
Coverage of 1600 square feetwith ceiling height of 8 to 12 feet; 110 degree field of view; with isolated relay and integral photocell; self-adaptive.

B. Power Packs for Wired Sensors:
1. Products:
a. 347 VAC power input/24 VDC, 100 mA power output; 15 A ballast (347 V) relay contact rating; Lutron Model PP-347H Power Pack.
b. 120-277 VAC power input/24 VDC, 150 mA power output; 16 A lighting (120-177 V), 1 HP motor (120-277 V) relay contact rating; Lutron Model PP-DV Power Pack.
c. 120-277 VAC power input (manual-on)/24 VDC, 150 mA power output; 16 A lighting (120-177 V), 1 HP motor (120-277 V) relay
contact rating;Lutron Model PP-DV-M Power Pack.
d. Control relay only (no power input/output); requires another power pack for power and counts as one of three sensors connected to power pack; 16 A lighting (120-277 V), 1 HP motor (120-277 V), 15 A ballast (347 V) relay contact rating; Lutron Model PP-SH Power Pack.
2. Provide sensor power packs where required for power connection to sensors.
3. For ease of mounting, installation and future service, power pack(s) to be able to mount through 1/2 inch trade size knockout in standard electrical enclosure and be integrated, self-contained unit consisting internally of isolated load switching control relay and transformer to provide low-voltage power. Transformer to provide power to minimum of three sensors.
4. Plenum-rated.
5. Control Wiring Between Sensors and Control Units: Class 2, 18-24 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.

C. Wired Daylight Sensors:
1. Digital Interior Daylight Sensor:
a. Product: Lutron Model EC-DIR-WH.
b. Use Class 2 wiring for low-voltage communication.
c. Can be replaced without reprogramming.

d. Open-loop basis for daylight sensor control scheme.
e. Stable output over temperature from 32 degrees F to 104 degrees F.
f. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
g. Provide linear response from 0 to 500 footcandles.
h. Integral IR receiver for personal control.
i. Mountable on lighting fixtures or recessed acoustical ceiling tiles.
j. Constructed via sonic welding.
k. Color: White.

2. Daylight Control Package:
   a. Product: Lutron CES Series (Lutron CES Analog Sensor, LC8 Controller, and Power Pack).
   b. Controller:
      (1) Product: Lutron Model LC8.
      (2) Automatically switches dry contact according to changes in ambient light levels.
      (3) Fully adjustable separate high and low setpoints, with adjustable dead band between set points to prevent unwanted cycling.
      (4) Input time delay to prevent unwanted cycling due to intermittent light level fluctuations.
      (5) Signal/setpoint and relay status indication.
      (6) Sensor calibration input.
   c. Sensors:
      (1) Class 2, three-wire analog devices.
      (2) Provision for zero or offset based signal.
      (3) Indoor Photo Sensors; Lutron Model CES/I: With fresnel lens and 60 degree cone of response; sensor range of 0 to 750 footcandles.
      (4) Outdoor Photo Sensors; Lutron Model CES/O: Weatherproof, with hood over aperture to shield sensor from direct sunlight; sensor range of 0 to 750 footcandles.
      (5) Atrium Photo Sensors; Lutron Model CES/A: With translucent dome and 180 degree field of view; sensor range of 2 to 2,500 footcandles.
      (6) Skylight Photo Sensors; Lutron Model CES/S: With translucent dome and 180 degree field of view; sensor range of 10 to 7,500 footcandles.

D. Infrared Partition Sensors:
   1. Product: Lutron Model GRX-IRPS-WH.
   2. Provide contact closure based on status of partition wall (open/close) enabling automatic linking of controls.

2.14 WIRELESS SENSORS

A. General Requirements:
   1. Operational life of 10 years without need to replace batteries when installed per manufacturer's instructions.
   2. Communicates directly to compatible RF receiving devices through use of radio frequency communications link.

3. Does not require external power packs, power wiring, or communication wiring.
4. Capable of being placed in test mode to verify correct operation from face of unit.
5. RF Range: 30 feet between sensor and compatible RF receiving device(s).
6. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

B. Wireless Occupancy/Vacancy Sensors:
1. General Requirements:
   a. Provides clearly visible method of indication to verify that motion is being detected during testing and that unit is communicating to compatible RF receiving devices.
   b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without need to change sensor's sensitivity threshold.
   d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.
   e. Turns off lighting after reasonable and adjustable time delay once last person to occupy space vacates room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
   f. Color: White.
   g. Provide necessary mounting hardware and instructions for both temporary and permanent mounting.
   h. Provide temporary mounting means to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be designed for easy, damage-free removal.
   i. Sensor lens to illuminate during test mode when motion is detected to allow installer to verify coverage prior to permanent mounting.
   j. Ceiling-Mounted Sensors:
      (1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
      (2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.
      (3) Provide customizable mask to block off unwanted viewing areas.
   k. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.
2. Wireless Combination Occupancy/Vacancy Sensors:
   a. Ceiling-Mounted Sensors: Programmable to operate as occupancy sensor (automatic-on and automatic-off),

occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or vacancy sensor (manual-on and automatic-off).

b. Wall-Mounted Sensors: Programmable to operate as occupancy sensor (automatic-on and automatic-off), or vacancy sensor (manual-on and automatic-off).

c. Products:

(1) Ceiling-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OCR2B-P-WH: Coverage from 324 square feet to 676 square feet depending on ceiling height from 8 to 12 feet; 360 degree field of view.

(2) Wall-Mounted Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OWLB-P-WH: Minor motion coverage of 1500 square feet (139.4 sq m) and major motion coverage of 3000 square feet with mounting height of 6 to 8 feet; 180 degree field of view.

(3) Corner-Mounted Occupancy/Vacancy Sensor; << Lutron Radio Powr Savr Series, Model LFR2-OKLB-P-WH:
Minor motion coverage of 1225 square feet and major motion coverage of 2500 square feet with mounting height of 6 to 8 feet; 90 degree field of view.

(4) Hallway Occupancy/Vacancy Sensor; Lutron Radio Powr Savr Series, Model LFR2-OHLB-P-WH: Major motion coverage of up to 150 feet with mounting height of 6 to 8 feet; narrow field of view.

3. Wireless Vacancy-Only Sensors:

a. Operates only as vacancy sensor (manual-on and automatic-off).

b. Products:
(1) Ceiling-Mounted Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VCR2B-P-WH: Coverage from 324 square feet to 676 square feet depending on ceiling height from 8 to 12 feet; 360 degree field of view.
(2) Wall-Mounted Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VWLB-P-WH: Minor motion coverage of 1500 square feet and major motion coverage of 3000 square feet with mounting height of 6 to 8 feet; 180 degree field of view.
(3) Corner-Mounted Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VKLB-P-WH: Minor motion coverage of 1225 square feet and major motion coverage of 2500 square feet with mounting height of 6 to 8 feet; 90 degree field of view.
(4) Hallway Vacancy-Only Sensor; Lutron Radio Powr Savr Series, Model LFR2-VHLB-P-WH: Major motion coverage of up to 150 feet with mounting height of 6 to 8 feet; narrow field of view.

C. Wireless Daylight Sensors:
1. Product: Lutron Model LFR2-DCRB.
2. Open-loop basis for daylight sensor control scheme.
3. Stable output over temperature from 32 degrees F to 104 degrees F.
4. Partially shielded for accurate detection of available daylight to prevent fixture lighting and horizontal light component from skewing sensor detection.
5. Provide linear response from 0 to 10,000 footcandles.
6. Color:
a. White.
7. Mounting:
a. Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.
b. Provide necessary mounting hardware and instructions for both temporary and permanent mounting.
c. Provide temporary mounting means to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary

mounting method to be designed for easy, damage-free removal.

8. Meets California Title 24 requirements.

2.15 ACCESSORIES

A. Emergency Lighting Interface:
   1. Product: Lutron Model LUT-ELI.
   2. Provides total system listing to UL 924 when used with lighting control system.
   3. Senses all three phases of building power.
   4. Provides output to power panels or digital ballast interfaces if power on any phase fails and sends all lights controlled by these devices to 100 percent intensity. Lights to return to their previous intensities when normal power is restored.
   5. Accepts contact closure input from fire alarm control panel.

B. Emergency Shunt Device:
   1. Product: LVS Model LUT-SHUNT-A-TD.
   2. UL 924 listed for use with select Lutron and Ketra lamps, luminaires, and controls in emergency lighting systems.
   3. Emergency power is passed through to downstream Clear Connect Type X Ketra intelligent light sources.
   4. Upon sensing loss of normal utility power, sends downstream Clear Connect Type X Ketra intelligent light sources to 100 percent intensity by generating 2.5 second power interruption.

C. Provide power supplies as indicated or as required to power system devices and accessories.
   1. Products:
      a. Junction box-mounted power supply for shades, keypads, and accessories, and for providing additional low voltage power to communication link; Lutron Model QSPS-J-1-35V; with miswire and thermal protection.
      b. Plug-in power supply for shades, drapery drive units, keypads, and accessories, and for providing additional low voltage power to communication link; Lutron Model QSPS-P1-1-35V; with miswire protection; powered from standard receptacle using cord 6 feet (1.8 m) in length; complies with DOE Level VI regulation.
      c. Ten output power supply panel for shades, drapery drive units, keypads and accessories, and for providing additional low voltage power to communication link; Lutron Model QSPS-10PNL; no replaceable fuses required for overload/miswire protection; contains DOE Level VI Compliant power supplies.
      d. Power supply for keypads and accessories (not for shades/window treatments), and for providing additional low voltage power to communication link; Lutron Model QSPS-DH-1-75.

D. Provide locking covers for controls in public areas.
1. Reversible to allow lock to be located on either side of control.
2. Products:
a. 1-gang device for compatible Lutron QS keypads; Lutron Model GRX-1GLC.
b. 4-gang device for Lutron Grafik Eye QS main units; Lutron Model QSG-4GLC.

2.16 SOURCE QUALITY CONTROL
A. See Section 01 400 - Quality Requirements for additional requirements.
B. Factory Testing; Lutron Standard Factory Testing:
1. Perform full-function factory testing on completed assemblies. Statistical sampling is not acceptable.
2. Perform full-function factory testing on 100 percent of ballasts and LED drivers.
3. Perform factory audit burn-in of dimming assemblies and panels at 104 degrees F at full load for two hours.
4. Perform factory burn-in of 100 percent of ballasts at 104 degrees F.

III. PART 3 - EXECUTION

3.1 EXAMINATION
A. Verify that field measurements are as shown on drawings.
B. Verify that ratings and configurations of system components are consistent with indicated requirements.
C. Verify that mounting surfaces are ready to receive system components.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION
A. Perform work in accordance with NECA 1 and, where applicable, NECA 130.
B. Install products in accordance with manufacturer's instructions.
C. Define each dimmer/relay load type, assign each load to zone, and set control functions.
D. Sensor Locations:
1. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with drawings.
2. Sensor locations indicated are diagrammatic. Within design intent, reasonably minor adjustments to locations may be

made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

E. Mount exterior daylight sensors to point due north with constant view of daylight.

F. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

G. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

H. Lamp Lead Lengths: Do not exceed 3 feet for T4 4-pin compact and T5 BIAX lamps and 7 feet for T5, T5-HO, T8 U-bend, and T8 linear fluorescent lamps.

I. LED Light Engine/Array Lead Length: Do not exceed 100 feet.

J. System and Network Integration Consultation; Lutron LSC-INT-VISIT: Include as part of base bid additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.

1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

K. Identify system components.

3.3 FIELD QUALITY CONTROL

A. See Section 01 400 - Quality Requirements for additional requirements.

B. Manufacturer's Startup services will not be required.

C. Manufacturer's Startup Services; Lutron Standard Startup Services:

1. Manufacturer's authorized Service Representative to conduct minimum of two site visits to ensure proper system installation and operation.
2. Conduct Pre-Installation visit to review requirements with installer as specified in Part 1 under "Administrative Requirements".
3. Post Wire Termination Visit; Lutron LSC-POSTWIRE-VST: Include as part of base bid additional costs to conduct site visit to verify system is properly wired and ready for startup.
4. Conduct second site visit upon completion of lighting control system to perform system startup and verify proper operation:
   a. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require deviation from locations indicated.
   b. Verify connection of power wiring and load circuits.

c. Verify connection and location of controls.
d. Energize lighting management hubs and download system data program.
e. Address devices.
f. Verify proper connection of panel links (low-voltage/data) and address panel.
g. Verify system operation control by control.
h. Verify proper operation of manufacturer's interfacing equipment.
i. Configure initial groupings of ballasts/drivers for wall controls, daylight sensors and occupancy sensors.
j. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service where specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS".
k. Train Owner's representative on system capabilities, operation, and maintenance, as specified in Part 3 under "Closeout Activities".
l. Obtain sign-off on system functions.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.4 ADJUSTING

A. On-site meeting with the Lighting Control Manufacturer to make adjustments to the lighting control system, after all equipment and room furnishings have been installed
B. This meeting may be desired in order to meet the lighting designer's original design intent. These adjustments may include light level, fade time and delay in lighting scenes.
C. On-Site Scene and Level Tuning; Lutron LSC-AF-VISIT: Include as part of base bid additional costs for Lighting Control Manufacturer to visit site to conduct meeting with Engineer; Owner's representative; to make required lighting adjustments to the system for conformance with original design intent.
D. Remote Programming Assistance; Lutron LSC-PRG-AST-RMTE: Include as part of base bid additional costs for Lighting Control Manufacturer to provide one 4-hour session of remote programming assistance to make required lighting adjustments to system for conformance with original design intent.
E. Dynamic White Programming Package; Lutron LSC-DWP-PKGE: Include as part of base bid additional costs for Lighting Control Manufacturer to provide minimum of three site visits and one remote session to support fine tuning of tunable LED and/or DALI lighting.
    1. Conduct post-wire-termination site visit to verify system is properly wired.
    2. Conduct site visit during normal business hours to perform fine tuning of lighting and programming adjustments in day setting.
    3. Conduct site visit after hours to perform fine tuning of lighting and programming adjustments in night setting.
    4. Provide one 2-hour remote session for additional adjustments.

F. Sensor Fine-Tuning: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "DIGITAL-NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide up to two additional post-startup on-site service visits for fine-tuning of sensor calibration. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, Contractor to provide fine-tuning of sensor calibration.

3.5 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.6 COMMISSIONING

A. See Section 16022 for commissioning requirements.

3.7 CLOSEOUT ACTIVITIES

A. See Section 16010 - Closeout Submittals for closeout submittals.
B. See Section 16022 - Demonstration and Training for additional requirements.
C. Demonstration:
On-Site Performance-Verification Walkthrough; Lutron LSC-WALK: Include as part of base bid additional costs for Lighting Control Manufacturer to provide on-site demonstration of system functionality to Owner.
D. Training:
1. Include services of manufacturer's authorized Service Representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of standard system start-up services.
a. Include training on software to be provided:
(1) Configuration software used to make system programming and configuration changes.
(2) Control and monitor.
2. Customer-Site Solution Training Visit; Lutron LSC-TRAINING: Include as part of base bid
additional costs for Lighting Control

Manufacturer to provide one day of additional on-site system training.

3.8 PROTECTION

A. Protect installed products from subsequent construction operations.

3.9 MAINTENANCE

A. See Section 16022 - Execution Requirements for additional requirements relating to maintenance service.

END OF SECTION

https://www.jjmconstruction.net/

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ABOUT PRODUCTS JJM SUBMITTAL CONTACT

WELCOME

JJM Construction provides special fabrication of patented and approved JJM FIRE RATED ACCESS ENCLOSURES for elevator hoist ways. Each ACCESS ENCLOSURE is designed to hold smoke detectors/heat sensors and remain in compliance with current fire safety regulations per NFPA 72, ASME & NBCC requirements.

JJM Construction Inc also is a distributor of access doors, ACCESS ENCLOSURES FOR ELEVATOR HOIST WAYS, and roof hatches).

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CONTACT US

30141 Antelope Rd. Suite D 211 Menifee, CA 92584
Office: 909-518-1804 | Email: christina@jjmconstruction.net

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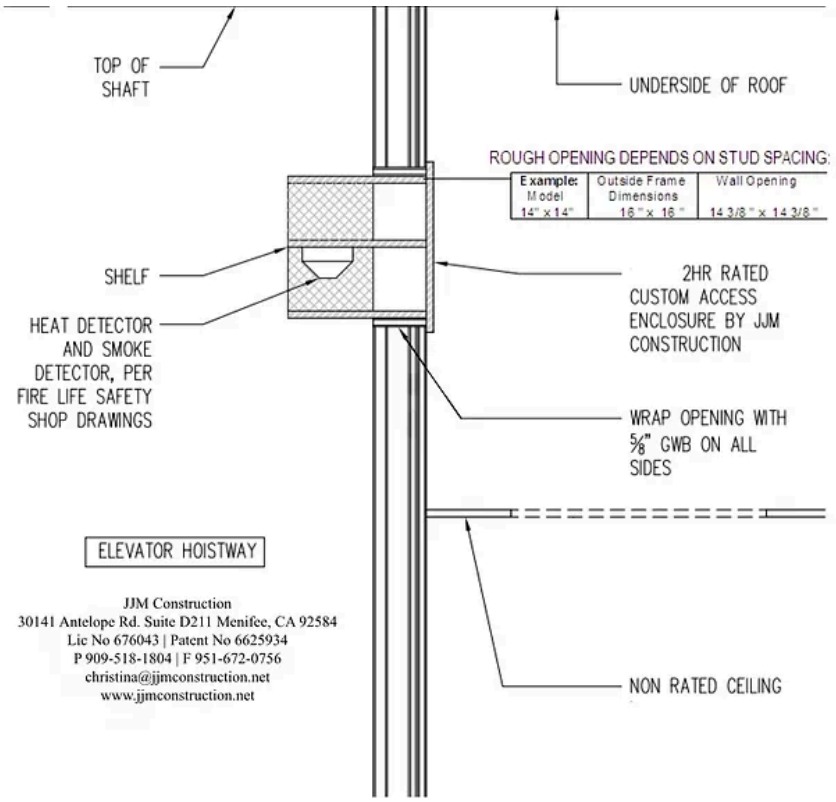
FIRE RATED ACCESS ENCLOSURES



TO PLACE AN ORDER

Access enclosures are custom fabricated to your specifications; some are stock items. You may call, email or fax over an inquiry or purchase order. Please provide stud spacing, and thickness of overall wall for measurements. We then set up a C.O.D. order for you. Please have a check ready when product is delivered, or set up a credit card order.

JJM CONSTRUCTION

JJM Construction began with a general contractor, Jim McGrath. While working in the commercial construction industry, Jim found ways to expand his brand and began to sell access doors and other construction supplies. He secured a patent on his design of the JJM Fire Rated ACCESS ENCLOSURES. Each JJM Fire Rated ACCESS ENCLOSURE is designed to be used in Elevator Hoist ways and all new MRL Elevator Installations to house smoke detectors/heat sensors.

To fulfill the State Elevator Inspector and State Fire marshal requirements on your projects, JJM Construction provides an approved method for allowing smoke detectors and heat sensors inside restricted areas such as inside elevator hoist ways, machine rooms, and other restricted areas, while remaining serviceable from outside.

The JJM CONSTRUCTION FIRE RATED ACCESS ENCLOSURES

JJM Construction's proprietary product utilizes a UL labeled door, self closing, self locking, spring loaded, concealed hinged door. The full assembly has 18gage welded expanded metal attachment with an adjustable shelf to allow horizontal smoke detector/ heat sensor installation inside the hoist way, but accessible from outside the hoist way.

Permissible for elevator wall construction in the elevator hoist way, our design has been approved by State Elevator inspectors and State Fire Marshals at inspection every time. Our enclosures are custom made to your specifications on your project.

The enclosures are custom made and delivered to the customer within 14 business days of placed order. Special orders may take a bit longer. Our brochure shows most commonly ordered sizes.

We also provide a stainless steel for exterior applications. For additional prices please call and ask for CHRISTINA.

We hope to help you with any upcoming projects you may have.

CONTRACTORS LICENSE# 676043

PRODUCTS

Fire Rated Access Enclosures, Access Panels, Roof Hatches.

JJM FIRE RATE ACCESS ENCLOSURES
Are custom made for your project. There are common sizes ordered most of the time. Below are the most common dimensions ordered. Call us to discuss your project.
Prices vary on fabrication to your specifications and delivery needs.

DESCRIPTION
Fire Rated Access Enclosure: with 1" finish flange, universal flush turn ring/key lock, self closing, self locking, UL B Label/Warnock Hersey Door (Rated to 1-1/2 hours for vertical surfaces and 3 hour non-combustible horizontal surfaces). Expanded metal attachment and adjustable shelf to allow for horizontal smoke detector/heat sensor mounting inside the enclosure. Full assembly has proved to be permissible for elevator wall construction in the elevator hoist way. Approved by State Elevator inspectors and State Fire Marshals at your inspection, our enclosures are custom made to your specifications.

*C.O.D. Delivery included within 30 mile radius of Menifee CA., or delivery fee will be added.

*Approx. Delivery time: 7-14 business days after signed work proposal is received.

*All sales are final.

*Patent Approval No. 6625934

JJM Fire Rated Access Enclosures by Size Most Commonly Ordered
10in' x 10in' x 11in'
12in' x 12in' x 11in'
14in' x 14in' x 11in'
16in' x 16in' x 11in'
18in' x 18in' x 11in'
24in' x 24in' x 11in'
Special Sizes Will Be Quoted

Vertical/Horizontal Exterior Application
Stainless Steel Exterior Application and Roof Hatches for additional prices.
These prices vary due to the price of steel (additional 7 business days for supply)

JJM FIRE RATED ACCESS ENCLOSURE SPECS

Fire Rated Access Door Features
JJM utilizes fire rated access doors made by others that are designed for wall and ceiling applications that are UL listed and approved by the various testing agencies. These **Access Enclosures** are specifically designed for elevator hoist ways and satisfy the "Means for testing and maintaining fire alarm initiating devices without having to enter the hoist way" per jurisdictions enforcing NFPA 72 or NBCC.

SPECIFACATATIONS
Doors are 1-1/2 hr. UL approved 10B, self closing and, self-locking approved for use in 2 hour fire barrier for vertical surfaces.
FRAME 16 gauge Steel
HINGE Flush Continuous Piano
INSULATION 2 inch Thick, Fire-Rated mineral fiber to assist in reducing heat transfer in the event of fire.

LATCH
Universal latch mechanism can be converted between knob, ring and flat key lock, and special order mortised key lock.

AUTOMATIC CLOSING
Springs enable self closing on all size doors. A second spring is included on sizes 16" thru 24" and must be used for the ceiling fire rating for these sizes.

OPTIONS (at additional cost)
Custom Sizes
Finishes Colors/Galvanized/Stainless
Mortise Key Lock Options
Gasketing

ENCLOSURES
16gauge Expanded Metal Cage
16gauge Steel Shelf not attached for the sensors that allow you to hinge the door in any direction.

SIZING
***What's your finished face to finished face wall dimension (wall thickness)?**
***What's your stud or rebar spacing?**
***What's your wall opening?**
***What type of wall construction? CMU, shaft, stucco, wood etc.**

MODEL SIZE	WALL OPENING DIMENSIONS 1-hr ceiling opening dimensions		CEILING OPENING DIMENSIONS 3-hr ceiling opening dimensions		SHIPPING WEIGHT (lbs.)			LATCHES
W x H (inches)	W	H	W	H	FD/ FDWB	FDSS	HGFD	
8" x 8"	8-3/8"	8-3/8"	9-3/8"	9-3/8"	7	11	11	1
10" x 10"	10-3/8"	10-3/8"	11-3/8"	11-3/8"	9	9	15	1
12" x 12"	12-3/8"	12-3/8"	13-3/8"	13-3/8"	11	11	17	1
14" x 14"	14-3/8"	14-3/8"	15-3/8"	15-3/8"	15	15	22	1
16" x 16"	16-3/8"	16-3/8"	17-3/8"	17-3/8"	16	16	24	1
18" x 18"	18-3/8"	18-3/8"	19-3/8"	19-3/8"	19	20	30	1
20" x 30"	20-3/8"	30-3/8"	21-3/8"	31-3/8"	34	35	51	1
22" x 30"	22-3/8"	30-3/8"	23-3/8"	31-3/8"	32	33	53	2
24" x 24"	24-3/8"	24-3/8"	25-3/8"	25-3/8"	27	28	47	1
22" x 36"	22-3/8"	36-3/8"	23-3/8"	37-3/8"	40	41	58	2
24" x 36"	24-3/8"	36-3/8"	25-3/8"	37-3/8"	42	43	60	2
24" x 48"	24-3/8"	48-3/8"	-	-	57	59	85	2
30" x 30"	30-3/8"	30-3/8"	-	-	44	45	62	2
32" x 32"	32-3/8"	32-3/8"	-	-	54	55	81	2
36" x 36"	36-3/8"	36-3/8"	-	-	61	63	92	2
36" x 48"	36-3/8"	48-3/8"	-	-	75	78	114	2

ACCESS DOORS ROOF HATCHS

JJM is a Distributor for Access Door Manufacturers such as JL Industries, Karp, Williams Brothers, Elmdor and others.

We supply Fire Rated, Non Rated, Metal, Stainless Steel, Zinc, Galvanized Doors and Roof Hatches.

CONTACT US

30141 Antelope Rd. Suite D 211 Menifee, CA 92584
Office: 909-518-1804 | Email: christina@jjmconstruction.net

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CONTACT

How You Can Reach Us

Phone, Fax or Email
9am - 4pm, Monday - Friday

30141 Antelope Rd. Suite D211
Menifee, California 92584
Office: 909-518-1804
Fax: 951-672-0756
Cell: 951-545-6901

Email: christina@jjmconstruction.net
jim@jjmconstruction.net

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