

Table of Contents

SECTION		PAGE
09511	ACOUSTICAL PANEL CEILINGS	2
09653	RESILIENT BASE AND ACCESSORIES	7
09680	FLOORING	10
09912	INTERIOR PAINTING & CORNER GUARDS	15
16010	BASIC ELECTRICAL REQUIREMENTS	18
	ETHOSPACE – POWER ENTRY	24
16050	BASIC MATERIALS AND METHODS	28
16500	LIGHTING	35

SECTION 09511 ACOUSTICAL PANEL CEILINGS

PART I-GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Related Sections include the following:
 - 1. Division 9 Section "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.

1.3 DEFINITIONS

- A. AC: Articulation Class
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated,
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch square Samples of each type, color, pattern, and texture.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity

conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of Quantity installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 66 percent by weight.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- D. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries Cirrus Second Look II fine texture or approved product.
- B. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
- C. Color: White,

- D. LR: Not less than 0.85.
- E. NRC: Not less than 0.65.
- F. CAC: Not less than 35,
- G. Edge/Joint Detail: Tegular.
- H. Thickness: 3/4 inch.
- I. Modular Size: 24 by 48 inches.
- J. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class I zinc coating, soft tern per.
 - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch diameter wire.
- B. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- C. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- D. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

2.4 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a) Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b) USG Corporation; SHEETROCK Acoustical Sealant. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.5 Metal Suspension System for Acoustical Panel Ceiling

- A. Basis-of Design Product: Subject to compliance with requirements, providing Armstrong World Industries, Inc. "Prelude" or approved.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653M, no less than G30 coating designation, with prefinished 12/16 inch wide metal caps on flanges.

1. Structural Classification: Heavy Duty system
2. End Condition of Cross runners: Butt-edge type
3. Face Design: Flat, flush
4. Cap material: Steel or aluminum cold-rolled sheet
5. Cap Finish: Painted white

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows: Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counters playing, or other equally effective means. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counters playing, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires. Do not attach hangers to steel deck tabs. Do not attach hangers to roof deck. Attach

hangers to structural members. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post installed anchors.
- D. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a) As indicated on reflected ceiling plans.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09653 RESILIENT BASE AND ACCESSORIES
PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Resilient base.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.3 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.2 RESILIENT BASE (B1)

- A. Resilient Base:
 - 1. Manufacturers: Subject to compliance with requirements, products by the following:
 - a) Johnsonite
 - 2. Color:
 - a) Burnt umber
- B. Resilient Base Standard: ASTM F 1861
Material Requirement: TS rubber, vulcanized thermoset or Type TP rubber, thermoplastic.
Manufacturing Method: I solid, homogeneous .
Style: base with toe.
- C. Minimum Thickness: .125 inch.
- D. Height: 6-inches.
- E. Lengths: rolls of manufacturers' standard length.
- F. Outside Corners: Cut to fit on site
- G. Inside Corners: Cut to fit on site
- H. Finish: luster

2.2 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, products by one of the following:
 - a) Johnsonite Corporation, USA.

- B. Description: for resilient floor covering, strip for resilient floor covering strips.
 - C. Material: Rubber.
 - D. Profile and Dimensions: Transitions, Johnsonite DPT-XX-B.
 - 1. Cove filler strips, Johnsonite CFS-00-A
 - E. Colors and Patterns: As selected from manufacturers full range.
- 2.3 INSTALLATION MATERIALS
- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
 - B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

Bellevue Service Center
Water Quality Tenant Improvement

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Cover resilient products until Substantial Completion.

END OF SECTION 09653

SECTION 09680 FLOORING
PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Carpet.
2. Sheet Vinyl

- B. Related Sections include the following:

1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet & vinyl.

1.2 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 -PRODUCTS

2.1 CARPET - OWNER PROVIDED MATERIAL

- A. Carpet:

1. Manufacturer: Interface Flor
2. Style: #13820, Mantra
3. Type: Tile
4. Color: #4090, Calm
5. Size: 50cm x 50cm
6. Installation Pattern: Ashlar

- B. Sheet Vinyl:

1. Manufacturer: Mannington
2. Style: Assurance II
3. Type: 6' sheet
4. Color: #16324, Mystic

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by .

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and written installation instructions for the following:
 - 1. Direct-Glue-Down installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
- B. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- C. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- E. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet: Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer. Remove yarns that protrude from carpet surface. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet.

Bellevue Service Center
Water Quality Tenant Improvement

- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer .

Construction	Slip Retardant Sheet Flooring
Size	6' – (1.83m)
Wearlayer Thickness	.080 (2.03 mm)
Overall Thickness	.080 (2.03 mm)
Weight Per Square Yard	5.8 lbs / yd ² * (3.15 Kg / m ²) (*For packing weight it includes interleaf of .04 lbs per sq.yd.)
Roll (Min. – Max.)	30 – 68 sq. yd. (25.1 – 56.9 sq. m.)
Static Load Limit	750 psi
ASTM Specification (F-1913)	Exceeds
HUD/FHA Requirements	Exceeds
Electrical Resistance, EN1815	≤ 2 kv
Flooring Radiant Panel Test (ASTM-E-648)	≥ .45 watts/cm ² , Passes (Class I)
N.B.S. Smoke chamber Test (ASTM-E-662)	<450 - Passes
Installation Adhesive Porous Sub-floor	V-82 / Full Spread
Installation Adhesive Non-Porous Sub-floor	V-95 / Full Spread (Must use V-95 under OR tables, hospital beds and heavy rolling loads)
Chemical Seam Sealer	MLG-33
Heat Weld Seaming	Mannington Commercial Solid Color Weld Rods
Warranty	Limited Five Year Commercial Warranty Limited Five Year Quantum Guard HP Wear Warranty

- Mannington Assurance II is not recommended in commercial areas that require static dissipation.
- Mannington Assurance II is not recommended in commercial areas where the surface temperature over radiant heated substrate exceeds 90° F.
- Mannington Assurance II can be installed in areas with topical moisture as long as V-95 adhesive is used, seams are properly sealed, and perimeter / edges are protected or covered up the wall.
- Meets the Americans with Disabilities Act Guidelines for static coefficient of friction as manufactured.
- Meets CHPS 01350 Indoor Air Quality, Passed and Listed.
- Dirt, wetness, finish selection and maintenance schedule may cause significant variation in actual performance.
- Specifications are based on averages from normal manufacturing tolerances. Such variations do not affect product performance.
- This product is intended solely for use as an indoor floor covering and is not recommended or sold for any other purpose.
- Use entryway systems outside each entrance to prevent dirt, sand, grit and other substances from being tracked onto floor.



END OF SECTION 09680

SECTION 09912 INTERIOR PAINTING & CORNER GUARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section,

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Gypsum Board.

1.3 SUBMITTALS

- A. Samples: for each finish and for each color and texture required.

PART 2 PRODUCTS

2.1 PAINT, GENERAL

- A. Material Compatibility:
Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Chemical Component of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:
Flat Paints and Coatings: VOC content of not more than 50 gil.
Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
- C. Colors: Match Architect's samples.
 - A. Interior Latex Primer/Sealer: MPI #50.

2.2 LATEX PAINTS

- A. High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 5.
- B. High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).
 - 1. VOC Content: E Range of E1 E2.

2. Environmental Performance Rating: EPR 6.

PART 3 -EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 %
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
- E. Painting of Patched Areas:
 - 1. Prime and paint wall contiguous to patch sites, corner to corner and floor to ceiling. Match existing room color and texture.

3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulates.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface impedements. Cut in sharp lines and color breaks.
- D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE

- A. P-1
 - 1. Benjamin Moore HC – **BELLEVUE STORE ONLY** - , SPECIAL MIX; 310-1A, oy-24, Bk-6, BB-1 ½, cr-3x, og-4, gy-24.

3.4 STAINLESS STEEL CORNER GUARDS

Bellevue Service Center
Water Quality Tenant Improvement

- A. MODEL: C08MOD, surface mounted, 16 gauge, 304 alloy, 1/8" nose radius, construction adhesive for mounting, #4 satin finish, 90 degrees, 3'-0" height, custom legs 1"x1".

END OF SECTION 09912

16010 BASIC ELECTRICAL REQUIREMENTS
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical systems required for this work includes labor, materials, equipment, and services necessary to complete installation of electrical work shown on Drawings, specified herein or required for a complete operable facility and not specifically described in other Sections of these Specifications. Among the items required are:
 - a) Branch circuit wiring from the distribution panels for lighting, receptacles, motors, signal systems and other detailed circuit wiring.
 - b) Luminaires, control switches, receptacles, relays, supports and other accessory items.
 - c) Fire alarm system.

1.2 DEFINITIONS

A. Following is a list of abbreviations generally used in Division 16:

ADA Americans With Disabilities Act
AHJ Authority Having Jurisdiction
ANSI American National Standards Institute
APWA American Public Works Association
ASTM American Society for Testing and Materials
FCC Federal Communications Commission
HVAC Heating, Ventilating and Air Conditioning
IBC International Building Code, latest adopted version
IFC International Fire Code.
IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronics Engineers.
IETA International Electrical Testing Association
FM FM Global
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
OSHA Occupational Safety and Health Administration
UL Underwriters Laboratories Inc.

B. Provide: To furnish and install, complete and ready for the intended use.

C. Furnish: Supply and deliver to the project site, ready for unpacking, assembly and installation.

D. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at the project site to complete items of work furnished by others.

1.3 ADDITIONAL REQUIREMENTS TO DIVISION 01

A. Product Submittals and Shop Drawings:

When requested by individual Sections provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and the like. Refer to individual Specification Sections for additional requirements for the shop drawings.

Provide product submittals and shop drawings in two formats – electronic (PDF, or portable document format) and paper. Electronic format must be submitted on CD, DVD, portable flash drive, or via email in a zip file. Provide one electronic file for each specification section. When documents are submitted via email, copy architect on all transmissions.

B. Operation and Maintenance Documentation: Provide copies of certificates of code authority acceptance, test data, product data, guarantees, warranties, and the like.

C. Shop Drawings: When requested by individual Sections provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and the like. Refer to individual Specification Sections for additional requirements for the shop drawings.

D. Closeout Documentation: Submit electrical code authority certification of inspection. Include documentation of onsite electrical testing that was performed.

E. Record Drawings:

Show changes and deviations from the Drawings. Include written Addendum and change order items. Show exact routes of feeders conduits for signal systems 2 inches in diameter and larger, and service entrance conduits.

Make changes to Drawings in a neat, clean, and legible manner.

1.4 QUALITY ASSURANCE

A. Conform to the latest adopted version of the National Electric Code (NEC), with state amendments.

B. Obtain and pay for electrical permits, and inspections from local AHJs.

C. Furnish products listed by UL or other testing firm acceptable to AHJ.

D. Conform to requirements of the serving electric utilities.

1.5 SEQUENCING AND SCHEDULING

A. For the proper execution of the work cooperate with other crafts and contracts as needed.

B. To avoid installation conflicts, thoroughly examine the complete set of Contract Documents. Resolve conflicts with Engineer prior to installation.

C. Prior to installation of feeders to equipment requiring electrical connections, examine the manufacturer's shop drawings, wiring diagrams, product data, and installation instructions. Verify that the electrical characteristics detailed in the Contract Documents are consistent with the electrical characteristics of the actual equipment being installed. When inconsistencies occur request clarification from Engineer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide like items from one manufacturer, such as luminaire types, switches, receptacles, breakers, panels, and the like.

2.2 MATERIALS

- A. Provide new electrical materials of the type and quality detailed, listed by UL, bearing their label wherever standards have been established. Indicated brand names and catalog numbers are used to establish standards of performance and quality. The description of materials listed herein governs in the event that catalog numbers do not correspond to materials described herein.
- B. Provide material and equipment that is acceptable to AHJ as suitable for the use indicated. For example, provide wet labeled equipment in locations that are wet.
- C. Include special features, finishes, accessories, and other requirements as described in the Contract Documents regardless of the item's listed catalog number.
- D. Provide incidentals not specifically mentioned herein or noted on Drawings, but needed to complete the system, in a safe and satisfactory working condition.

2.3 FIRESTOPPING

- A. For additional requirements see 07 84 1. for LSW Projects only.
- B. Foam Sealant: Foam sealant for use around conduit penetrations to prevent passage of smoke, fire, toxic gas or water. Maintain seal before, during and after fire. In and around conduit for thermal break at penetration of barrier between heated and unheated spaces. Chase Technology Corporation, Fire Foam, Thomas & Betts, or approved.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Construction Documents:
Drawings are diagrammatic with symbols representing electrical equipment, outlets, luminaires, and wiring.
Electrical symbols indicating wiring and equipment shown in the Contract Documents are included in the Contract unless specifically noted otherwise. Examine the entire set of Drawings to avoid conflicts with other systems. Determine exact route and installation of electrical wiring and equipment with conditions of construction.
- B. Clarification:
The Drawings govern in matters of quantity, the Specification in matters of quality. In event of conflict on Drawings or in the Specifications, the greater quantity and the higher quality apply.
Should the Electrical Documents indicate a condition conflicting with the governing codes and regulations, refrain from installing that portion of the work until clarified by Engineer.

3.2 INSTALLATION

- A. Install electrical equipment complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to roughin of the electrical equipment, examine the instructions thoroughly. When requirements of the installation instructions conflict with the Contract Documents, request clarification from Engineer prior to proceeding with the installation.

- B. Do not install electrical equipment in obvious passages, doorways, scuttles or crawl spaces which would impede or block the area passage's intended usage.
- C. Noise Control:
Do not install outlet boxes back to back. Do not use straight through boxes. Do not place contactors, transformers, starters and similar noise producing devices on walls which are common to occupied spaces unless specifically called for on Drawings. Where such devices must be mounted on walls common to occupied spaces, mount or isolate in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.
- D. Firestopping:
Coordinate with the Drawings the location of fire rated walls, ceilings, floors and the like. When these assemblies are penetrated by electrical equipment, seal around the equipment with approved firestopping material. Install firestopping material complete as directed per the manufacturer's installation instructions.

3.3 FIELD QUALITY CONTROL

- A. Tests:
Conduct tests of equipment and systems to demonstrate compliance with requirements specified in Division 16. Refer to individual Specification Sections for required tests. Document tests and include in Closeout Documents. During site evaluations by Engineer, provide an electrician with tools to remove and replace trims, covers, devices, and the like, so that a proper evaluation of the installation can be performed.
- B. Lighting System Control Testing and Commissioning: Test lighting controls to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with Drawings and Specifications. Provide functional testing of sequences of operation to ensure operation in accordance with Drawings and Specifications. Provide complete report of test procedures and results to engineer and insert approved copy into project closeout documents.

3.4 CLEANING

- A. Remove dirt and debris caused by the execution of the electrical work.
- B. Leave the entire electrical system installed under this Contract in clean, dust free and proper working order.
- C. Vacuum clean interiors of all new and modified electrical signal and communication equipment enclosures.

3.5 DEMOLITION

- A. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access, access to different areas. The Owner will cooperate to the best of their ability to assist in a coordinated schedule, but will remain the final authority as to time of work permitted.
- B. Examination: Determine the exact location of existing utilities and equipment before commencing work, compensate the Owner for damages caused by the failure to locate and preserve utilities. Replace damaged items with new material to match existing.
- C. Promptly notify Owner if utilities are found which are not shown on Drawings.
- D. Execution:
Remove existing luminaires, switches, receptacles, and other electrical equipment and devices and associated wiring from walls, ceilings, floors, and other surfaces scheduled

for remodeling, relocation, or demolition unless shown as retained or relocated on Drawings. Maintain electrical continuity of existing systems. Remove or relocate electrical boxes, conduit, wiring, equipment, luminaires, and the like, as encountered in removed or remodeled areas in the existing construction affected by this work. Remove and restore wiring which serves usable existing outlets clear of the construction or demolition if existing junction boxes will be made inaccessible, or if abandoned outlets serve as feed through boxes for other existing electrical equipment which is being retained, provide new conduit and wire to bypass the abandoned outlets. If existing conduits pass through partitions or ceiling which are being removed or remodeled, provide new conduit and wire to reroute clear of the construction or demolition and maintain service to the existing load.

Extend circuiting and devices in existing walls to be furred out. Existing electrical outlets and luminaires are indicated on electrical demolition plans. Verify exact location and number of existing electrical outlets and luminaires in the field. Only partial existing electrical shown. Locations of items shown on Drawings as existing are partially based on Record and other Drawings which may contain errors. Verify the accuracy of the information shown prior to bidding and provide such labor and material as is necessary to accomplish the intent of the Contract Documents.

Remove abandoned wiring to leave site clean.

If existing electrical equipment contains PCBs (polychlorinated biphenyl), replace with new. Dispose of material containing PCBs as required by federal and local regulations. Repair adjacent construction and finishes damaged during demolition work. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

3.6 SALVAGED EQUIPMENT AND RECYCLED MATERIAL

- A. Salvage the following equipment not being reused and return to owner:
Luminaires
Breakers
- B. Salvage the following equipment not being reused and sell/give to electrical salvage company:
Luminaires
Breakers
- C. Electrical equipment that cannot be salvaged for reuse sell/give to recycling company. Recycle the following excess, removed, or demolished electrical material:
Copper or aluminum conductors, buses, motor/transformer windings, and the like.
Steel and aluminum from raceways, boxes, enclosures, housings and the like. Acrylic and glass from luminaire lenses/refractors.
- D. Provide separate onsite storage space for recycled and salvaged material. Clearly label space as "Salvaged Equipment."

3.7 CONTINUITY OF SERVICE

- A. No interruption of services to any part of existing facilities will be permitted without express permission in each instance from the Owner. Requests for outages shall state the specific dates and hours and the maximum durations, with the outages kept to these specific dates and hours and the maximum durations. Obtain written permission from the Owner for any interruption of power, lighting or signal circuits and systems.

BSC – Waste Water Tenant Improvement
City of Bellevue

- B. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work, due to maintaining continuity of service herein required.
- C. Organize work to minimize duration of power interruption.

Description **E1331.**

This power entry connects a ceiling's electrical supply to the base of a frame, either directly or through any connector. It distributes up to four 20-amp circuits and holds up to 90 4-pair UTP Category 5 cables. The power entry has a 10'-high pole that can be field cut to the appropriate length, ceiling and base trim, connecting hardware, conduit, and a factory-installed electrical harness that plugs into the right-hand receptacle outlet on the frame harness. Due to the location of the power entry connection, only three receptacle locations remain available in the frame harness. It is UL listed and CSA certified.

Dimensions	Height	Depth	Width
	46", 54", 62", 70", 86"	3 1/4"	3"

Construction **Pole, Hardware, and Trim**

The ceiling power entry power pole, which houses cables and wires between the ceiling and the base of the frame, shall be a rigid, fire-retardant polyvinyl chloride (PVC) extrusion, 10' high, with a full-length, two-sided zip-lock seam. It shall also have connecting hardware for mechanical attachment to ends of frames or to corner connectors, either 54" or 70" high. A bezel, for trimming the pole entry into the ceiling, shall be injection-molded Noryl N190 (polyphenylene oxide-based resin from GE Plastics). The bezel shall have hardware (for attaching to the ceiling) and a fire-retardant flexible polyester polyurethane foam plug (to prevent air passage through the pole). The trim cover, for finishing the base of the pole, shall be injection-molded Noryl N190.

Electrical Components

Inside the pole and 3' above the base, a 14' conduit with 8 American Wire Gauge (AWG) copper wire conductors, 6 #12 AWG, 2 #10 AWG, shall be connected to a 9/16" extra-flexible conduit, 3' long, with a conduit connector. A polycarbonate terminal housing shall mechanically lock to the bottom of the conduit with a molded-in clamp. The terminals shall be tin-plated, high-conductivity copper alloy.

Conductor Color Coding

Color	Wire Size	Use
white (red stripe)	10 gauge	isolated neutral
white (black lettering)	10 gauge	shared (common) neutral
green/yellow	12 gauge	isolated ground
green	12 gauge	common ground
black	12 gauge	hot circuit A
red	12 gauge	hot circuit B
blue	12 gauge	hot circuit C
pink	12 gauge	hot circuit D

Additional Electrical Information

The power entry kit shall use either 120/208 volt, 3-phase (in a WYE configuration), 60-hertz power, or 120/240 volt, single-phase, 60-hertz power to supply 4 separate 20-amp circuits.

Performance Data The unit shall be Underwriters Laboratories (UL) listed and Canadian Standards Association (CSA) certified. The unit shall be approved for use in New York City. Only the nonpowered ceiling power entry shall be approved for use in cities under the jurisdiction of the City of Los Angeles electrical code. Conductor insulation shall be rated for a capacity of 600 volts and for 105° centigrade. This ceiling power entry distributes up to four 20-amp circuits.

Cable Capacity

	Product Reference	Pathway Area (sq. in.)	4-pr. UTP Cable Categories 3,5,5e		4-pr. UTP Cable Category 6		4-pr. UTP Cable Category 6a		Fiber Optic Cable	
Cable Diameter, in.			0.22		0.25		0.35		.12 x .25	
Cable Area, sq. in.			0.03801		0.04909		0.09621		0.03000	
Fill Factor			40%	60%	40%	60%	40%	60%	40%	60%
Ceiling Entry, powered	E1331.xxE	5.4	57	86	44	66	23	34	72	109
Ceiling Entry, non-powered	E1331.xxN	6.6	70	105	54	81	28	41	89	133

Description	<p>E1325.</p> <p>This power entry connects a building's electrical supply from a wall, floor, or column to a powered frame. It enters the frame through the end of the cable management cover and plugs into the right-hand receptacle outlet on a power harness. The power entry includes a 6' cable that can be field cut to the appropriate length. Due to the location of the power entry connection, only three receptacle locations remain available in the frame harness. It is UL listed and CSA certified.</p>
--------------------	--

Dimensions	<p>Length of Conduit</p> <hr/> <p>6'</p>
-------------------	---

Construction	<p>Power Entry</p> <ul style="list-style-type: none"> • Each direct connect power entry is an electrical harness that can be wired to the building's power (on 1 end) and plugged into a frame's electrical harness (on the other end) to distribute 4-circuit electrical power. It shall include a 6' length of cable with a connector on 1 end. • The cable shall be 8 American Wire Gauge (AWG) copper wire conductors in a conduit of extra-flexible steel tubing with a 9/16" interior diameter and a 7/8" exterior diameter. • The connector—which lets the power entry connect to a receptacle mounting bracket in the base of a panel—shall be 8 tin-plated, high-conductivity copper alloy terminals in an Underwriters Laboratories (UL) 94 V-O rated fire retardant, rigid nylon terminal housing. Each terminal shall connect to a conductor. • Conductors (lines and wiring) shall be <ul style="list-style-type: none"> - 4 hot wires of 12-gauge copper, each rated at 20 amps - 1 common and 1 isolated neutral wire of 10-gauge copper - 1 common and 1 isolated ground wire of 12-gauge copper • The 8 conductors shall be color coded: <table border="0" style="margin-left: 20px;"> <tr> <td>- Green</td> <td>common ground</td> </tr> <tr> <td>- Green/yellow</td> <td>isolated ground</td> </tr> <tr> <td>- White w/black lettering</td> <td>shared (common) neutral</td> </tr> <tr> <td>- White w/red lettering</td> <td>isolated neutral</td> </tr> <tr> <td>- Black</td> <td>hot circuit A</td> </tr> <tr> <td>- Red</td> <td>hot circuit B</td> </tr> <tr> <td>- Blue</td> <td>hot circuit C</td> </tr> <tr> <td>- Pink</td> <td>hot circuit D</td> </tr> </table> 	- Green	common ground	- Green/yellow	isolated ground	- White w/black lettering	shared (common) neutral	- White w/red lettering	isolated neutral	- Black	hot circuit A	- Red	hot circuit B	- Blue	hot circuit C	- Pink	hot circuit D
- Green	common ground																
- Green/yellow	isolated ground																
- White w/black lettering	shared (common) neutral																
- White w/red lettering	isolated neutral																
- Black	hot circuit A																
- Red	hot circuit B																
- Blue	hot circuit C																
- Pink	hot circuit D																

Additional Electrical Information
 The power entry kit shall use either 120/208 volt, 3-phase (in a WYE configuration) 60-hertz power, or 120/240 volt, single-phase, 60-hertz power to supply 4 separate 20-amp circuits. The connector shall slide into a receptacle mounting bracket on the frame's electrical harness; conductors shall be hardwired to the building power source.

Performance Data	<p>The power entry shall be Underwriters Laboratories (UL) listed and Canadian Standards Association (CSA) certified. Because the conduit is not liquid tight, UL regulations prohibit its use wherever any of the conduit shall be outside the frame or be visible. This power entry shall be approved for use in cities under the jurisdiction of the City of Los Angeles electrical code; it will not be approved for use in New York City. Conductors shall be rated for a capacity of 600 volts and their insulation shall be rated for 90° centigrade.</p>
-------------------------	--

END OF SECTION 16010

1.1 SUMMARY

- A. Section Includes:
 - 1. Raceways.
 - 2. Wires, cables and connectors.
 - 3. Outlet boxes.
 - 4. Devices and plates.
 - 5. Identification.
 - 6. Power/signal poles.

1.2 SYSTEM DESCRIPTION

- A. Provide raceways, wires, cables, connector, boxes, devices, finish plates and the like for a complete and operational electrical system.
- B. Electrical Connections: Connect equipment, whether furnished by Owner or other Divisions of the Contract, electrically complete.
- C. Supporting Devices: Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Provide seismic bracing per IBC requirements for this building location.
- D. Provide power/signal poles as indicated on Drawings.

1.3 SUBMITTALS

- A. Provide shop drawings and product data for the following:
 - 1. Raceways.
 - 2. Wires, cables and connectors.
 - 3. Outlet boxes.
 - 4. Devices and plates.
 - 5. Identification equipment.
 - 6. Power/signal poles.
- B. Provide the following operating and maintenance instructions from the manufacturer for project closeout, see project closeout requirements in Division 1:
 - Devices and plates.
 - Power/signal poles.

1.4 REGULATORY REQUIREMENTS

- A. Conform to the latest adopted version of the National Electric Code (NEC), with state amendments.
- B. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wires and Cables: Carol, General Cable, Okonite, Southwire, or approved.
- B. Connectors: Stranded conductors by Anderson, Burndy, IlSCO, Thomas & Betts, or approved.

2.2 RACEWAYS

- A. Power/Signal Poles:

1. Power and Communication or Communication Only Power Poles: 20 amp circuit on divided power and communication pole. Panduit PCPA11R20 (power/communication) or PCPA112 (communication only) PanPoles.
2. Finish: Off White.

2.3 WIRES AND CABLES

- A. Copper, 600 volt rated throughout. Conductors 14AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded. Phase color to be consistent at feeder terminations; ABC, top to bottom, left to right, front to back. Conductors 3AWG and larger, minimum insulation rating of 75C. Insulation types THWN2 or XHHW2. Minimum insulation rating of 90C for branch circuits. Color code conductors as follows:

PHASE	208 VOLT WYE	240 VOLT DELTA	480 VOLT
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green
Isolated Ground	Green w/yellow trace	N/A	N/A

2.4 CONNECTORS

- A. Conductor Branch Circuits: Wire nuts with integral spring connectors for conductors 18 through 8AWG. Pushin type connectors where conductors are not required to be twisted together are not acceptable. Manufacturers: 3M, Ideal, or approved.
- B. Fluorescent Luminaire Disconnect: polycarbonate housing, tinned brass contacts, insulated 18AWG, factory installed solid copper leads, 105C temperature rating, UL94V2 flammability, 4A, 600V. NEC Article 410 compliant. Fingersafe line side. Pushandclick connector. Thomas & Betts StaKon, Lithonia or approved.

2.5 BOXES

- A. General:
 Device Outlet: Installation of one or two devices at common location, minimum 4 inches square, minimum 1 1/2 inches deep. One or two gang flush device raised covers. Bowers, Hubbell, or approved.
 Signal and Communication Systems Outlet: 4 inch square box, 2 1/8 inches deep. One or two gang raised device cover. Bowers, Hubbell, or approved.
 Multiple Devices: Three or more devices at common location. Install one piece gang boxes with one piece device cover. Install one device per gang. Bowers, Hubbell, or approved.
- B. Box Extension Adapter: Diecast aluminum construction. Install over flush wall outlet boxes to permit flexible raceway extension to equipment. Bell 940 Series, Carlon, Red Dot IHE4 Series, or approved.
- C. Conduit Fittings: Provide corrosion resistant punched steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation. OZ Gedney, Thomas & Betts, or approved.

2.6 WIRING DEVICES

- A. Wall Switches:

1. Toggle Type Characteristics: Quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage. Cooper 1221, Leviton 1221, Hubbell 1221, Pass & Seymour 20ACI.
 2. Finish: Match building standard.
 - B. Wall Dimmers:
 1. Compatible with type or load controlled (i.e., electronic ballast, low voltage luminaire, and the like).
 2. Finish to match wall switches. Size dimmers to accept connected load. Do not cut fins. Where dimmers are ganged together, provide a single multigang coverplate. Leviton TN Series, Lutron NT Series, or approved.
 - C. Receptacles:

Finish: Same exposed finish as switches.

 1. Duplex Receptacle Characteristics: Straight parallel blade, 125 volt, 2 pole, 3 wire grounding.
 - a. Commercial Grade: Riveted. Brass ground contact on steel mounting strap. 20 amp. Cooper BR20, Hubbell CR5362, Leviton BR20, Pass & Seymour BR20.
 - b. Decorative Type: Back and side wired. 20 amp. Cooper 6352, Hubbell HBL2162, Leviton 16362, Pass & Seymour 26352.
Ground Fault Circuit Interrupter (GFCI) Receptacle: Meets or exceeds UL943 (Class A GFCI), UL498. Feed through type, backandside wired, 20 amp, 125VAC, Cooper XGF20, Hubbell GF5362, Leviton 8898, Pass & Seymour 2094.
Special Purpose Receptacles: Refer to drawings for NEMA Standard Specification.
 - D. Finish Plates: Match building standard.
 - E. Surface Covers:
 1. Material: Galvanized or cadmium plated steel, 1/2inch raised industrial type with openings appropriate for devices installed in surface outlets.
- 2.7 SUPPORTING DEVICES
- A. Hangers: Kindorf B9052A channel, H119D washer, C105 strap, 3/8inch rod with ceiling flange.
 - B. Concrete Inserts: Kindorf D255, cast in concrete for support fasteners for loads up to 800 lbs.
 - C. Pipe Straps: Two hole galvanized or malleable iron.
 - D. Luminaire Chain: Single jack chain No. 10, 40 lb. working load limit.
- 2.8 ELECTRICAL IDENTIFICATION
- A. Conductor Numbers: Manufacturers standard vinylcloth selfadhesive cable and conductor markers of the wraparound type. Preprinted black numbers on yellow field. Brady, Panduit, or approved.
 - B. Branch Circuit Panel Schedules: Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.
 - C. Circuit Breaker Identification: Provide permanent identification number in or on panelboard deadfront adjacent to each circuit breaker pole position.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conduit:

- a. Where exposed conduits are permitted install parallel or at right angles to building lines, tight to finished surfaces and neatly offset into boxes.
 - b. Do not install conduits or other electrical equipment in obvious passages, doorways, scuttles or crawl spaces which would impede or block the area passage's intended usage.
 - c. Do not install conduits on surface of building exterior, across roof, on top of parapet walls, or across floors.
 - d. Route raceway at least 6 inches from hot surfaces above 120F, including non insulated steam lines, heat ducts, and the like.
2. Flexible Conduit: Install 12inch minimum slack loop on flexible metallic conduit and PVC coated flexible metallic conduit.
 3. Conduit Size: Size as indicated on drawings. Where size is not indicated, provide conduit in minimum code permitted size for THW conductors of quantity required for complete operation. Minimum trade size 3/4 inch.
 4. Provide pull cord in empty conduits that exceed 10 feet in length or the total sum of bends exceed 90 degree radius.
 5. Branch Circuits: Do not change the intent of the branch circuits or controls without approval. Homeruns for 20 amp branch circuits may be combined to a maximum of six current carrying conductors in a homerun. Apply derating factors as required by NEC. Increase conductor size as needed.
 6. Feeders: Do not combine or change feeder runs.
 7. Unless otherwise indicated, provide raceway systems for conductors.

B. Conduit Fittings:

1. Use set screw type fittings only in dry locations. When set screw fittings are utilized provide insulated continuous equipment ground conductor in conduit, from over current protection device to outlet.

C. Surface Receptacle/Signal Raceway System: Install per manufacturer's installation instructions. Install perpendicular and parallel to building lines.

D. Conductors, Wires and Cables:

Conductor Installation:

1. Install conductors in raceways having adequate, code size cross sectional area for wires indicated. Install conductors with care to avoid damage to insulation. Do not apply greater tension on conductors than recommended by manufacturer during installation. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation. Do not use pulling compounds for installation of conductors connected to GFCI circuit breakers or GFCI receptacles.
2. Conductor Size and Quantity: Install no conductors smaller than 12AWG unless otherwise shown. Provide required conductors for a fully operable system.

3. Provide dedicated neutrals (one neutral conductor for each phase conductor) in the following single phase circuits:
 - a) Ground fault protected circuits where a GFCI breaker is used in a panel board.
 - b) Other electronic equipment that produces a high level of harmonic distortion including, but not limited to, computers, printers, plotters, copy machines, and fax machines.
4. Conductors in Cabinets: Hold conductors away from sharp metal edges. Cable and tree wires in panels and cabinets for power and control. Use plastic ties in panels and cabinets. Tie and bundle feeder conductors in wireways of panelboards.
- E. Connectors: Retighten lugs and connectors for conductors to equipment prior to Substantial Completion.
- F. Boxes:
 1. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
 2. Round Boxes: Avoid using round boxes where conduit must enter through side of box, which would result in a difficult and insecure connection with a locknut or bushing on the rounded surface.
 3. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
 4. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.
 5. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.
 6. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Include but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, and other necessary components.
 7. Code Compliance: Comply with NEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to NEC, except as noted otherwise.
 8. Flush Outlets in Finished Spaces: Maintain integrity of insulation and vapor barrier. Surface outlets are only acceptable in areas with surface conduit.
 9. Mount center of outlet boxes as required by ADA, or noted on drawings, the following distance above the floor:
 - a. Control Switches: 46 inches.
 - b. Receptacles: 18 inches.
 - c. Other Outlets: As indicated in other Sections of Specifications or as detailed on drawings.
 10. Coordinate electrical device locations (switches, receptacles, and the like) with drawings to prevent mounting devices in mirrors, back splashes, behind cabinets, and the like.
- G. Wiring Devices:
 1. Wall Mounted Receptacles: Install with long dimension oriented vertically at centerline height shown on drawings or specified herein.

2. Vertical Alignment: When more than one outlet is shown on drawings in close proximity to each other, but at different elevations, align the outlets on a common vertical center line for best appearance. Verify with Architect.
- H. Provide NEC required disconnect switches whether specifically shown on drawings or not. Provide disconnect switch in sight of each motor location unless otherwise noted. Provide disconnect switch in site of each motor controller. Motor controller disconnect equipped with lockout/tagout padlock provisions do not require a disconnect switch at the controlled motor location. Coordinate fuse ampere rating with installed equipment. Fuse ampere rating variance between original design information and installed equipment, size in accordance with Bussmann Fusetron 40C recommendations. Do not provide fuses of lower ampere rating than motor starter thermal units.
- I. Supporting Devices:
1. Verify mounting height of luminaires or items prior to installation when heights are not detailed.
 2. Install vertical support members for equipment and luminaires, straight and parallel to building walls. Provide independent supports to structural member for electrical luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.
 3. Do not use other trade's fastening devices as supporting means for electrical equipment, materials or luminaires. Do not use supports or fastening devices to support other than one particular item.
 4. Support conduits within 18 inches of outlets, boxes, panels, cabinets and deflections. Maximum distance between supports not to exceed 8 foot spacing.
 5. Securely suspend junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
 6. Provide seismic bracing per IBC requirements for this building location.
- J. Electrical Identification:
1. Graphics: Coordinate names, abbreviations and designations used on drawings with equipment labels.
 2. Conductor Identification: Apply markers on each conductor for power, control, signaling and communications circuits.
 3. Install a PTouch label on each major unit of electrical equipment indicating both equipment name and circuit serving equipment (e.g. "EF1, CKT. 2P11,3,5), including but not limited to the following items: Disconnect switches, relays, contactors, time switches, override switches, service disconnects, distribution switches, branch circuit panelboards, and central or master unit of each electrical system including communication/signal systems, mainly for labeling receptacle circuits.
 4. Install engraved labels on the inside of flush panels, visible when door is opened. Install label on outside of surface panel.
 5. Install signs at locations detailed or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment.

6. On the front of receptacle finish plates provide PTouch label with the circuit that each device is connected to. Label is selfadhesive type with black letters and clear background, 18 point lettering size.

3.2 FIELD QUALITY CONTROL

- A. Wiring Device Tests: Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements. Test receptacles for line to neutral, line to ground and neutral to ground faults. Correct any defective wiring.

END OF SECTION 16050

16500 LIGHTING
PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Luminaires – OWNER PROVIDED.
 2. Ballasts and power supplies – OWNER PROVIDED.
 3. Lamps. - OWNER PROVIDED.
 4. Emergency lighting equipment.

1.2 SUBMITTALS

- A. Submit for:
1. Luminaires: Include electrical ratings, dimensions, mounting, material, required clearances, terminations, wiring and connection diagrams, photometric data, diffusers, and louvers.
 2. Ballasts and power supplies.
 3. Lamps.
 4. Emergency lighting equipment.
 5. Lighting poles.
- B. Submittal Cutsheets: Highlight, circle or otherwise indicate which option(s) are being selected for the products submitted. Cutsheets that are not edited to indicate which products are submitted for this project are not acceptable.
- C. Specified manufacturers are approved to submit bid. However, inclusion does not relieve manufacturer from supplying product as described.
- D. Provide the following operating and maintenance instructions from the manufacturer for project closeout, see Project Closeout Requirements in Division 1:
1. Luminaires.
 2. Ballasts and power supplies.
 3. Lamps.
 4. Emergency lighting equipment.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Provide luminaires acceptable to code authority for application and location as indicated.
 2. Comply with applicable ANSI standards pertaining to lamp materials, lamp ballasts and transformers, and luminaires.
 3. Comply with applicable NEMA standards pertaining to lighting equipment.
 4. Provide luminaires and lampholders which comply with UL standards and have been listed and labeled for location and use indicated by a testing agency acceptable by the AHJ (e.g. UL, ETL, and the like).
 5. Comply with NEC as applicable to installation and construction of luminaires.
 6. Comply with fallout and retention requirements of IBC for diffusers, baffles, louvers, and the like.
 7. Provide same type lamps and ballasts from same manufacturer (e.g. fluorescent lamps from Osram/Sylvania, MR lamps from Ushio, and the like).

1.4 WARRANTY

- A. Ballast Manufacturer's Warranty: Not less than 2 years for magnetic type ballasts and 5 years for electronic type ballasts, based on date of substantial completion. Warranty includes normal cost of labor for replacement of ballast.
- B. Linear T8 and T5 Lamp and Ballast Combination Warranty: Provide ballast and lamp combinations which will result in written factory warranty covering lamps for 3 years and ballasts for 5 years, based on date of substantial completion.
- C. Lamp Warranty: 30 days for incandescent, 12 months for compact fluorescent, 36 months for fluorescent and 12 months for HID lamps, based on date of substantial completion.
- D. Induction: 5 years for the lamp and ballast.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Luminaires: Refer to description and manufacturers in Luminaire schedule.
- B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.
- C. UL label luminaires installed under canopies, roof or open porches, and similar damp or wet locations, as suitable for damp or wet locations.
- D. Suspended luminaires: provide 24 inch adjustability in aircraft cable length where used.
- E. Recessed Luminaires: Frame compatible with ceiling material installed at particular luminaire location. Provide proper factory trim and frame for luminaire to fit location and ceiling material.
- F. Finishes:
 - 1. Manufacturer's standard finish (unless otherwise indicated) over a corrosion resistant primer.
 - 2. Interior Light Reflecting Finishes: White or specular finish with not less than 85 percent reflectances.
 - 3. Exterior Finishes: As detailed in luminaire schedule or on Drawings. Refer cases of uncertain applicability to Architect for resolution prior to release for fabrication.
- G. Light Transmitting Components:
 - 1. Plastic diffusers, molded or extruded of 100 percent virgin acrylic.
 - 2. Prismatic acrylic, extruded, flat diffusers, 0.125 inch overall thickness, unless otherwise noted.
- H. Fluorescent Luminaires:
 - 1. Provide open lamp fluorescent luminaires without diffusers or guards with turret type, spring loaded sockets.
 - 2. For T5HO lamps, provide twist and lock design sockets, socket body rated to 110C and socket rotor rated to 140C.
 - 3. Provide wire lamp guards on exposed lamp fluorescent luminaires.

2.2 BALLASTS AND POWER SUPPLIES

- A. General:

1. Provide ballasts UL rated for specified lamps.
 2. Thermal Protection: Internal UL Class 'P' with automatic reset.
 3. Sound Ratings: Class 'A'. Where not available as standard product from any specified manufacturer, provide quietest rating available.
 4. Total Harmonic Distortion: Not to exceed 20 percent of the input current unless otherwise indicated.
 5. Input Voltage: Provide universal voltage ballast matching branch circuit supply voltage, with minimum +/-10 percent variation tolerance.
 6. Provide quantity of ballasts to provide switching as indicated on Drawings.
 7. Provide factory printed wiring diagram on ballast housing.
 8. Ballasts used in enclosed and gasketed luminaires shall be of Type 1 construction.
 9. Comply with FCC rules and regulations Part 18, Class A concerning generation of both electromagnetic interference and radio frequency interference.
- B. Ballasts for Linear Fluorescent Lamps:
1. Power Factor: Minimum 97 percent.
 2. Do not provide magnetic fluorescent ballasts.
 3. Linear T8 ballasts: Antistriation circuitry, and UL type CC rated for arc protection. Compliant with NEMA/CEE high performance T8 lighting system specifications and listed with NEMA Premium Electronic Ballast program.
 4. Nondimming Electronic:
 - a. Tandem wiring between luminaires may be used to minimize the number of ballasts while accomplishing the switching requirements shown on Drawings. Provide label in lamp compartment of luminaire to identify the function of ballast. Label shall not be visible from room.
 - b. Provide ballasts that meet requirements of UL 935, ANSI C82.11 and bear the appropriate UL label.
 - c. Provide ballasts that withstand input power line transients as defined in ANSI C62.41, Category A and IEEE 587.
 - d. Provide series wired programmed start ballast unless noted on drawings.
 - e. High frequency operation: Not less than 42kHz.
 - f. Integral end of lamp life detection and shutdown circuit with automatic reset.
 - g. Lamp Crest Factor: Maximum 1.7 for programmed rapid start ballasts and maximum 1.85 or less for instant start ballasts.
 - h. Average Ballast Factor (BF): Minimum 88 percent or as indicated in the luminaire schedule.
 - i. Provide 0 degree Fahrenheit minimum starting temperature ballasts for luminaires installed where exposed to anticipated ambient temperature less than 55F.
 - j. Manufacturers for Ballasts for T8 lamps: Philips Optanium Series, Universal Lighting Technologies Accustart Series, Osram/Sylvania Quicktronic Series, or approved.
 5. Dimming Electronic:
 - a. Meet requirements of nondimming electronic ballasts.

- b. Do not use tandem wiring between luminaires.
 - c. Ballast starts lamp at any preset light output setting and provide continuous, square law dimming from 100 percent to specified lowend output.
 - d. Control Protocol for Ballast: Compatible with lighting control system as specified and supplied. Ballast supplied with positive line voltage on/off.
 - e. Manufacturers: Lutron, Philips, Osram/Sylvania, or approved.
- C. Ballasts for Compact Fluorescent Lamps:
- 1. Power Factor: Minimum 97 percent.
 - 2. Provide ballasts which meet requirements of UL 935, ANSI C82.11 and bear the appropriate UL label.
 - 3. Integral end of lamp life detection and shutdown circuit with automatic reset.
 - 4. Nondimming Electronic:
 - a. Provide series wired programmed start ballast unless noted on drawings.
 - b. High frequency operation: Not less than 42kHz.
 - c. Integral end of lamp life detection and shutdown circuit with automatic reset.
 - d. Lamp Crest Factor: Maximum 1.5.
 - e. Average Ballast Factor (BF): Minimum 98 percent.
 - f. 0 degree Fahrenheit minimum starting temperature.
 - g. Manufacturers: Philips Smartmate Series, Osram/Sylvania Quicktronic Prostart Series, or approved.
 - 5. Dimming Electronic:
 - a. Meet requirements of nondimming electronic ballasts.
 - b. Ballast starts lamp at any preset light output and provide continuous, square law dimming from 100 percent to specified lowend output.
 - c. Supply line voltage controls with airgap disconnect.
 - d. Control Protocol for Ballast: Compatible with lighting control system as specified and supplied. Ballast supplied with positive line voltage on/off.
 - e. Manufacturers: Lutron, Philips, Osram Sylvania, or approved.
 - 6. Nondimming Electronic:
 - a. Integral end of lamp life detection and shutdown circuit with automatic reset.
 - b. High frequency operation: not less than 170Hz.
 - c. Ballast shall tolerate input voltage variation of plus or minus 10 percent with less than plus or minus 0.5 percent variation in output voltage.
 - d. Lamp Crest Factor: Maximum 1.3.
 - e. Manufacturers: Osram/Sylvania, Robertson, Philips, Lightech, Universal Lighting Technologies, Panasonic or approved.
- D. Provide special types as indicated in the Luminaire Schedule.
- 2.3 LAMPS
- A. Provide lamps for luminaires.
 - B. Provide lamp cataloged for specified luminaire type.
 - C. Provide similar lamps by a common manufacturer unless indicated in the luminaire schedule.

- D. Manufacturers: Osram/Sylvania, General Electric, Philips, Venture, Ushio (MR only), EYE (MR only), or approved unless specific manufacturer is indicated in the luminaire schedule.
- E. Incandescent: Not allowed unless noted in luminaire schedule.
- F. Tungsten Halogen Incandescent:
 - 1. Line voltage:
 - a. PAR lamps: Provide HIR technology, medium screw base, size, wattage and beam spread as indicated in the luminaire schedule.
 - b. Tubular: Provide HIR technology, wattage and base configuration as indicated in the luminaire schedule and proper type for luminaire.
 - 2. Low Voltage: Wattage, voltage, beam spread, base style and type as indicated in the luminaire schedule.
- G. Fluorescent:
 - 1. Provide 3500K fluorescent lamps unless noted in luminaire schedule.
 - 2. Linear Fluorescent:
 - a. T8: Provide the following:
 - 1) Bipin base, triphosphor coated
 - 2) Initial 3100 lumen output.
 - 3) Compatible with dimming ballasts.
 - 4) Length and wattage as indicated in the luminaire schedule.
 - 3. Compact Fluorescent:
 - a. CRI equal to or exceeding 82.
 - b. Single ended, fourpin plugin base, triphosphor coated, CCT, wattage and configuration as indicated in the luminaire schedule.
 - c. Manufacturers: Osram/Sylvania, General Electric, Philips, or approved.
- H. Induction:
 - 1. Triphosphor coated, CRI exceeding 80, CCT, wattage and configuration as indicated in the luminaire schedule.
 - 2. Manufacturers: Osram/Sylvania, Philips

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordination of Conditions: Coordinate ceiling construction, recessing depth and other construction details prior to ordering luminaires for shipment. Refer cases of uncertain applicability to Architect for resolution prior to release of luminaires for shipment. Where luminaires supplied do not match ceiling construction, replace luminaires at no cost to Owner.
- B. Provide fluorescent and HID luminaires with ballast compatible to lighting control system as shown in drawings and specifications.

3.2 INSTALLATION

- A. Install luminaire of types indicated where shown and at indicated heights in accordance with manufacturer's written instructions and with recognized industry practices to ensure that luminaires comply with requirements and serve intended purposes.

- B. Align, mount and level luminaires uniformly. Use ball hangers for suspended stem mounted luminaries.
 - C. Avoid interference with and provide clearance for equipment. Where indicated locations for luminaires conflict with locations for equipment, change locations for luminaire by minimum distance necessary as directed by Architect.
 - D. Suspended Luminaires: Mounting heights indicate clearances between bottom of luminaire and finished floors.
 - E. Egress Luminaires: Provide unswitched emergency circuit to exit signs and emergency luminaires.
 - F. Interior Luminaire Supports:
 - 1. Support Luminaires: Anchor supports to structural slab or to structural members within a partition, or above a suspended ceiling.
 - 2. Maintain luminaire positions after cleaning and relamping.
 - 3. Support luminaires without causing ceiling or partition to deflect.
 - 4. Provide recessed fluorescent luminaires with two support wires as outlined in IBC.
 - G. Wiring:
 - 1. Recessed luminaires to be installed using flexible metallic conduit with luminaire conductors to branch circuit conductors in a nearby accessible junction box over ceiling. Junction box fastened to a building structural member within 6 feet of luminaire.
 - 2. Install luminaires for lift out and removal from ceiling pattern without disconnecting conductors or defacing ceiling materials.
 - 3. Flexible connections where permitted to exposed luminaires; neat and straight, without excess slack, attached to support device.
 - 4. Install junction box, flexible conduit and high temperature insulated conductors for through wiring of recessed luminaires.
 - H. Relamp luminaires which have failed lamps at completion of work.
- 3.3 ADJUSTING
- A. Focus and adjust floodlights, spotlights and other adjustable luminaires, with Architect, at such time of day or night as required.
 - B. Align luminaires that are not straight and parallel/perpendicular to structure.
- 3.4 CLEANING
- A. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.
 - B. Where finish of luminaires has been damaged, touch up finish as directed by manufacturer's instructions.

END OF SECTION 16500