CHARLESTOWN CROSS CREEK RENOVATION - PHASE I

Catonsville, Maryland

Bid Set
December 8, 2017

PROJECT MANUAL

OWNER	**Charlestown Community, Inc.** **715 Maiden Choice Lane** **Catonsville, MD 21228**
ARCHITECT	**Marks, Thomas Architects, Inc** **1414 Key Highway, 2nd Floor** **Baltimore, MD 21230**
MEP ENGINEER	**Kibart Inc., Consulting Engineers** **901 Dulaney Valley Road, Suite 301** **Towson, MD 21204**
INTERIOR DESIGN	**Marks, Thomas Architects, Inc** **1414 Key Highway, 2nd Floor** **Baltimore, MD 21230**
KITCHEN CONSULTANT	**Drafting & Design, LLC** **4120 Rinehart Road** **Westminster, MD 21158**

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SECTION 114000 – FOOD SERVICE EQUIPMENT

PART 1 – GENERAL SPECIFICATIONS

1.00 SCOPE OF WORK AND RELATED WORK:

A. **Scope of Work**: The Kitchen Equipment Contractor is to furnish all labor, materials, equipment and services necessary to furnish and deliver all Food Service Equipment specified in Section 11400 into the building or buildings, uncrate, assemble, hang, set in place, level, and completely install unless otherwise noted, exclusive of final utility connections which are by Divisions 15 and 16. The K.E.C. shall provide start-up and testing of all equipment furnished by K.E.C. (See Section 3.2 - START UP AND TESTING)

B. **Related work to be furnished by Other Trades**:

1. All plumbing, electrical, mechanical and ventilation work required along with the food service equipment including roughing in of utilities required as indicated on the Food Service Consultant Design Drawings and the Contract documents along with the final connections from the rough ins to the equipment, utility service to rough ins and all utility connections shall be by Divisions 15 and 16.
2. All fittings, hoses, valves, check valves, stops, traps, direct and indirect wastes with tailpieces, strainers, etc. required for equipment in this section will be furnished and installed by Division 15 unless specifically called for otherwise under any item.
3. All fittings, wire, disconnect switches, safety switches, convenience boxes, outlets, materials and connections will be furnished and installed by Division 16 unless specifically called for otherwise.
4. <u>All interconnections between the building components and equipment along with materials needed for such will be by Divisions 15 and 16 unless specifically called for otherwise under any item</u>. The Kitchen Equipment Contractor shall furnish any technical support required for these interconnections from the factories, etc.
5. Any starters, valves, faucets, tailpieces, etc. furnished loose with the equipment will be installed by Divisions 15 and 16.
6. Any sleeves or conduit required for soda lines, cash registers, refrigeration, beer lines and carbonation lines will be furnished and installed by Division 15.
7. Any electrical and plumbing interconnections to and between compressors, blower coils, controls, lights, etc. along with final connections will be furnished and installed by Divisions 15 and 16 unless stated otherwise.
8. Any ventilating fans and all duct work required for a complete operation system as well as any access panels required for fire protection nozzles in the ductwork will be furnished by Division 15 unless specifically noted otherwise. If the Exhaust & MUA Fans are furnished by the K.E.C., they will be furnished loose along with the roof curbs to the General Contractor Division 15/ for installation by the General Contractor/ Division 15.
   <u>NOTE: General Contractor and/or HVAC Contractor/ Division 15 shall provide proper air handling balancing by an Authorized Balancing Company between the Exhaust/MUA Fans and Room Air System to ensure negative balance at the Exhaust Hood. Coordinate with K.E.C.</u>
9. All penetrations/sleeves, in walls, floors or ceilings including roof pitch pockets needed for equipment as well as any access panels for any food service equipment not furnished by the food service equipment vendor will be furnished by the General Contractor unless specifically noted otherwise.

1.01 **DEFINITIONS:**

A. All references to the terms “Kitchen Equipment Contractor” or “K.E.C.” in these specifications and/or on the drawings shall be defined as meaning the Kitchen Equipment Contractor/Supplier.

B. All references to the term “Owner’ in these specifications and/or drawings shall be defined as meaning the Owner or Owner’s representative.

C. All references to the term “Consultant” or “Food Service Equipment Consultant” in these specifications and/or drawings shall be defined as meaning **DRAFTING & DESIGN, LLC** and its authorized representatives.

1.02 **QUALIFICATIONS**:

A. Qualification of Supplier:

1. Commercial Food Service Equipment Suppliers shall comply with the following qualifications.
   a. List of projects successfully completed of comparable scope if requested.
   b. Must have manufacturer’s authorization to distribute and install specified equipment.
   c. Provide an experienced staff of foodservice equipment installers.
   d. Prepare/provide professional roughing in drawings and brochure books if required.
   e. Must have access to fabrication companies meeting N.S.F. requirements that is familiar with and regularly produce Food Service Equipment.
   f. Must have access to a stock of repair and replacement parts along with factory authorized service companies.

B. Qualification of Fabricators:

1. Any fabricator to be used shall be a N.S.F. approved company and must have trained personnel and facilities in order to comply with these specifications and any details attached.
2. All custom fabricated equipment shall bear the N.S.F. (National Sanitation Foundation) seal of approval.
3. One fabricator must be used per project and all equipment must be fabricated at the same shop.

C. Qualifications of Manufacturers:

1. All manufacturers shall be routinely engaged in the production of items to be furnished and have demonstrated the capability to regularly furnish similar equipment that performs the functions specified within. All equipment to be the latest in design that complies with these specifications.

D. Discrepancies:

1. Any discrepancies with contract documents should be brought to the attention of the Consultant in writing for clarification prior to ordering or fabricating of any items.

1.03 **PLANS AND SPECIFICATIONS:**

A. These documents (plans & specifications) have been prepared for the use in procuring, installation, erection and start up of all the equipment in these specifications and contract. These plans and specifications are to be considered as mutually explanatory and work required by one, but not the other, will be performed as though required by both. When there is any discrepancy between drawings and specifications, drawings will govern.

Any discrepancies are to be clarified from the Consultant before bidding.

1.04 **SUBMITTAL REQUIREMENTS:**

A. The submittals for this project are to be submitted within four (4) weeks or within the time frame described by the General Contractor or Owner to meet the project's time frame. Assemble and submit all shop drawings, rough in drawings, brochures, color samples/charts, etc. in order to submit a complete package. No reviews of incomplete submittals will be performed.

B. Should there are any delays to this project due to non-submittal of the complete package by the K.E.C., the K.E.C. will be responsible for all costs associated with this delay.

C. Mark each submittal with the Project Name, date, contractor and any other information needed to properly identify the submittals.

1. PLAN & ROUGH-IN DRAWINGS:

a. Submit six (6) sets of drawings for the food service equipment professionally prepared from the architectural dimensioned plans at a minimum scale of 1/4" = 1' - 0". Verify the number of copies required by the General Contractor and/or Owner or if they are required at all. Consultants Dimensioned Design Rough-in drawings may be used only with permission. If the Consultants design drawings are used, the K.E.C. shall double check all utility information to verify accuracies. The Consultant shall not be held liable or responsible for any errors associated with these drawings being used by K.E.C. It is the responsibility of the K.E.C. to verify all quantities, utilities, etc.

b. Submit an Equipment Layout Plan with arrangement of all specified items identified on a schedule listing item number, description, quantity, manufacturer, model number.

c. Submit Plumbing and Electrical drawings showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.

d. Submit a special condition plan showing exact dimensions and details of all masonry bases, floor depressions, critical partition locations and heights, wall openings, reinforcing for wall and/or ceiling mounted equipment, and conduit locations for soda, beer and refrigeration lines. In addition, on this plan, show ventilation dimensioned locations for all duct openings for ventilators and dish machines identifying size, C.F.M.'s required for exhaust and supply, static pressures, and connection heights.

2. EQUIPMENT BROCHURES:

a. Submit hardbound six (6) copies of manufacturer's brochures along with information sheets indicating item numbers, quantities, model numbers, all utility information and accessories per the specifications. Include any deviations from standard information. These brochure books must be approved before procurement. Include any manufacturer's schematic drawings for mechanical and electrical services for any equipment that may require technical support. (Verify quantity)

3. SHOP DRAWINGS:

a. For manufactured equipment that requires shop drawings for approvals, such as walk in cooler/freezers, ventilator and utility distribution systems, refrigeration systems and custom fabrication, submit (6) sets or however

as many required.

4. OPERATIONAL AND MAINTENANCE MANUALS:

1. Submit four (4) hardbound sets for all standard equipment that is mechanically operated.
2. Include operating, maintenance and cleaning instructions, parts listing recommended parts inventory listing and purchase source, copies of all warranties, schematics, etc. from manufacturer.
3. Manuals shall be marked with the project name, project number, name of contractor, date, and any other appropriate information. There should be information sheets in front of each item of maintenance manuals marked with the item numbers for proper identification.
4. Include in the front of each manual, include a list of all manufacturer's representatives of the food service equipment and the factory authorized service agency for each piece of equipment along with addresses, Telephone numbers and contacts.

5. SAMPLES:

1. If requested, samples of materials, products and fabrication methods, shall be submitted for approvals at no extra cost, before proceeding with the work.

6. RESUBMISSION PROCEDURES:

a. Drawings: Revise all drawings as noted, indicate all revisions on the drawings including any requested by the Consultant. Resubmit under conditions as previously outlined above.
b. Product Data: Resubmit new brochures, etc. as noted. Indicate any revisions on the data. Resubmit under conditions as previously outlined above.
c. Make all re-submittals with two working weeks, ten (10) days from date K.E.C. received marked up submittals.

7. APPROVALS OF SUBMITTALS:

a. After K.E.C. has received approved packages, furnish as many prints and /or copies as requested for various trades, the Owner, the Architect and the Consultant.
b. The approval of drawings are general and in no way relieves the K.E.C. of the responsibility of proper fitting, finishes, quantities, and erection of the work in strict accordance with the contract requirements, nor does it relieve the K.E.C. of the responsibility of furnishing materials and workmanship not indicated on approved drawings but required for the completion of the work.
c. Approvals by the Consultant and/or Owner of the submittals by the K.E.C. does not waive the responsibility of the K.E.C. to furnish each item of equipment in complete accordance with the specifications and drawings including accessories, finishes, etc. Discrepancies between Contract Documents and furnished equipment shall be corrected even after approvals and installation of said equipment at no additional cost to the Owner.

1.05 **PRODUCT STORAGE, DELIVERY AND HANDLING:**

A. Storage:

1. All equipment to be stored in a protected area free from weather and job hazards.
2. Delivery:
   All equipment to be delivered to the job site only after the building is weather proof and vandal safe. Equipment that is installed prior to interior finishes being completed, i.e., ventilators, walk in cooler & freezers should be protected to avoid any damaging of finishes, etc.
3. Handling:
   All equipment to have the factory wrapping, crating and protective coatings remain on them until installation at the job site. Even at this time, all protective coatings, such as coatings on griddles, fryers, etc. are to remain until the final cleaning to ensure against rust and contamination.
4. Damages:
   K.E.C. has all responsibility for any damages or loss incurred prior to final acceptance by the Consultant/Owner. Any items that may be damaged or lost shall immediately be replaced or repaired to new status to the complete satisfaction by the Owner and at no additional cost to the Owner.

1.06 **JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS:**

A. Include the work specified, shown or reasonably inferable as part of food service equipment. Portions of this work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

1.07 **REGULATIONS AND CODES:**

A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication and installation of the work in this section.
   1. N.S.F. Standards: Comply with National Sanitation Foundation Standards and criteria and provide N.S.F. “Seal of Approval” on each manufactured item and custom fabricated work.
   2. UL Standards: For electrical components and assemblies, provide either UL labeled products or, where no labeling service is available provide a complete index of the components used as selected from the UL “Recognized Component Index”.
   3. A.N.S.I Standards: gas burning equipment must comply with ANSI Z21-Series Standards. Comply with ANSI B57.1 for compressed gas cylinder connections and with applicable standards of the Compressed Gas Association for water connection air gaps and vacuum breakers.
   4. A.G.A.: All gas fired equipment shall be A.G.A. approved, equipped to operate on the type gas available at the job site and shall contain 100% automatic safety shut-off devices.
   5. N.F.P.A. Standards: Comply with N.F.P.A. Bulletin 96 for Exhaust systems and with N.F.P.A. Bulletins 17 and 96 for fire extinguishing systems.
   6. A.S.M.E.: Comply with A.S.M.E. boiler code requirements for steam generating and steam heated equipment. Provide A.S.M.E. inspection, stamps, and certification of registration with National Board.
   7. National electric Code: Comply with NEC Volume 5 for electrical wiring and devices included with food service equipment.

8. All authorities having jurisdiction over this type of equipment and/or installation.
9. Where specifications and/or drawings require mechanical, electrical or refrigeration work to be performed, such work shall be done in strict conformance to other portions of the Base Building Specifications which sets forth standards for this type of work.
10. Where there exists two standards or codes for one type of work, the stricter method shall govern.

1.08 **WARRANTIES:**

A. Provide in writing a warranty for all equipment and fabrication against defects and workmanship for a period of one (1) year from date of acceptance including parts and labor.
B. Refrigeration system compressors shall be warranted for five (5) years by the manufacturer. Free Refrigeration service, including parts and labor shall be furnished for one (1) year from date of acceptance.

1.09 **JOB SITE CONDITIONS:**

A. K.E.C. shall visit the job site to field check actual wall dimensions and roughing ins and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site.
B. K.E.C. shall verify all door openings, passageways, elevators, etc. to ensure that all equipment can be moved to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjambs, windows, etc. with the General Contractor for the purpose of moving the equipment into its proper location. Any removal and/or rebuilding of any of the building in order to properly place the equipment, or if caused by incorrect information of the K.E.C.'s drawings, shall be done at the expense of the K.E.C. at no additional cost to the Owner.
C. K.E.C. to notify the Consultant and Owner prior to fabrication of equipment of any discrepancies between plans and specification and actual job site conditions.
D. K.E.C. to physically check the location of all utility rough ins at the job site before the finished walls, floors, etc. are in place. Report any discrepancies in writing to the Consultant and Owner.
E. Changes required after fabrication has started to ensure equipment accurately fitting the space as it exists and conforming to actual field dimensions on the job shall be made at no additional costs to the owner.
F. If special hoisting equipment and/or operators/riggers are required for installation, the cost for this should be included as part of the bid for this work.

1.10 **CHANGES IN THE WORK:**

A. The owner reserves the right to require reasonable modifications to be made in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where more desirable accessibility can be obtained or whose materials cannot be installed because of structural or mechanical conditions encountered. Such changes shall be made at no additional cost to the Owner.

1.11 **PATENTS:**

A. Hold harmless and save the Owner and its officers, consultants, and employees from liability of any nature or kind, including costs and expenses for or on account of any copyrighted, patented, or non-patented invention, process, trademark, design, device, material, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

B. If the Contractor has information that the process or article specified is an infringement of a patent, they are responsible for such loss unless he promptly notifies the Owner in writing. The contract price shall include all royalties or costs associated from the use of any and all of the above which are, in any way, involved in the contract.

1.12 **CONTRACTOR'S WARRANTY:**

A. The K.E.C. represents and warrants that they are financially solvent and that they are experienced and competent to perform the types of work or to furnish the plans, materials, supplies and/or equipment, to be so performed or furnished by them.

B. K.E.C. must be familiar with all Federal, State, municipal and department law, ordinances, orders, and regulations, which may, in any way, affect the work of those employed therein. K.E.C. is responsible for any cost for any any permits required to perform their work.

C. K.E.C. is responsible for reviewing all Contract Documents, specifications, addenda, if any and the job site to ensure that all conditions, etc. are satisfactory to ensure the quality, quantity and installation of all equipment.

1.13 **SUBSTITUTIONS:**

A. Bids that are submitted shall be for the specific manufacturer and model, size, capacity and accessories as specified or shown on the drawings.

B. The K.E.C. may quote vendors and model numbers other than those specified as a substitute, however, they must receive approval to do so. At the time of the bid, submit on a separate sheet with the bid for review and approval any items numbers desired to substitute, vendors and model numbers along with brochure sheets with data for comparison. The K.E.C. must however, also bid the primary item.

C. The K.E.C. shall be held responsible for any costs associated to himself or any other trade for changes required to install materials, devices, equipment, etc. which the Contractor has substituted for that item specified.

D. The Owner reserves the right to award a contract or contracts based on the inclusion or exclusion of one or more of the alternate estimates. The description of all workmanship and materials under the various headings of the specifications shall have the same meanings and force when applied to similar workmanship and materials in the alternate. If the descriptions are not specific, the workmanship shall be the best quality and the materials the best commercial grade.

E. Whenever any product is specified in the Contract Documents by reference to the name, trade name, make, or catalog number of any manufacturer or supplier, the intent is not to limit competition but to establish a quality which is necessary for the project. Products of other manufacturers meeting the established criteria will be considered, however, please take note that all drawings prepared by this consultant and the architect and their staff have been based on the primary specified product under each item number designation. Therefore, any other product which is substituted for approval

in lieu of the primary item specified, shall confirm to all the requirements established for the first product named, as well as the physical size and building construction requirements.

F. Any equipment listed which is not in accordance with the provisions of these specifications will be rejected. If the Contractor fails to submit for approval within the specified time the list of equipment as required herein, the Consultant then shall have the right to make the final equipment selection. The selection made by the Consultant shall strictly conform to these specifications and will be final and binding, and the items shall be furnished by the Contractor without change in the contract price at the time of completion.

G. It shall be the responsibility of the K.E.C. to prove that the substitutions are equal to the specified items. DRAFTING & DESIGN, LLC as the Owner's representative, shall be the determining authority as to the acceptability or equality of the substitutions. No substitutions shall be approved after bids are received.

1.14 **DESIGN/MODEL CHANGE - DISCONTINUED ITEMS:**

A. All equipment specified and provided shall be of latest design.

B. K.E.C. is to notify Consultant in writing of any discontinued items and suggest or request an alternate of equal performance, including all accessories, at no additional costs to the Owner.

PRODUCTS

2.00 **GENERAL:**

A. All equipment and internal component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.

B. All oil holes, grease fittings, and filler caps shall be accessible without the use of tools and means shall be provided to ensure adequate lubrication for all moving parts.

C. All equipment shall be designed to provide safe and convenient operation with any covers or other safety devices provided for any items of equipment presenting safety hazards. These safety features shall not present any substantial interference to the operation of the equipment and shall allow easy access to the guarded parts.

D. When trim is required in lieu of rejection of items of equipment, it shall be the K.E.C.'s responsibility to provide same at no additional costs. Trim is not to be a substitute for accuracy.

2.1 **FABRICATION OF METAL WORK:**

A. Metal and Gauges: Except as otherwise indicated, fabricate exposed metalwork of stainless steel; and fabricate the following components from gauge of metal indicated, and fabricate other components from not less than 20 gauge metal:

1. Table Tops & Counter Tops: 14 gauge S/S, Type 302, No. 4 finish.
2. Shelves: 16 gauge S/S (18 gauge if less than 12" wide)
3. Front Drawer/Door Panels: 18 gauge S/S (double pan type)
4. Single Pan Doors and Drawer Fronts: 16 gauge S/S
5. Enclosed Base Cabinets & Wall Cabinets: 18 gauge S/S
6. Sinks, Drain boards and Compartment Covers: 14 gauge S/S
7. Exhaust Hoods: as specified
8. Pan Type Insets and Trays: 16 gauge S/S
9. Removable Covers/Panels, Skirts and Enclosure Panels: 18 gauge S/S
10. Closure and Trim Strips over 4" wide: 18 gauge S/S
11. Hardware Reinforcements: 12 gauge

12. Gusset Plate: 10 gauge
13. Legs – 1-5/8" dia. S/S tubing, Type 304, No. 4 finish
14. Cross bracing – 1-1/2" dia. S/S tubing, Type 304, No. 4 finish.

B. Work Surface Fabrication: Fabricate metal work surfaces by forming and welding to provide seamless construction, using welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide with waterproof gasket, draw type joints with concealed bolting.

C. Reinforce work surfaces 30" O.C. both ways with galvanized or stainless concealed structural members. Reinforce edges which are not self-reinforced by forming.

D. Sound deaden the underside of metal work surfaces, including sinks and similar units, with a coating of sound deadening material. Hold coating back 3" from sanitary edges for cleaning.

E. Structural Framing: Except as otherwise indicated, provide framing of minimum 1" pipe size, round pipe or tube members with mitered and welded joints and gusset plates, ground smooth and polished. Provide 14 gauge, stainless steel tube for exposed framing and galvanized steel pipe for concealed framing in areas exposed to customer's view; in non-customer's views, provide either stainless steel tube or enamel finished steel pipe for exposed framing, and either galvanized or enamel finished steel pipe for concealed framing (where permitted by NSF standards, and at fabricator's option).

F. Casework: At fabricator's option, and unless otherwise indicated, provide either box-type face framing or open channel type (complying with NSF requirements in either case).

G. Enclosure: Except as otherwise indicated, provide each unit of casework, (base, wall, overhead and free standing) with a complete enclosure metal cabinet, including fronts, backs, tops, bottoms and sides.

H. Door and Drawer Fronts: Except as single pan construction is indicated, provide double pan type, not less than 5/8" thick, with seams on inside face. Weld hardware reinforcements inside of inner pan. Sound deadened by either coating both pans on concealed face, or by inserting mineral wool insulation between the pans.

I. Shelves: Except as otherwise indicated, provide adjustable standards for positioning and supporting of shelves in casework. Turn back edge of shelf units up 2" and hem. Turn other edges down to form an open channel. Reinforce shelf units to support 40 lbs. per square foot loading, plus 100% impact loading.

J. Drawer bodies: Except as otherwise indicated, draw form drawer bodies from a single piece of metal to provide seamless construction. Flange top edge to protect slides from spillage.

K. Closed Base: Where casework is indicated to be located on a raised floor base, prepare casework for support without legs, and for anchorage and sealant application, as required for a completely enclosed and concealed base.

L. Support from floor: Equip floor supported, mobile units with casters and equip items indicated as "roll-in" or "roll-out" units with the manufacturer's standard, single directional rollers. Otherwise, and except for closed base units, provide pipe or tube legs with adjustable, stainless steel bullet feet for floor supported items of fabricated metal work. Provide a 2" adjustment of feet with concealed threads.

2.2 **EXHAUST HOODS**:

A. Comply with NFPA No. 96 and all applicable appendixes.

B. Installation: Install in a secure and sanitary manner.

C. Grease Removal: Provide type indicated (removable filters if not otherwise specified) with drip channel gutters, drains and removable, stainless steel collection basins.

D. Light Fixtures: Provide fluorescent fixtures (or otherwise as specified) outside the hood with sealed safety lenses flush with the inside of the hood with stainless steel exposed conduit for wiring.

E. Fire Extinguishing System(s): Provide as specified. System shall comply with NFPA No. 12 including all appendixes. Furnish completely with automatic gas and/or electrical shut-offs and support accessories as required for complete safety against fire. Comply fully with all applicable standards of applicable agencies and associations.

2.3 **PLASTIC LAMINATE CASEWORK:**

A. General: Fabricate plastic laminate casework in the types and styles indicated, with hardware and accessories. Provide exposed and semi-exposed surfaces and edges (self-edged) with plastic laminate

covering on particle board, plywood or metal as specified. Plastic laminate shall be as specified by the Architect and/or the Owner as indicated. Paint plywood or hardboard for all concealed panels or as otherwise indicated.

B. Provide adjustable standards for positioning and support of shelves.

C. Comply with applicable standards of the Architectural Woodwork Institute for not less than (Custom Grade) casework. Additionally, comply with the Woodwork Institute of California for "Custom Grade" casework.

D. All Corian work to be done by certified installers and to be of the highest standards. All Corian installations to include Corian's factory warranty. All joints to be seamless.

2.4 **REFRIGERATION EQUIPMENT**:

A. General: Provide either single or multiple compressor units, as recommended by the manufacturer for size and variations between connected evaporator loads as indicated. Provide units of capacities indicated; arrange to respond to multiple evaporator thermostats and defrosting timers. Indicate coils, receivers, compressors, motors, motor starters, mounting bases or stands, housings, vibration isolation units, fans, dryers, valves, piping, insulation, gauges, winter controls equipment and completely automatic control system.

B. Refrigerants: Pre-charge units with type or types recommended by the manufacturer for services indicated, with quick-disconnect type of connections ready to receive refrigerant piping runs to evaporators and, where remote, to condensers unless specified otherwise.

C. Condensers: Provide air, water and/or combination air/water cooled condensers as specified, ready for piping connections with condenser water piping and drain or return. Locate units with compressors complete with refrigerant piping installed at the factory. Maximum incoming water temperature is 75 degrees F to 0 degrees condensers, located with the compressors, complete with refrigerant piping installed at the factory. Locate units as shown – if exterior, with weather housings and protective enclosures. The minimum outdoor operating ambient temperature for design of units is –10 degrees F to 0 degrees F. Maximum ambient condition for load on the air cooled condenser is 95 degrees F with 75% relative humidity in basically still air.

EXECUTION

3.0 **INSPECTION AND PREPARATION**:

A. Rough-In Work: The K.E.C. must examine roughed-in mechanical and electrical service, installation of floors, walls, columns and ceilings and conditions under which the work is to be installed, and must verify dimensions of services and substrates before fabricating the work. Notify the Contractor in writing of unsatisfactory conditions for proper installation of food service equipment. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions are corrected in a manner acceptable to the K.E.C. The K.E.C. must field verify all measurements at the building prior to fabrication of custom equipment.

3.1 **INSTALLATION:**

A. The K.E.C. shall coordinate his delivery schedule with the General Contractor to ensure adequate openings in the building for access for equipment.

B. Equipment shall be uncrated, fully assembled and set level in position for final connections. Parts shipped loose but required for connections be properly tagged and shall be accompanied by the necessary instructions.

C. Provide a competent, experienced installer to supervise installation and coordinate final connections with the other trades.

D. The General Contractor is responsible for installation of wall backing at all locations of any wall mounted/fastened equipment. The K.E.C. is to coordinate with General Contractor regarding the heights, etc.

3.2 **START UP AND TESTING**:

A. Delay startup of food service equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
B. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.
C. Supply a trained person(s) to start up all equipment, test and make adjustments as necessary, resulting in all equipment, including controls and safety devices, performing in accordance with manufacturer's specifications.
D. Repair or replace any equipment found defective in its operation, including equipment which are below capacity or operating with excessive noise or vibration unless equipment was damaged by others. Proof of this damage is required by K.E.C.

3.3 **DEMONSTRATION:**

A. Instruct the Owners operating personnel in the proper operation and maintenance procedures for each item of operational food service equipment that has daily usage of controls. Equipment that does not have any controls, i.e., worktables, sinks, etc. does not require demonstrations except for instructions on proper cleaning. The fire suppression system is demonstrated to the Owner at the time of testing for the Fire Marshal or proper authority. Instructions as to what to do in case of a fire are required for the Operating personnel. The Owner shall dictate which equipment is to be demonstrated.
B. Such instructions shall be provided at the convenience of the Owner and the operating staff; however, no instructions shall be considered valid unless the equipment is completely operational for the purpose of demonstrating or instructing.
C. Assemble, tag and label all keys from equipment and turn over to the Owner for their use.

3.4 **WARRANTY SERVICE**:

A. Properly explain the procedures for reporting service calls in case of malfunctioning equipment; person(s) to call, information required before calling in a service problem, etc.

3.5 **CLEANING AND ADJUSTMENTS**:

A. Upon completion of the installation and testing, clean and sanitize all food service equipment, and leave in a condition ready for use by the operating staff.
B. Remove all protective coverings, and thoroughly clean equipment both internally and externally.
C. Make any final adjustments required for proper operation of the equipment.
D. Remove any abrasions, dents, and other damages and restore any finishes marred during installation. Polish stainless steel surfaces, and touch up any painted surfaces with original paint to match.
E. Remove any and all refuse, rubbish, scrap materials, and debris caused by the work of this Section, and leave the site in a neat, orderly, and broom clean condition.

3.6 **CODE CONFORMANCE:**

A. All equipment and installations shall conform to all applicable codes, including but not limited to, the County, State and local authorities, including Health Department. All equipment indicated in the drawings are subject to final approval by code authorities and shall be required to conform to codes at no change in price. It is the responsibility of the K.E.C. to conform to all code requirements.

SECTION 114000 – FOOD SERVICE EQUIPMENT

PART 2 – ITEMIZED SPECIFICATIONS

Substitutions are not allowed unless equal to the equipment specified and must be approved prior to procurement from Drafting & DESIGN, LLC and/or the Owner(s) or shall not be accepted.

Scope of Work: The Kitchen Equipment Contractor is to furnish all labor, materials, equipment and services necessary to furnish and deliver all Food Service Equipment specified in Section 11400 into the building or buildings, uncrate, assemble, hang, set in place, level, and completely install unless otherwise noted, exclusive of final utility connections which are by Divisions 15 and 16. The K.E.C. shall provide start-up and testing of all equipment furnished by K.E.C. All cranes, operators, riggings, etc. to be furnished by the General Contractor as required. K.E.C. shall visit the job site to field check actual wall dimensions and roughing ins and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site. K.E.C. shall verify all door openings, passageways, elevators, etc. to ensure that all equipment can be moved to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjambs, windows, etc. with the General Contractor for the purpose of moving the equipment into its proper location.

Related work to be furnished by Other Trades: All plumbing, electrical, mechanical and ventilation work including ductwork connections required along with the food service equipment including roughing in of utilities required as indicated on the Food Service Consultant Design Drawings and the Contract documents along with the final connections from the rough ins to the equipment, utility service to rough ins and all utility connections shall be by Divisions 15 and 16. All interconnections between the building components and equipment along with materials needed for such will be by Divisions 15 and 16 unless specifically called for otherwise under any item. The Kitchen Equipment Contractor shall furnish any technical support required for these interconnections from the factories, etc. The verification of the Existing Exhaust Hood and Fans are to be by Erickson and project engineers.

ITEM # 1 EXHAUST HOOD – EXISTING TO REMAIN **(New S/S Wall Panels Underneath)**

1. Kitchen Equipment Contractor shall field measure, fabricate and install NEW Stainless Steel Wall Panels for Entire Length under the hood and left end.
Kitchen Equipment Contractor shall provide all cutouts for any utilities as required and provide cutouts with no sharp edges.

ITEM # 2 FIRE SUPPRESSION SYSTEM - NOT IN KITCHEN EQUIPMENT CONTRACT

Fire Suppression System - Not In Kitchen Equipment Contract.
Existing Fire Suppression/Hood Connections to be modified to accommodate new cooking equipment line with existing contractor currently under contract with Cross Creek.

ITEM # 3 SPARE NO. <Spare No.>

ITEM # 4 6 BURNER RANGE, COUNTERTOP, GAS

Quantity: One (1)
Manufacturer: Wolf
Model: AHP636

One (1) Model AHP636 Achiever Hotplate, gas, 36" W, 180,000 BTU total, (6) 30,000 BTU (27,500 BTU/hr for LP) open burners with lift-off burner heads, protected standing pilots, cast iron grates, manual gas valve controls, stainless steel front, sides & backsplash, aluminized pull out crumb tray, 4" adjustable legs, CSA, NSF
One (1) 1 year limited parts & labor warranty, standard
One (1) Natural gas, specify elevation if over 2,000 ft.
One (1) Model PLTRAIL-36 Plate Rail, 10-5/8" deep, stainless steel
One (1) Model 3/4QDH-4FT 3/4" x 4' flex hose & quick disconnect, with restraining device

ITEM # 5 CHARBROILER, COUNTERTOP, 25"

Quantity: One (1)
Manufacturer: Wolf
Model: ACB25

One (1) Model ACB25 Achiever Charbroiler, 25-1/8" W, countertop, (4) cast iron 17,000 BTU burners with standing pilots and cast iron radiants, heat deflector tray, supercharger burner dividers, high range infinite heat control valves, fully welded chassis, stainless steel front, sides, top trim, backsplash & grease trough, cast iron top grates, 4" adjustable legs, 68,000 BTU, CSA, NSF
One (1) 1 year limited parts & labor warranty, standard
One (1) Natural gas, specify elevation if over 2,000 ft.
One (1) Model CONRAIL-ACB25 Condiment rail, (3) 1/6 size pans or (1) 1/3 size pan
One (1) Model LEGS-GRD6 6" legs, user installed
One (1) Model 3/4QDH-4FT 3/4" x 4' flex hose & quick disconnect, with restraining device

ITEM # 6 COUNTERTOP GRIDDLE, 48"

Quantity: One (1)
Manufacturer: Wolf
Model: ASA48

One (1) Model ASA48 Heavy Duty Griddle, countertop, gas, 48" W x 24" D cooking surface, 1" thick polished steel griddle plate, (4) burners, 4" back & tapered side splashes, (1) mechanical snap action thermostat per burner with temperature adjustment, pilot safety, manual ignition, (1) 6 quart grease drawer, stainless & aluminized steel chassis frame, 11" low profile cooking height on 4" adjustable legs, 108,000 BTU, CSA, NSF
One (1) 1 year limited parts & labor warranty, standard
One (1) Natural gas, specify elevation if over 2,000 ft.
One (1) 10" splashes with tapered sides
One (1) Model PLTRAIL-48 Plate Rail, 10-5/8" deep, stainless steel
One (1) Model 3/4QDH-4FT 3/4" x 4' flex hose & quick disconnect, with restraining device

ITEM # 7 EQUIPMENT STAND, REFRIGERATED BASE

Quantity: Two (2)
Manufacturer: True Food Service Equipment
Model: TRCB-96

Two (2) Model TRCB-96 Refrigerated Chef Base, 95-1/2"L base, one-piece 300 series 18 gauge stainless steel top with V edge, stainless steel front/sides, aluminum back, aluminum interior with stainless steel floor, (4) drawers [accommodates (3) 12"x20"x4" pans, NOT included], 4" castors, 1/3 HP, 115v/60/1, 10.4 amps, NEMA 5-15P, cULus, UL EPH Classified, CE, MADE IN USA
Two (2) Self-contained refrigeration standard
Two (2) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
Two (2) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
Two (2) Standard marine edge top
Two (2) 4" Castors, standard
Two (2) NOTE: This unit is standard with (2) pan dividers per drawer

ITEM # 8 GAS FLOOR FRYER

Quantity: One (1)
Manufacturer: Vulcan
Model: LG400

One (1) Model LG400 Fryer, gas, 15-1/2" W, free-standing, 45-50 lb capacity, millivolt thermostat controls, twin baskets, legs, stainless steel front top, door and fry tank, 120,000 BTU, CSA, NSF
One (1) 1 year limited parts & labor warranty, standard
One (1) 5 year limited fry tank warranty (NOTE: If tank fails within the first year and verified by an authorized service agency, then the entire LG fryer will be replaced), standard
One (1) Natural gas (add -1 suffix) (specify elevation if over 2,000 ft.)
One (1) Model VSPGARD-G/E Removable Splash Guard, 10", stainless steel, for 35, 45, 50 & 65 lb. fryers
One (1) Model CASTERS PLTMNT Set of 4 adjustable casters - 2 locking, 2 non-locking, 4" wheels
One (1) Model 3/4QD HOSE-4 3/4" x 4' long gas flex hose & quick disconnect

ITEM # 9 WORKTOP FREEZER

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: TWT-27F-HC~SPEC1

One (1) Model TWT-27F-HC~SPEC1 SPEC SERIES® Work Top Freezer, one-section, -10° F; SPEC Package 1 includes: 16-ga. stainless steel top with rear splash, stainless steel front, sides & back, stainless steel interior, (1) heavy duty stainless steel door, steel handle, door lock standard, (2) shelves, electronic temperature control with digital temperature display; 5" castors, rear mount, R290 Hydrocarbon refrigerant, 1/4 HP, 115v/60/1, 2.3 amps, NEMA 5-15P, cULus, UL EPH Classified, CE, MADE IN USA, ENERGY STAR®
One (1) Self-contained refrigeration standard
One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
One (1) 5" Castors, standard

ITEM # 10 SPARE NO. <Spare No.>

ITEM # 11 BUN / SHEET PAN RACK

Quantity: One (1)
Manufacturer: Metro
Model: RT115N

One (1) Model RT115N Pan Rack, mobile, end load, single section, 20-3/8"W x 64-1/8"H, 28"D, open sides, with slides for (11) 18" x 26" or (22) 14" x 18" pans, slides on 5" centers, riveted tubular aluminum frame, 5" swivel casters (2) with brake, KD, NSF

ITEM # 12 SALAMANDER BROILER, GAS

Quantity: One (1)
Manufacturer: Wolf
Model: C36RB

One (1) Model C36RB Salamander Broiler, Gas, 36" wide, 50,000 BTU heavy duty burner, dual control, (6) grid positions, removable pan, stainless steel front, top and sides, 3/4" gas rear connection & pressure regulator
NOTE: PROVIDE SLOPED GREASE DIVERTOR ON BOTTOM OF UNIT PER MARLAND CODES & REGULATIONS.
One (1) 1 year limited parts & labor warranty, standard
One (1) Natural gas (specify if over 2000 ft.)
One (1) Model WALLMNT-CHRBKR Stainless steel wall mount brackets, for salamander broilers
One (1) Model BOTTOM-SLMNDR Bottom Panel for Salamander, stainless steel (required with wall bracket)
One (1) Model 3/4QDH-4FT 3/4" x 4' flex hose & quick disconnect, with restraining device

ITEM # 13 SPARE NO. <Spare No.>

ITEM # 14 SPARE NO. <Spare No.>

ITEM # 15 CONVEYOR OVEN

Quantity: One (1)
Manufacturer: Turbochef
Model: HHC2620 STD

One (1) Model HHC2620 STD High h Conveyor 2620™ Conveyor Oven, Rapid Cook, electric, countertop, stackable design (requires stacking kit), 26” wide by 20” length cook chamber, variable speed motor, idle mode, built-in self-diagnostics, smart voltage sensor technology, cool to touch covers and panels, stainless steel front, top, sides and back, stainless steel interior, cULus, CE, UL EPH Classified, ANSI/NSF 4, TUV (standard)

One (1) All items FOB: Carrollton, Texas: Consumable/accessory orders less than $5,000 will incur a handling fee. Orders shipping standard ground will incur a $15.00 handling fee. Orders shipping other than standard ground will incur $25.00 handling fee
One (1) One year parts and labor warranty
One (1) 208/240v/50/60/3-ph, 40.0amps, 6 foot cord (nominal), NEMA 15-50P, standard
One (1) Model NGC-1478 Paddle, Aluminum, 12.3" x 13.6" (31.2 cm x 34.5 cm)

ITEM # 16 HAND SINK

Quantity: Two (2)
Manufacturer: Eagle Group
Model: HSA-10-FA-P

Two (2) Model HSA-10-FA-P Hand Sink, pedestal mounted base, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mount gooseneck spout, pedal valves, P-trap, tail piece, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF
Two (2) Model -MG MicroGard™ antimicrobial finish on bowl only- add suffix "-MG" to end of hand sink model number
Two (2) Model -LRS Left & right side splashes

ITEM # 17 TWO (2) SOAP & TOWEL DISPENSERS - NOT IN KITCHEN EQUIPMENT CONTRACT

Two (2) Soap & Towel Dispensers - Not In Kitchen Equipment Contract. By Owner.

ITEM # 18 SPARE NO. <Spare No.>

ITEM # 19 SPARE NO. <Spare No.>

ITEM # 20 SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: TSSU-60-16D-4-HC

One (1) Model TSSU-60-16D-4-HC Sandwich/Salad Unit, (16) 1/6 size (4"D) poly pans, stainless steel insulated cover, 11-3/4"D cutting board, stainless steel top, front and sides, aluminum back, (4) drawers [accommodates (1) 6"D pan, NOT included], aluminum interior with stainless steel floor, 5" castors, R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1, 6.5 amps, NEMA 5-15P, cULus, UL EPH Classified, MADE IN USA
One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
One (1) Self-contained refrigeration standard
One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
One (1) Model 980207FI Exterior Digital Thermometer, rectangular, Fahrenheit/Celsius (Factory install only)
One (1) 5" Castors, standard

ITEM # 21 FOOD SHIELD

Quantity: One (1)
Manufacturer: BSI
Model: DECO 205-N

One (1) Model DECO 205-N BSI, LLC Deco™ Engineered Operator-Serve Food Shield, service style, 18-1/2" height, 18-1/2" fixed glass over shelf with 18-1/8" vertical shield, tempered glass front and top, beveled and polished exposed glass edges, stainless steel tubing uprights, mounting flange, NSF, ETL
(APPROXIMATELY 69" LONG) VERIFY FINISH WITH ARCHITECT/OWNER.
One (1) Tube Upright: 1-1/2" Round diameter, standard
One (1) Tube finish: #4 Brushed (contact factory)
One (1) ABOVE COUNTER NARROW FLANGE 2" FOR MOUNTING TO COUNTERTOP.
One (1) Fitting finish: #4 Brushed (contact factory)
One (1) Glass front: 1/4" Tempered, standard
One (1) 1/4" Tempered Glass end panel (contact factory)
One (1) Top Shelf: 1/4" Tempered glass, standard

ITEM # 22 HOT / COLD SHELF

Quantity: One (1)
Manufacturer: Hatco
Model: HCSBF-48-F

One (1) Model HCSBF-48-F Hot/Cold Shelf, built-in flush top, 49-1/2" W x 17" D, electronic temperature control, condensing unit, aluminum hardcoat, top mount, cULus, Made in USA
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) 1 year on-site parts and labor warranty
One (1) Model EWC Four year extended parts only warranty on the compressor (Available at time of purchase only)
One (1) 1-Yr Warranty on Blanket Heating Elements against burnout, standard
One (1) 120v/60/1-ph, 1044 watts, NEMA 5-15P, standard

ITEM # 23 DECORATIVE LAMP

Quantity: Three (3)
Manufacturer: Hatco
Model: DLH-500

Three (3) Model DLH-500 Decorative Heat Lamp, High Wattage, (1) bulb type (not included), 8-1/2" H x 6-1/8" Dia. shade, 375 watt max, CE, cULus, UL EPH Classified, ANSI/NSF 4, Made in USA
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
NOTE: VERIFY COLOR WITH ARCHITECT/OWNER PRIOR TO ORDERING.
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) NOTE: The decorative lamp and Luminaires are NOT returnable
Three (3) 120v/60/1-ph, 375 watt, standard
Three (3) Model WHITE-CTD-120H Lamp Bulb, 375 Watt clear, coated

Three (3) Model NICKEL Antique Nickel plated finish (Available at time of purchase only) special process required and extended lead times
Three (3) Color to match unit finish
One (1) NOTE: This finish is a special process and requires extended lead time
Three (3) Model R Mounting Style - Retractable (specify cord color) - retractable cord mount, adjusts from 31" to 69-1/2" (Available at time of purchase only)
Three (3) Model L Switch To Be On Lamp.
Three (3) Model DL-CORD-BK Black Cord, (CL, CU, CT, RL mounts only), (black is standard) (Available at time of purchase only)

ITEM # 24 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Hatco
Model: HWBI-1DA

One (1) Model HWBI-1DA Drop-In Modular Heated Well, with drain & auto-fill, (1) full size pan capacity, insulated, top mounted, remote thermostat with separate power switch, stainless steel and Aluminized construction (standard watt), cULus, UL EPH Classified, ANSI/NSF 4, Made in USA
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) One year on-site parts and labor warranty, plus one additional year parts only warranty on the metal sheathed elements
One (1) 120v/60/1, 1215w, 10.1 amps
One (1) Single remote control configuration
One (1) Model HWBI-EZ EZ-locking hardware for installation and remote thermostats with lighted power switches (Available at time of purchase only) standard
One (1) Model BALLVALVE3/4 High Temperature NPT Ball Valve, 3/4", for units with drains and no manifold
One (1) 23-5/8" bezel depth, standard

ITEM # 25 FOOD SHIELD

Quantity: One (1)
Manufacturer: BSI
Model: DECO 331-N

One (1) Model DECO 331-N BSI, LLC Deco™ Engineered Operator-Serve Food Shield, 26" height, 24-1/2" vertical shield, tempered glass, beveled and polished exposed glass edges, stainless steel tubing uprights, mounting flange, NSF, ETL
(APPROXIMATELY 57" LONG) VERIFY FINISH WITH ARCHITECT/OWNER.
One (1) Tube Upright: 1"x 2" rectangular, standard
One (1) Tube finish: #4 Brushed (contact factory)
One (1) ABOVE COUNTER NARROW FLANGE 2" FOR MOUNTING TO COUNTERTOP.
One (1) Fitting finish: #4 Brushed (contact factory)
One (1) Glass front: 1/4" Tempered, standard

ITEM # 26 FOOD SHIELD

Quantity: One (1)
Manufacturer: BSI
Model: DECO 205-N

One (1) Model DECO 205-N BSI, LLC Deco™ Engineered Operator-Serve Food Shield, service style, 18-1/2" height, 18-1/2" fixed glass overshelf with 18-1/8" vertical shield, tempered glass front and top, beveled and polished exposed glass edges, stainless steel tubing uprights, mounting flange, NSF, ETL
(APPROXIMATELY 69" LONG) VERIFY FINISH WITH ARCHITECT/OWNER.
One (1) Tube Upright: 1-1/2" Round diameter, standard
One (1) Tube finish: #4 Brushed (contact factory)
One (1) ABOVE COUNTER NARROW FLANGE 2" FOR MOUNTING TO COUNTERTOP.
One (1) Fitting finish: #4 Brushed (contact factory)
One (1) Glass front: 1/4" Tempered, standard
One (1) 1/4" Tempered Glass end panel (contact factory)
One (1) Top Shelf: 1/4" Tempered glass, standard

ITEM # 27 SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: TSSU-60-16D-4-HC

One (1) Model TSSU-60-16D-4-HC Sandwich/Salad Unit, (16) 1/6 size (4"D) poly pans, stainless steel insulated cover, 11-3/4"D cutting board, stainless steel top, front and sides, aluminum back, (4) drawers [accommodates (1) 6"D pan, NOT included], aluminum interior with stainless steel floor, 5" castors, R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1, 6.5 amps, NEMA 5-15P, cULus, UL EPH Classified, MADE IN USA
One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
One (1) Self-contained refrigeration standard
One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
One (1) Model 980207FI Exterior Digital Thermometer, rectangular, Fahrenheit/Celsius (Factory install only)
One (1) 5" Castors, standard

ITEM # 28 MILLWORK GRILL/PIZZA/DELI/ENTREE COUNTER - NOT IN KITCHEN EQUIPMENT CONTRACT

Millwork Grill/Pizza/Deli/Entree Counter - Not In Kitchen Equipment Contract. By G.C.

ITEM # 29 TRASH CONTAINERS - NOT IN KITCHEN EQUIPMENT CONTRACT

Trash Containers - Not In Kitchen Equipment Contract. By Owner.

ITEM # 30 SPARE NO. <Spare No.>

ITEM # 31 HEATED CUP & GLASS DISPENSERS

Quantity: One (1)
Manufacturer: Caddy
Model: CM-1020-H

One (1) Model CM-1020-H Caddy Magic Cup/Glass Rack Dispenser, cabinet style without door, heated, for 10" x 20" racks, capacity up to (70) cups or (95) glasses, self-leveling platform, plastic vertical corner bumpers, 4" swivel casters, stainless steel control box, hi-lo heat control, UL, NSF
One (1) 120v/60/1-ph, 7.9 amps, 950 watts, cord with NEMA 5-15P, standard.

ITEM # 32 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Hatco
Model: HWBI-2D

One (1) Model HWBI-2D Drop-In Modular Heated Well, with drains, (2) full size pan capacity, insulated, top mounted, remote thermostat with separate power switch, stainless steel and Aluminized construction (standard watt), cULus, UL EPH Classified, ANSI/NSF 4, Made in USA
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) One year on-site parts and labor warranty, plus one additional year parts only warranty on the metal sheathed elements
One (1) 208v/60/1, 2415w, 11.6 amps
One (1) Single remote control configuration
One (1) Model HWBI-CORD-1-2 Attached cord for HWBI-1, -2, Single Phase with single control box only (NEMA 6-15P), Installation includes brackets to attach the control box to the long side of the unit opposite the drain side (Available at time of purchase only)
One (1) Model HWBI-EZ EZ-locking hardware for installation and remote thermostats with lighted power switches (Available at time of purchase only) standard
One (1) Model BALLVALVE3/4 High Temperature NPT Ball Valve, 3/4", for units with drains and no manifold
One (1) 23-5/8" bezel depth, standard
One (1) Model 7QT-PAN 7 Quart round pan, stainless steel
One (1) Model 7QT-LID Lid, round hinged and notched, 7 quart
One (1) Model HWB-2-7Q Adapter, to convert warmer to hold (2) 7 qt inserts

ITEM # 33 FOOD SHIELD

Quantity: One (1)
Manufacturer: BSI
Model: DECO 205-N

One (1) Model DECO 205-N BSI, LLC Deco™ Engineered Operator-Serve Food Shield, service style, 18-1/2" height, 18-1/2" fixed glass overshelf with 18-1/8" vertical shield, tempered glass front and top, beveled and polished exposed glass edges, stainless steel tubing uprights, mounting flange, NSF, ETL
(APPROXIMATELY 36" LONG) VERIFY FINISH WITH ARCHITECT/OWNER.
One (1) Tube Upright: 1-1/2" Round diameter, standard
One (1) Tube finish: #4 Brushed (contact factory)

One (1) ABOVE COUNTER NARROW FLANGE 2" FOR MOUNTING TO COUNTERTOP.
One (1) Fitting finish: #4 Brushed (contact factory)
One (1) Glass front: 1/4" Tempered, standard
One (1) 1/4" Tempered Glass end panel (contact factory)
One (1) Top Shelf: 1/4" Tempered glass, standard

ITEM # 34 SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: TSSU-48-12D-4-HC

One (1) Model TSSU-48-12D-4-HC Sandwich/Salad Unit, (12) 1/6 size (4"D) poly pans, stainless steel insulated cover, 11-3/4"D cutting board, stainless steel top, front and sides, aluminum back, (4) drawers [accommodates (1) 6"D pan, NOT included], aluminum interior with stainless steel floor, 5" castors, R290 Hydrocarbon refrigerant, 1/3 HP, 115v/60/1, 5.8 amps, NEMA 5-15P, cULus, UL EPH Classified, MADE IN USA
One (1) Drawers all section, standard
One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
One (1) Self-contained refrigeration standard
One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
One (1) Stainless steel back (Contact factory for price, lead times apply)
One (1) Model 980207FI Exterior Digital Thermometer, rectangular, Fahrenheit/Celsius (Factory install only)
One (1) 5" Castors, standard

ITEM # 35 FOOD SHIELD

Quantity: One (1)
Manufacturer: BSI
Model: DECO 205-N

One (1) Model DECO 205-N BSI, LLC Deco™ Engineered Operator-Serve Food Shield, service style, 18-1/2" height, 18-1/2" fixed glass overshelf with 18-1/8" vertical shield, tempered glass front and top, beveled and polished exposed glass edges, stainless steel tubing uprights, mounting flange, NSF, ETL
(APPROXIMATELY 54" LONG) VERIFY FINISH WITH ARCHITECT/OWNER.
One (1) Tube Upright: 1-1/2" Round diameter, standard
One (1) Tube finish: #4 Brushed (contact factory)
One (1) ABOVE COUNTER NARROW FLANGE 2" FOR MOUNTING TO COUNTERTOP.
One (1) Fitting finish: #4 Brushed (contact factory)
One (1) Glass front: 1/4" Tempered, standard
One (1) 1/4" Tempered Glass end panel (contact factory)
One (1) Top Shelf: 1/4" Tempered glass, standard

ITEM # 36 SPARE NO. <Spare No.>

ITEM # 37 SPARE NO. <Spare No.>

ITEM # 38 SANDWICH / PANINI GRILL

Quantity: One (1)
Manufacturer: Star
Model: GX20IS

One (1) Model GX20IS (QUICK-SHIP) Grill Express™ Two-Sided Grill, electric, 20"W cooking surface, fixed lower grill, (2) hinged upper grills, smooth iron grill plates, thermostatic control, accommodates product up to 3" thick, 0.75" splash guard on bottom platen, stainless steel front & sides, cULus, UL EPH
One (1) 1 year parts & labor warranty, standard
One (1) 208/240v/60/1-ph, 2.7/3.6 kW, 13.0/15.0 amps, NEMA 6-20P (Quick-Ship), standard
One (1) Model CG-SC Pro-Max® "Panini" Grill Scraper, stainless steel

ITEM # 39 CONVEYOR TOASTER

Quantity: One (1)
Manufacturer: Hatco
Model: TQ-400-120-QS

One (1) Model TQ-400-120-QS (QUICK SHIP MODEL) Toast-Qwik® Conveyor Toaster, horizontal conveyor, countertop design, all bread types toaster, approximately 6 slice capacity/min, 2" opening height, electronic controls, colorguard sensing system, cULus, UL EPH Classified, ANSI/NSF 4, Made in USA
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) One year on-site parts and labor warranty, plus one additional year parts only warranty on all Toast-Qwik metal sheathed elements
One (1) 120v/60/1-ph, 1.8kw, NEMA 5-15P.

ITEM # 40.1 DISPLAY CASE, NON-REFRIGERATED COUNTERTOP (REAR DOORS)

Quantity: One (1)
Manufacturer: Federal Industries
Model: CK-10

One (1) Model CK-10 Counter Top Half Pan Non-Refrigerated Self-Serve Bakery Display, 34"W x 22"D x 32”H, Hinged self-closing glass doors, (2) vertical front lights, (10) zinc-plated wire display pan holders, powder coated metal frame, aluminum extrusion door frames, clear glass sides, black exterior, translucent gray Plexiglas back, 2” white display cap, cord & plug, UL
One (1) One year parts & labor warranty
One (1) 120v/60/1-ph, 1.5 amps
One (1) Rear doors

ITEM # 40.2 DISPLAY CASE, NON-REFRIGERATED COUNTERTOP (NO REAR DOORS)

Quantity: One (1)
Manufacturer: Federal Industries
Model: CK-10

One (1) Model CK-10 Counter Top Half Pan Non-Refrigerated Self-Serve Bakery Display, 34"W x 22"D x 32”H, Hinged self-closing glass doors, (2) vertical front lights, (10) zinc-plated wire display pan holders, powder coated metal frame, aluminum extrusion door frames, clear glass sides, black exterior, translucent gray Plexiglas back, 2” white display cap, cord & plug, UL
One (1) One year parts & labor warranty
One (1) 120v/60/1-ph, 1.5 amps
NO REAR DOORS.

ITEM # 41 ROLL-IN REFRIGERATOR

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: STG1RRI-1S

One (1) Model STG1RRI-1S SPEC SERIES® Roll-in Refrigerator, one-section, stainless steel front, aluminum sides, (1) stainless steel door with lock, cam-lift hinges, digital temperature control, aluminum interior, incandescent interior lighting, stainless steel ramp, 1/3 HP, 115v/60/1, 8.9 amps, NEMA 5-15P [accommodates 27"Wx29"Dx66"H cart, NOT included], cULus, UL EPH Classified, MADE IN USA
One (1) NOTE: Specifications subject to change without notice
One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
One (1) Door hinged Left.

ITEM # 41.1 BUN / SHEET PAN RACK

Quantity: One (1)
Manufacturer: Metro
Model: RT115N

One (1) Model RT115N Pan Rack, mobile, end load, single section, 20-3/8"W x 64-1/8"H, 28"D, open sides, with slides for (11) 18" x 26" or (22) 14" x 18" pans, slides on 5" centers, riveted tubular aluminum frame, 5" swivel casters (2) with brake, KD, NSF

ITEM # 42 ICE CREAM DIPPING CABINET

Quantity: One (1)
Manufacturer: Delfield
Model: 227L

One (1) Model 227L Ice Cream Dipping Cabinet, drop-in type, 12 gallon capacity, self-contained freezer 404A, removable cover with handle, acrylic lid, stainless steel top, 1/5 hp, (25-3/4" x 28" cutout required), cUL, UL, NSF
One (1) 115v/60/1-ph, 1.8 amps, NEMA 5-15P, standard
One (1) 1 year parts & 90 day labor warranty, standard
One (1) Model EWDDROP1 (Drop In) 1 Year extended warranty (for installation or planned maintenance quotes, please contact your local Sales Representative) (net)

ITEM # 43 DIPPER WELL

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-2282-01-F05

One (1) Model B-2282-01-F05 Dipper Well Faucet, with drain, stainless steel bowl, removable inner overflow cup, 0.5 gpm flow control, brass knob, polish chrome-plated

ITEM # 44 DISPLAY CASE, REFRIGERATED DELI, COUNTERTOP

Quantity: One (1)
Manufacturer: Federal Industries
Model: ERR-3628SS

One (1) Model ERR-3628SS Elements Counter Top Self-Serve Refrigerated Rear Mount Merchandiser, 36"W x 30"D x 28”H, self-contained refrigeration with condensate evaporator, adjustable temperature control, (3) hinged lift-up front doors, top light & lighted shelves, (2) tiers of adjustable black wire shelves, black display deck, black trim, removable sliding glass rear doors, solid end panels, set directly on counter, 1/3 HP, 120v/60hz/1ph electrical, cord & plug, UL, UL EPH CLASSIFIED
One (1) One year parts & labor warranty
One (1) Self-contained refrigeration standard
One (1) Five year compressor warranty, standard (for self-contained units only)
One (1) 120v/60/1-ph, 8.1 amps, 6 ft. cord & plug, standard

ITEM # 45 HEATED LOW TEMP HOLDING CABINET

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 750-S

One (1) Model 750-S Halo Heat® Low Temp Holding Cabinet, on/off simple controller with adjustable thermostat, indicator light, capacity (10) 12" x 20" pans, (2) chrome plated side racks, (3) wire shelves, stainless steel exterior, 2-1/2" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, UL EPH ANSI/NSF 4, CE, IP X3, TUV-NORD, EAC, N11942
One (1) 120v/60/1-ph, 9.0 amps, 1.1kW, 5 ft. cord, NEMA 5-15P, standard
One (1) Solid door, hinged on right, standard
One (1) 5004862 – 5” casters, 2 rigid, 2 swivel with brakes.

ITEM # 46 SPARE NO. <Spare No.>

ITEM # 47 CARVING STATION / SHELF

Quantity: One (1)
Manufacturer: Hatco
Model: DCSB400-R24-1

One (1) Model DCSB400-R24-1 Decorative Carving Station with Single Heat Lamp (clear bulb included), telescoping clearance (bottom of shade to top of cutting board) 14" - 26", 30° shade pivot, heated

Swanstone® base with thermostatic control, includes one 26" dia. cutting board with meat juice containment, specify finish, cULus, UL EPH Classified, ANSI/NSF 4, Made in USA
NOTE: VERIFY COLOR WITH ARCHITECT/OWNER PRIOR TO ORDERING.
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) One year parts and labor warranty (excludes sneeze guard and light bulbs), standard
One (1) One year warranty for burnouts on all ceramic heating elements
One (1) 120v/60/1-ph, 600 watt, NEMA 5-15P, standard
One (1) Model BNICKEL Bright Nickel (Available at time of purchase only)
One (1) Model BSAND Bermuda Sand Swanstone® base and cutting board color (one included) (Available at time of purchase only)
One (1) The color selected is considered custom and is NOT returnable

ITEM # 48 HEATED LOW TEMP HOLDING CABINET

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 750-S

One (1) Model 750-S Halo Heat® Low Temp Holding Cabinet, on/off simple controller with adjustable thermostat, indicator light, capacity (10) 12" x 20" pans, (2) chrome plated side racks, (3) wire shelves, stainless steel exterior, 2-1/2" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, UL EPH ANSI/NSF 4, CE, IP X3, TUV-NORD, EAC, N11942
One (1) 120v/60/1-ph, 9.0 amps, 1.1kW, 5 ft. cord, NEMA 5-15P, standard
One (1) Solid door, hinged on right, standard

ITEM # 49 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Hatco
Model: HWBI-5DA

One (1) Model HWBI-5DA Drop-In Modular Heated Well, with drains & auto-fill, (5) full size pan capacity, insulated, top mounted, remote thermostat with separate power switch, stainless steel and Aluminized construction (standard watt), cULus, UL EPH Classified, ANSI/NSF 4, Made in USA
One (1) NOTE: Sale of this product must comply with Hatco's Minimum Resale Price Policy; consult order acknowledgement for details
One (1) NOTE: Includes 24/7 parts & service assistance, call 800-558-0607
One (1) One year on-site parts and labor warranty, plus one additional year parts only warranty on the metal sheathed elements
One (1) 208v/60/1, 6015w, 28.9 amps
One (1) Single remote control configuration
One (1) Model HWBI-CORD-5-6 Attached cord for HWBI-5, -6 Single Phase with single control box only (NEMA 6-50P), Installation includes brackets to attach the control box to the long side of the unit opposite the drain side (Available at time of purchase only)
One (1) Model HWBI-EZ EZ-locking hardware for installation and remote thermostats with lighted power switches (Available at time of purchase only) standard
One (1) 23-5/8" bezel depth, standard

ITEM # 50 FOOD SHIELD

Quantity: One (1)
Manufacturer: BSI
Model: DECO 205-N

One (1) Model DECO 205-N BSI, LLC Deco™ Engineered Operator-Serve Food Shield, service style, 18-1/2" height, 18-1/2" fixed glass over shelf with 18-1/8" vertical shield, tempered glass front and top, beveled and polished exposed glass edges, stainless steel tubing uprights, mounting flange, NSF, ETL
(APPROXIMATELY 79" LONG) VERIFY FINISH WITH ARCHITECT/OWNER.
One (1) Tube Upright: 1-1/2" Round diameter, standard
One (1) Tube finish: #4 Brushed (contact factory)
One (1) ABOVE COUNTER NARROW FLANGE 2" FOR MOUNTING TO COUNTERTOP.
One (1) Fitting finish: #4 Brushed (contact factory)
One (1) Glass front: 1/4" Tempered, standard
One (1) 1/4" Tempered Glass end panel (contact factory)
One (1) Top Shelf: 1/4" Tempered glass, standard

ITEM # 51 REACH-IN UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: TUC-60D-2-LP-HC

One (1) Model TUC-60D-2-LP-HC Low Profile Under counter Refrigerator, 33-38° F, stainless steel front, top & sides, (1) stainless steel door, (2) drawers each accommodate (1) 12x20x6 food pan (NOT included), aluminum interior with stainless steel floor, 1-1/2" diameter dual wheel castors, 31-7/8" counter height, front breathing, R290 Hydrocarbon refrigerant, 1/4 HP, 115v/60/1, 4.0 amps, NEMA 5-15P, cULus, UL EPH Classified, MADE IN USA
One (1) NOTE: Specifications subject to change without notice
One (1) Self-contained refrigeration standard
One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
One (1) 1-1/2" diameter dual wheel castors, standard
One (1) Model 980207FI Exterior Digital Thermometer, rectangular, Fahrenheit/Celsius (Factory install only)

ITEM # 52 MILLWORK SOUP/SALAD/DESSERTS COUNTER - NOT IN KITCHEN EQUIPMENT CONTRACT

Millwork Soup/Salad/Desserts Counter - Not In Kitchen Equipment Contract.
By G.C.

ITEM # 53 SPARE NO. <Spare No.>

ITEM # 54 POINT OF SALES SYSTEMS - NOT IN KITCHEN EQUIPMENT CONTRACT

Point of Sales Systems - Not In Kitchen Equipment Contract. By Owner.

ITEM # 55 MILLWORK BEVERAGE COUNTER - NOT IN KITCHEN EQUIPMENT CONTRACT

Millwork Beverage Counter - Not In Kitchen Equipment Contract. By G.C.

ITEM # 56 MILLWORK TO-GO & CONDIMENT COUNTER - NOT IN KITCHEN EQUIPMENT CONTRACT

Millwork To-Go & Condiment Counter - Not In Kitchen Equipment Contract.

ITEM # 57 SPARE NO. <Spare No.>

ITEM # 58 SODA SYSTEM (UNDERCOUNTER) - NOT IN KITCHEN EQUIPMENT CONTRACT

Soda System (under counter) - Not In Kitchen Equipment Contract. To be sized, furnished and installed by Soda Purveyor.

ITEM # 59 SODA/ICE DISPENSER - NOT IN KITCHEN EQUIPMENT CONTRACT

Soda/Ice Dispenser - Not In Kitchen Equipment Contract. To be sized, furnished and installed by Soda Purveyor.

ITEM # 60 TEA BREWER - NOT IN KITCHEN EQUIPMENT CONTRACT

Tea Brewer - Not In Kitchen Equipment Contract. To be furnished and installed by Vendor.

ITEM # 61 JUICE DISPENSER - NOT IN KITCHEN EQUIPMENT CONTRACT

Juice Dispenser - Not In Kitchen Equipment Contract. To be Furnished and Installed by Vendor.

ITEM # 62 COFFEE CONDIMENT DISPENSERS - NOT IN KITCHEN EQUIPMENT CONTRACT

Coffee Condiment Dispensers - Not In Kitchen Equipment Contract.
Furnished & Installed by Owner.

ITEM # 63 TWO (2) COFFEE BREWERS - NOT IN KITCHEN EQUIPMENT CONTRACT

Two (2) Coffee Brewers - Not In Kitchen Equipment Contract. To be Furnished and Installed by Vendor.

ITEM # 64 COFFEE DRIP TRAY - NOT IN KITCHEN EQUIPMENT CONTRACT

Coffee Drip Tray - Not In Kitchen Equipment Contract. To be Furnished and Installed by Vendor.

ITEM # 65 OPEN MERCHANDISER, GRAB-N-GO

Quantity: One (1)
Manufacturer: Federal Industries
Model: RSSM-360SC

One (1) Model RSSM-360SC Specialty Display High Profile Self-Serve Refrigerated Merchandiser, 36"W x 35"D x 60”H, self-contained refrigeration, energy saving night curtain, top light, (2) tiers of adjustable black metal shelves, stainless steel display deck, black interior, tempered glass ends, choice of laminate, designed for continuous lineups, condensate evaporator provided, DOE 2012 compliant, UL, UL EPH CLASSIFIED
NOTE: VERIFY COLOR/FINISH WITH ARCHITECT/OWNER PRIOR TO ORDERING.
ALL STAINLESS STEEL FINISH...
NOTE: GLASS SHELVES IN LIEU OF STANDARD.
One (1) One year parts & labor warranty
One (1) Self-contained refrigeration standard
One (1) 120/208V-240v/60/1-ph, 1/2 hp, 10.0 amps
One (1) Five year compressor warranty, standard (for self-contained units only)
One (1) Stainless steel in lieu of laminate
One (1) LED top light, in lieu of fluorescent
One (1) Security night cover
One (1) Condensate evaporator assembly (field install kit, dedicated 120v, 15.0 amp circuit required), contact factory for details
One (1) Casters (includes cord & plug) (for self-contained units only)

ITEM # 65 REFRIGERATED MERCHANDISER <ALTERNATE> PRICE AS ALTERNATE

Quantity: One (1)
Manufacturer: True Food Service Equipment
Model: GDM-30-HC-LD

<Alternate> One (1) Model GDM-30-HC-LD Refrigerated Merchandiser, two-section, (4) shelves, black vinyl exterior, white interior with stainless steel floor, (2) Low-E thermal glass hinged doors, LED interior lights, R290 Hydrocarbon refrigerant, 1/4 HP, 115v/60/1-ph, 3.8 amps, NEMA 5-15P, cULus, UL EPH Classified, MADE IN USA
<Alternate> One (1) Self-contained refrigeration standard
<Alternate> One (1) Warranty - 5 year compressor (self-contained only), please visit www.Truemfg.com for specifics
<Alternate> One (1) Warranty - 3 year parts and labor, please visit www.Truemfg.com for specifics
<Alternate> One (1) Left door hinged left, right door hinged right standard
<Alternate> One (1) Model S-BSS Sign, "Self-Serve" blue graphic in lieu of standard

ITEM # 66 CABINET, ENCLOSED, BUSSING

Quantity Four (4)
Manufacturer: Cres Cor
Model: 103-UA-11D

Four (4) Model 103-UA-11D Cabinet, mobile, enclosed, single compartment, non-insulated, hold (11) sets universal angles pan slides on adjustable 1-1/2" centers, reinforced door swings 270°, gravity type latch, card clip included, (4) 5" swivel casters (2) braked, Hi-Tensile aluminum exterior and interior, NSF
Four (4) Standard Warranty: 1 yr labor, 2 yrs parts warranty

Four (4) Model 1430 Floor Lock, for use with 5" casters
Four (4) Model 1265-000-REAR Bail Handle Kit, rear mounted (1 per kit), for insulated cabinets

ITEM # 67 SOUP WARMER, COUNTERTOP

Quantity: Two (2)
Manufacturer: Wells
Model: SW-10T

Two (2) Model SW-10T Food Warmer, countertop, electric, 11 quart round pan, wet/dry operation, thermostatic controls, stainless steel construction, 120v/60/1-ph, 0.83 kW, 6.9 amps, NEMA 5-15P, UL
Two (2) Limited 3 year parts & labor warranty, standard
Two (2) Note: Must specify voltage and phase
Two (2) Model 20908 Round Inset, 11 quart, with handles & slotted lid, fits 10-1/2" opening
Two (2) Model 21860 Soup Ladle, 8 oz.

ITEM # 68 SPARE NO. <Spare No.>

ITEM # 69 WATER FILTRATION SYSTEM (UNDERCOUNTER INSTALLATION)

Quantity: One (1)
Manufacturer: Everpure
Model: EV933042

One (1) Model EV933042 High Flow CSR Twin-MC2 System, 18,000 gallon capacity, 3.34 gpm flow rate, 0.2 micron rating, combination coffee brewers, hot chocolate, fountain & ice maker (2) MC 0.2 micron precoat Cartridges (1) SRX scale reduction feeder (1) EC210 pre-filter, water shut-off, pressure gauges, flushing valve
One (1) Note: This system requires (2) cartridges, (1) pre-filter & (1) scale reduction feeder.

ITEM # 70 ICE CUBER

Quantity: One (1)
Manufacturer: Manitowoc
Model: ID-0452A

One (1) Model ID-0452A Indigo™ Series Ice Maker, cube-style, air-cooled, self-contained condenser, 30"W x 24-1/2"D x 21-1/2"H, production capacity up to 420 lb/24 hours at 70°/50° (316 lb AHRI certified tat 90°/70°), DuraTech™ exterior, dice size cubes, NSF, cULus, ENERGY STAR®
NOTE: VERIFY SIZE WITH OWNER/SODA PURVEYOR TO ENSURE PROPER FIT OF ICE MAKER TO SODA & ICE DISPENSER, ITEM 59.
One (1) 3 year parts & labor Commercial warranty
One (1) 5 year parts & labor Commercial warranty on evaporator
One (1) 5- year parts & 3 year labor Commercial warranty on compressor
One (1) (-161) 115v/60/1-ph, 13.2 amps
One (1) Model K-00379 Top Air Discharge Kit, for S-450, S-500, S-600 series & Indigo 450, 500, 606 models

END OF SECTION 114000

Division 26

Electrical

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this and other sections of Electrical and Special Construction Divisions.

1.2 SUMMARY

A. This section includes qualification requirements of the installer and suppliers, submittal procedures, record keeping, required testing and general electrical procedures.

B. Section Includes:

1. Additional submittal requirements.
2. Installer and product requirements.
3. Identification of equipment.
4. Firestopping for electrical installations.
5. Supporting devices for electrical components.
6. Fuses.
7. Equipment connections.
8. Cutting and patching for electrical construction.
9. Touch up painting.
10. Electrical demolition.
11. Project conditions.
12. Additional warranties.

C. Related Sections:

1. Section “Packaged Generator Assemblies” for concrete pad and bollard requirements.
2. Section “Low Voltage Electrical Distribution” for concrete pad or bollard requirements.
3. Section “Low Voltage Controllers” for motor control center concrete pad requirements.

D. Products installed but not supplied under this Section:

1. Provide electrical connections and materials required for the installation of the following:
   a. Countertops, Casework & Cabinets.
   b. Break room and lounge food service equipment/appliances.
2. Coordinate electrical connections with installation requirements and manufacturers’ nameplates and written instructions.
3. Verify equipment nameplates and connection requirements prior to rough in.

E. Permits and Fees:

1. Apply, pay for and secure all permits, required by the Authorities Having Jurisdiction prior to start of work, in accordance with contract General Conditions and Division 01.
2. Deliver all certificates to the Owner prior to final acceptance of work.

F. Conflicts:

1. Where variances occur within drawings and/or specifications, procedures of the General Conditions shall be followed.
2. In cases where clarification is not requested, provide the item or arrangement of better quality, greater value, or higher cost in the Contract Price.
3. Bring to the Architect's attention, any field conflicts or existing conditions, which prevent the intended work as designed.

1.3 ACRONYMS

A. The following acronyms are used throughout the Electrical Division specifications, defined as follows:

1.	AASHTO	American Association of State Highway and Transportation Officials
2.	ADA	Amer. With Disabilities Act
3.	ANSI	American National Standards Institute
4.	ASME	American Society of Mechanical Engineers
5.	ASTM	American Society for Testing and Materials
6.	IBC	International Building Code
7.	IEEE	Institute of Electrical and Electronics Engineers
8.	ETL	Electrical Testing Laboratory
9.	FM	Factory Mutual Research Corporation
10.	NEC	National Electrical Code
11.	NECA	National Electrical Contractors Association
12.	NEMA	National Equipment Manufacturers Association
13.	NESC	National Electrical Safety Code
14.	NETA	National Electrical Testing Association
15.	NFPA	National Fire Protection Association
16.	NLPI	Lightning Protection Institute
17.	UL	Underwriter’s Laboratories

1.4 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term product includes the terms material, equipment, system, and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is to be demonstrated and approved through the submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes proposed by Contractor in products, materials, equipment, and methods

of construction required by the Contract Documents.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is the only named manufacturer or is the “first” named manufacturer, or is accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimensions, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner

E. Extended Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.5 SUBMITTALS

A. General: Submit each item in this Section according to the conditions of the contract and Division 01 Specification Sections.

B. Comply with Division 01 Section "Submittal Procedures".

C. General:

1. Material and Equipment List
2. Shop Drawings
3. Product Data
4. Installation and Coordination Drawings
5. Record Documents
6. Operation and Maintenance Manuals
7. Construction Phasing and Outage Schedule

D. Submittal Deviations from Contract Documents:
1. Submittals shall explicitly identify any deviations from the drawings, specifications or design intent, including, but not limited to:
   a. Different products used.
   b. Products used in different locations from where shown or specified.
   c. Changes to intended application, location, etc.
   d. Changes to capacity, rating or sizes.
   e. Differences in physical sizes, dimensions and/or weights which will create installation, clearance or access problems or Code violations.
2. Contractor shall clearly and specifically identify each such deviation, substitution or change to the contract documents to Architect’s attention via note, clarification, etc. It is NOT considered to be explicitly identified simply by showing a device on the plans or including a product page in the submittal.

E. Basis-of-Design Comparable Products Submission:

1. Contract Drawings are based on only the named “Basis of Design” products.
2. Engineer has not verified that any Comparable Products by manufacturers other than the “Basis of Design” equipment will properly fit, perform or meet the design intent and contract documents.

3. Contractor must verify sizes, ratings, dimensions, clearance requirements, weight, etc. of any/all manufacturers. Contractor is responsible for the fitment of their proposed equipment, and resulting impacts to other construction or disciplines, Code compliance, etc.
4. Document each Submittal, Comparable Product or Substitution request with supporting data substantiating compliance of proposed product with Basis-of-Design product.
5. Use the attached "Comparable Product Submittal Form" in addition to the requirements specified herein.
6. Comparable products will not be reviewed without completion of the attached form.

F. Product Substitutions: Comply with all requirements of Division 01.

G. Comparable Products Submission:

1. Document each request for a proposed comparable product with supporting data substantiating compliance of proposed product with Basis-of-Design product.

2. Use the attached "Comparable Product Submittal Form" in addition to the requirements specified herein.
3. Comparable products will not be reviewed without completion of the attached form.

H. Coordination of Submittals: Coordinate Electrical and Special Construction Division submittals with those of all other Divisions.

I. Electrical Division additional submittal requirements: On projects where Div 01 does not specify otherwise, and where Owner does not have a defined submittal procedure, provide submittals, as follows:

1. Clearly identify all submittals, as follows:
   a. Number each submittal starting with the specification section associated with the product(s). Each successive product from same spec section shall utilize a sequential suffix (i.e. -01, -02).
   b. Following each number, include specific English name of each product. (i.e. Spec Section # - Panelboards).
   c. Do not combine product data from different spec sections into a single submittal package as this may prevent approval of one product due to resubmission requirement of another.
   d. Provide catalog spec and/or data sheets to completely describe proposed equipment. A product model number alone, with no supporting description or data will not be approved.
   e. Where numerous model or product numbers appear, clearly indicate the exact type, model number, size, options, and special features of the proposed item.
   f. Factory order forms showing only required capacities, are not acceptable.
   g. Identify all options furnished to meet specifications.
   h. The Architect shall not select or mark equipment ratings and/or options. Submittals not properly and specifically marked shall be returned without review.
2. Identify any discrepancies in the contract documents affecting submittals and seek clarification.

J. Material and Equipment List:

1. Submit within 30 calendar days after the award of contract for preliminary review.

2. List all proposed materials and equipment.
3. Indicate proposed manufacturer(s).
4. No further submittals will be reviewed until this list has been submitted and approved.
5. Identify missing items and the reason for their absence.

K. Product Data:

1. Manufacturer's specifications, data sheets.
2. Catalog cuts.
3. Dimensional drawings.
4. Installation Instructions.
5. Wiring & connection diagrams.
6. Capacity ratings, performance curves.
7. Information required indicating contract compliance.
8. Clearly indicate the exact size or rating proposed.

L. Shop Drawings:

1. All specially fabricated items.
2. Modifications to standard items.
3. Specially designed systems or products.

M. Closeout Submittals: Submit in accordance with the General Conditions and Division 1 requirements.

1. Electrical Division Operation and Maintenance Manuals:
   a. Arrange material in sections according to Electrical Division spec sections.
   b. Include a cover sheet, which contains the name and phone number of the Installer, Distributor, Supplier, Local Service Company, etc. for each system or product group.
   c. O & M Manuals shall also include the following:
   d. Material and Equipment List.
   e. Copies of all approved submittals.
   f. Acceptance Test Reports (ground resistance, etc.)
   g. Manufacturer's Product Warranties.
   h. Factory data sheets, wiring diagrams, etc.
   i. Spare parts lists.
   j. All operation and instruction papers.
   k. Maintenance schedules.

2. Record Drawings:
   a. During construction, maintain drawings on blue or black line white prints.
   b. Record all changes and alterations in red ink.
   c. Record the installed electric feeders, equipment, etc.
   d. Actual installed locations of panels, switchboards, transformers, etc.
   e. All feeders overhead, underslab or in chases.
   f. Pullboxes, handholes and splice box locations.
   g. All underground feeders, conduit, ducts, cables, handholes, manholes, etc. with installed dimensions from permanent construction elements.
   h. All modifications, changes, deletions or additions made during construction.
   i. Submit one (1) complete set of white prints with "as-built" information neatly

recorded at project completions.

N. Required Submittals: Submit the following items, as a minimum requirement for this project:

1. Section “Common Work Results for Electrical”:
   a. As-Built drawings
   b. O&M Manuals
2. Section “Fire Detection System”:
   a. Bill of materials showing quantities and model numbers.
   b. Manufacturer's product data on all proposed equipment.
   c. System wiring schematic.
   d. List of all system program points with device ID.
   e. Device schedule matrix
   f. Written sequence of operation for all modes
   g. Graphic Annunciator Panel drawing
   h. Scaled Floor Plans
   i. Calculations for Battery power and Voltage drop
   j. Copy of AHJ Final Inspection / Approval
3. Section “Wiring Devices”:
   a. A/C switches.
   b. Receptacles.
   c. Device plates and covers.
   d. Single/Multiple Station Smoke detectors and accessories.
4. Section “Low Voltage Electrical Distribution”:
   a. Panelboards.
5. Section “Lighting”:
   a. Product data for all Individual lighting fixtures.
   b. Ballast product data
   c. Low voltage contactor panels.
   d. Occupancy sensors.
   e. Lighting poles.
   f. FC calculations(when requested)
   g. Wiring diagrams for lighting controls, etc.

1.6 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed and Labeled”: As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

B. Underwriter’s Laboratory (UL) Requirements: All equipment containing electrical components and provided under electrical, mechanical, or other Divisions shall bear the Underwriter’s Laboratory (UL) label, as a complete packaged system.

C. Field Certifications and Labeling:

1. Equipment not provided with a UL label shall be tested in the field, certified and provided with a listed label at the installer's expense.
   a. Field testing shall be performed by a testing agency approved by the authority having jurisdiction.
   b. Provide services of a UL recognized, independent Electrical Testing Laboratory (ETL) to provide field inspection and testing. Provide an ETL Label on all such equipment as proof of satisfactory inspection.

D. Fire Safe Materials: Unless otherwise indicated, materials shall conform to UL, National Fire Protection Agency (NFPA) or American Society for Testing and Materials (ASTM) standards for fire safety with smoke and fire hazard rating not exceeding flame spread of 25 and smoke developed of 50.

E. Install all components and equipment per manufacturer's written instructions.

F. Installer Qualifications:

1. Provide proof of qualification. Submit the following, when requested:
   a. Five (5) comparable completed projects.
   b. Reference letters from minimum of three (3) registered professional engineers, general contractors, or building owners, explaining proficiency, quality of work, or other attribute on projects of similar size or substance.
   c. Copy of Master Electrician's License.
   d. Local or State license.
   e. BICSI RCDD certification, as required in other Electrical Division sections.
   f. NICET certification, as required in other Electrical Division sections.
2. Electrical installer shall utilize a full time project foreman in charge of all electrical work.
   a. Fully qualified and experienced in such work.
   b. Available, on site, at all times during construction.
   c. All communication shall be through this person.
3. Installer of specialized systems such as Fire Alarms, telecommunication systems, etc. shall meet the requirements of the associated spec section(s).

G. Installation Quality: In accordance with listed Codes, recognized trade organizations and standards.

1. ADA Americans with Disabilities Act Accessibility Guidelines
2. ANSI/EIA/TIA American National Standards Institute
3. ASME American Society of Mechanical Engineers
4. IEEE C2 "National Electrical Safety Code"
5. NEMA National Equipment Manufacturers Association
6. NECA National Electrical Contractors Association "Standards of Installation"
7. NEMA National Electrical Manufacturer's Association
8. NETA National Electrical Testing Association
9. UL Underwriter's Laboratories

H. Comply with the latest version of following Codes, Standards and regulations as adopted by the Authority Having Jurisdiction, unless otherwise specified.

1. NFPA
2. NFPA 70 "National Electrical Code".
3. IBC

4. COMAR (Code of Maryland Regulations).
5. State of Maryland Fire Prevention Code
6. Baltimore City Electrical Code

7. Local Amendments to the above Codes

1.7 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Arrange for proper shipping methods for all materials.
2. Provide for handling and unloading of all materials at site or at offsite storage facility.
3. Provide for proper transportation between offsite storage and project site.
4. Provide rigging and other handling services, when necessary.

B. Storage and Protection:

1. Store all materials in dry, heated areas, unless manufacturers permit other storage environments.
2. Store equipment according to manufacturers' written instructions.
3. Protect materials subject to damage or corrosion from excessive moisture.
4. Protect equipment subject to damage from excessive heat or sunlight in ventilated environments.
5. Protect equipment from dripping, splashing or sprayed materials.

C. Repair and Replacement of Damaged Equipment: Repair equipment damaged as a result of improper storage or handling at no expense to Owner. If, in the opinion of the Architect, equipment cannot operate properly after repairs are made, replace at no cost to Owner.

1.8 SEQUENCING

A. General Sequencing:

1. Coordinate electrical work with other trades based on phasing and sequence of construction, as identified elsewhere in the contract documents.
2. Provide all scheduling, phased installation, etc. to coordinate with overall phasing plans.

B. Electrical Division Sequencing, Coordination, and Integration:

1. Coordinate systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
4. Coordinate the installation of required supporting devices, sleeves and conduit to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Make provisions for large equipment requiring positioning prior to closing in the building.
6. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

7. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
8. Coordinate requirements for access panels and doors where electrical items requiring access are concealed behind finished surfaces.

1.9 COMMISSIONING

A. Provide post-installation commissioning for particular products and systems, as specified within individual specification sections.

1.10 WARRANTY

A. Provide warranty in accordance with the General Conditions and Division 01 requirements, and as stated herein.

B. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

C. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include project-specific information and properly executed.
2. Refer to other specification Sections for specific content requirements and particular requirements for submitting special warranties.

D. Special Warranties: Provide additional product and/or installation warranties for particular products, as specified within individual specification sections.

E. Obtain all warranty papers and records from the Original Equipment Manufacturer (OEM) according to their warranty policy and deliver the same to the Owner. Fulfill all the OEM's requirements to validate the warranty at conclusion of project. Include copies of warranty papers with Closeout Submittals.

1.11 MAINTENANCE

A. Extra Materials: Provide extra, loose and/or spare materials, as required by individual specification sections.

B. Maintenance Service: Provide preventative maintenance services or maintenance services as required by individual specification sections.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with Contract Documents, which are undamaged and new at time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Where products are accompanied by the term as selected, Architect will make selection.
4. Where products are accompanied by the term match sample, sample to be matched is Architect's.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. General Compliance Requirements: Compliance requirements for individual products, as indicated in Contract Documents, are multiple in nature and may include generic descriptions, performance requirements, compliance with reference standards, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.

C. Procedures for Selecting Products: Contractor's options for selecting products are limited by Contract Document requirements, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.

D. Products specified by Reference Standards, Codes and Regulations: Select from among products, which can be shown to comply to, referenced documents.

E. Products specified by Naming Products and Manufacturers: Select from among products listed.

F. Products specified by Naming One Manufacturer's Product as the Basis-of-Design with Reference to Other Manufacturers: Select either the specified Basis-of-Design product or an approved comparable product by one of the other named manufacturers.

1. Comply with provisions in Comparable Products Article to obtain approval for use of a comparable product by one of the named manufacturers.

G. Products specified by Naming One Manufacturer's Product and Indicating Option of Selecting Comparable Products by stating or Approved Equivalent or similar language: Select either the specified product or an approved comparable product.

1. Comply with provisions in Comparable Products Article to obtain approval for use of an unnamed comparable product by another manufacturer.

H. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether proposed product matches satisfactorily.

I. Visual Selection Specification: Where Specifications include the phrase as selected from manufacturer's standard colors, patterns, textures or similar phrase, select a product that complies with other specified requirements. Architect will select color, pattern, and texture.

1. Standard Range: Where Specifications include the phrase standard range of colors, patterns, textures or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
2. Full Range: Where Specifications include the phrase full range of colors, patterns, textures or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Where Basis-of-Design products are specified by name, submit the following, in addition to other required submittals, to obtain approval of a comparable product by one of the named manufacturers:

1. Evidence that the proposed comparable product does not require revisions to the Contract Documents, and is consistent with the Contract Documents.
2. Documentation that the proposed comparable product will produce the indicated results, and is compatible with other portions of the Work.
3. Detailed comparison of significant qualities of proposed product with the Basis-of-Design product in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, serviceability, visual effect, and specific features and requirements indicated.
4. Evidence that proposed product provides specified warranty.
5. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
6. Samples, if requested.

2.3 IDENTIFICATION PLATES

A. General:

1. Dimensions: Minimum of 1" H x 2 1/2" W.
2. Lettering: All capitals, 1/4"H x 1/16" stroke. Indicate circuit number, device (EXHAUST FAN 1, PUMP No. 2, etc.).
3. Indoor Tags:
   a. Laminated phenolic plastic.
   b. White with black engraved letters.
   c. Stainless steel attaching screws.

2.4 LOW VOLTAGE TERMINAL IDENTIFICATION

A. Permanent identification in accordance with the manufacturer’s shop drawings or product data.

B. Identify all control cables and wires:

1. All indoor locations:
   a. Nylon, self-adhesive.
   b. Factory printed with permanent numerals/letters on white background.
2. LEM Wire Markers, or equal.

2.5 WARNING SIGNS

A. Warning signs to identify “HIGH VOLTAGE - KEEP OUT”.

B. Interior Warning and Caution Signs:

1. Preprinted, aluminum, baked-enamel finish signs.
2. Punched for fasteners, with colors, legend, and size appropriate to the application.

C. Exterior Warning and Caution Signs:

1. Weather-resistant, nonfading, preprinted, cellulose acetate butyrate signs.

2. 0.0396-inch (1-mm), galvanized steel backing.
3. Colors, legend, and size appropriate to the application.
4. 1/4-inch (6.4-mm) grommets in corners for mounting.

2.6 FIRE STOPPING MATERIALS

A. General:

1. UL 1479 Listed, Fire Tests For Through-Penetration

B. For large openings:

1. 2-part, RTV silicone elastomer expanding foam.
2. 3-4X expansion.
3. STI Pensil Series PEN Foam, Dow Corning Fire Stop Foam, or equal.

C. For small openings and voids (less than 1"):

1. 1-part, Intumescent sealant.
2. Permanent, flexible and resilient.
3. 5X free expansion.
4. Red color for instant identification as fire barrier.
5. 4-hour fire rating.
6. STI Spec Seal Intumescent Sealant, 3M Fire Barrier Sealant, or equal.

D. For openings around cable tray penetrations:

1. Intumescent pillows.
2. Compressible, lightweight, removable.
3. Sealed poly bags.
4. 1/2" expansion in all directions.
5. STI Spec Seal SSB Pillows, or equal.

2.7 SUPPORTING DEVICES

A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.

1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.

B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and accessories mate and match with channels and are from the same manufacturer.

C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"-

type hangers.

D. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

G. Toggle Bolts: All-steel springhead type.

H. Powder-Driven Threaded Studs: Heat-treated steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:

1. Examine site and existing conditions prior to submitting bids.
2. Carefully examine proposed locations where work will occur in existing buildings and excavation near existing piping, conduit, cable, structures, etc.
3. Make required allowances for the conditions.
4. Request clarifications and or directions in writing, if required.
5. No allowance will be made for any errors, oversights or other negligence on the part of the Installer.

3.2 PREPARATION

A. Protection:

1. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
2. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

3.3 INSTALLATION

A. General Requirements:

1. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings.
2. Install work, generally as shown. Carefully examine all contract drawings and fit the work in each location without substantial alteration. Where departures are proposed or required, submit detailed drawings for acceptance.
3. Installation shall provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
4. Install all items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
5. Install equipment with proper service and access clearances as required by NEC and manufacturers' requirements.
6. Install such that future service or replacement shall not require interference with or removal of other installations.
7. Provide access to all equipment, splice boxes, switches, controls and other devices,

without use of poles, ladders, scaffolding, etc.

8. Where equipment requiring access or service is concealed behind finished surfaces, provide access panel(s) or door(s).

B. Penetration of Fire Rated Construction:

1. Seal all in and around conduits and other electrical materials penetrating or creating openings in fire-rated, fire resistant or fire-stopped walls, ceilings, partitions and floors.
2. Contractor is responsible for the coordination, means & methods, and costs for all penetrations required for the installation of the work.

C. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.

D. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

E. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:

1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow concrete masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
4. In partitions of light steel construction use sheet-metal screws.
5. Drill holes in concrete beams so holes more than 1-1/2 inches (38 mm) deep do not cut main reinforcing bars.
6. Drill holes in concrete so holes more than 3/4 inch (19 mm) deep do not cut main reinforcing bars.
7. Fill and seal holes drilled in concrete and not used.
8. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

F. Rough-in:

1. Contract drawings are generally diagrammatic.
2. Provide all offsets, bends, fittings and accessories, required to fit the work to the conditions, even though not specifically shown.
3. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
4. Refer to equipment specifications in all other Divisions for rough-in requirements.
5. The Owner, and/or his/her representative, reserves the right to make reasonable changes in location of equipment, conduit and wiring up to the time of rough-in or fabrication.

G. Cutting and Patching: Provide all cutting and patching in accordance with Division 1 and per the

following requirements.

1. Perform all required cutting, fitting, and patching necessary for installation of Electrical Division work.
2. Cut, remove and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical systems and equipment as indicated on the drawings and specifications and other electrical items made obsolete by the new Work.

3.4 CONSTRUCTION

A. Connections to Existing Work:

1. Keep all existing systems in operation during the progress of the work.
2. Provide temporary connections, where necessary to maintain continuous operation until the new systems and equipment are ready for operation.
3. Provide all necessary alterations, cuttings, fitting, etc. of existing work to make satisfactory connections between the new and existing work.
4. Leave the complete work in a finished and workmanlike condition.
5. Relocate existing equipment, conduits, wiring, etc. required. Make changes to existing work as may be required.

B. Interface with Other Work:

1. Mechanical and Plumbing Division Equipment and Systems:
   a. Provide the following for equipment furnished and/or installed under mechanical/plumbing Divisions, unless specifically noted otherwise:
   b. Line voltage power wiring connections to equipment such as motors, AHU's, heaters, etc.
   c. Disconnect means per NEC.
   d. Manual or automatic starting contactors, starters, switches, etc.
   e. Furnish duct smoke detectors and sampling tubes. Install detectors into bases, and make all wiring connections (mechanical Division to install sampling tubes into ductwork).
   f. Provide power to all motor operated smoke dampers, furnished and installed under other Divisions. Coordinate control operation through fire alarm duct detectors, per Section "Fire Detection and Alarm".
   g. Furnish gas/oil burner emergency shutdown switches at boiler room exits per NFPA. Provide all wiring to gas or oil fired boilers and/or water heaters for manual shutdown. Final connections to equipment or associated control panels shall be by mechanical Division.
   h. Mounting and connection of starters, speed controls, variable frequency drives and other such equipment furnished by mechanical Division.
   i. Low voltage wiring between transformers and plumbing fixtures (faucets, toilets, urinals, etc.) for automatic controls, or line voltage wiring to fixtures, as required by equipment furnished under mechanical Divisions.
   j. Mounting, connections and disconnects for power factor correction capacitors furnished with motors by mechanical Division.
2. All electrical work performed under mechanical and/or plumbing Divisions shall be provided in accordance with electrical specification Divisions.
   a. Work performed/provided by mechanical Division shall include the following, unless specifically noted otherwise:
   b. All low voltage and line voltage control wiring including conduits, wiring,

branch circuit breakers, etc.

c. EMS or ATC system wiring and connections.
d. Line voltage connections to all motor operated dampers, automatic valves, etc.
e. Line voltage thermostats and associated wiring.
f. All relays, contacts and other control equipment required for operation of mechanical Division equipment.
g. Fuses within equipment, switches, control panels, etc. furnished from the factory with the equipment.
h. Installation of duct smoke detector sampling tubes. Tubes furnished under Section "Fire Detection and Alarm".

3. It is the intent to provide a complete and operational system. The work between mechanical and electrical Divisions is complementary and is meant to produce a single and operating system. Contractor shall make its own determination as to the distribution of responsibility among the various trades.
4. Equipment specified in other Divisions:
   a. Provide the following for equipment furnished and/or installed under Divisions, unless specifically noted otherwise:
   b. Flexible conduit connections to pre-wired modular office furniture and partition walls:
      1) Conduit with power wiring.
      2) Conduit with telecomm wiring.
   c. Hardwired connections to elevators and associated equipment.

C. Penetration of Waterproof Construction:

1. Minimize penetration of roofs, exterior walls and interior waterproof construction.
2. Provide necessary curbs, sleeves, shields, flashing, fittings and caulking to make the penetrations watertight.
3. All penetrations shall comply with roof manufacturer's recommended materials and methods.

D. Penetration of Fire Rated Construction:

1. Seal all in and around conduits and other electrical materials penetrating or creating openings in fire-rated, fire resistant or fire-stopped walls, ceilings, partitions and floors.

3.5 FIELD QUALITY CONTROL

A. General:

1. Provide all circuits free from ground faults, short circuits and open circuits
2. Perform tests specified or required to demonstrate that the work is installed and operating properly.
3. Where specific tests are required, give proper notices and perform all necessary preliminary tests to assure that the work is complete and ready for final test.
4. Other tests of a specific nature for special equipment shall be as specified under the respective equipment.

B. Inspections:

1. Schedule, pay for (as applicable) and attend all inspections required by the Authorities Having Jurisdiction.
2. Deliver all certificates to the Owner prior to final acceptance of work.

3. Notify Architect in advance of scheduled inspections.
4. An electrical foreman, superintendent or other supervisor shall be in attendance for all scheduled electrical inspections.
5. Schedule preliminary and rough-in inspections in a timely manner. Any work covered prior to any inspection in a manner which, in the inspector's opinion, precludes a complete inspection, shall be uncovered at the installer's cost.
6. Uncover Work to provide for installation of ill-timed Work.
7. Disconnect installed work as specified for testing.

C. Acceptance Testing: Provide for acceptance testing of electrical equipment, as follows, and as required in other electrical Division specification sections.

1. Pay for and schedule all required acceptance testing.
2. Testing shall be by independent electrical testing contractor, licensed and certified by NETA.
3. Testing company shall be independent of installing company (i.e. no subsidiaries).
4. All tests shall be performed in accordance with the National Electrical Testing Association (NETA).
5. Notify Architect and Owner in advance of all testing.
6. Deliver all reports to Architect for approval.
7. Retest all failed equipment after adjustment, repairs, etc.
8. Provide all fuel, labor, etc. required for tests.
9. All costs associated with preparations for actual testing shall be borne by the installer.
10. Provide letter or statement on Testing Agency letterhead attesting to the satisfactory test results and suitability of the equipment to be energized and/or placed into service, as applicable. If testing reveals any problems or marginal results, the letter shall state these.

D. Replacement of Faulty Work or Materials:

1. Replace any equipment, which fails NETA test results at the direction of the Owner. All replaced equipment shall be retested at no cost to Owner.
2. Remove and replace all defective Work or materials.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Materials not installed per recognized standards, manufacturers' instructions, contract documents or design intent shall be removed and replaced when so directed by the Architect, at the Contractor's expense.

E. Project Punchout Inspection: Architect/Engineer will perform punch out reviews and will provide the Contractor with a list of punch list items to be completed before contract close out. Each and every punch list item shall be initialed and dated by the Contractor when the work is complete. The Architect/ Engineer will not perform any punch list verification until all items have been completed, initialed, dated and the list returned to the Architect/Engineer. If any items have been initialed as being completed by the Contractor and the Architect/Engineer determines that the work is not complete, the Architect/Engineer shall be reimbursed by the Contractor at his regular hourly rate for any and all items requiring revisiting of the site by the Architect/Engineer. Reimbursement shall be made by deducting the Architect/Engineer's fee from the Contractor's final payment.

3.6 ADJUSTING

A. General:

1. Lubricate, clean, adjust and test all equipment and systems in accordance with the manufacturer's instructions prior to initial operation.
2. Do not operate equipment unless proper safety devices and controls are operational.
3. Provide all maintenance and service for equipment, which is operated during construction, and protect the equipment.
4. Provide services of the manufacturer's factory-trained technicians to start up the equipment where required, or specified.

3.7 IDENTIFICATION

A. Permanently identify all equipment in accordance with the project nomenclature.

1. Panelboards - identify panel as per contract, voltage, and emergency or UPS power, as applicable.
2. i.e. PANEL RP1
   120/208 VOLTS
   EMERGENCY POWER
3. Starters, disconnects - identify fan, pump or load served, using contract nomenclature.
   i.e. EXHAUST FAN N0. 1
4. Miscellaneous controls, terminal boards, etc.
   i.e. FIRE ALARM POWER SUPPLY
5. General purpose receptacles - identify branch circuit panel and circuit number on back of coverplate with permanent marker.

B. Provide manufacturer’s Arc Flash Hazard Warning labels on all electrical switchboards, switchgear, panelboards, MCC’s, meter sockets and meter stacks, industrial control panels, etc. per NEC 110.16.

C. Identify all power conductors via colored insulation, or individual identification of phase wires with colored electrical tape at each junction box, panel or enclosure where conductors are visible. Color coding as listed below, on all building wiring and feeders:

1. 208/120-V System: As follows:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral: White.
   e. Ground: Green.

2. 480/277-V System: As follows:
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.
   d. Neutral: Gray.
   e. Ground: Green.

3.8 LOW VOLTAGE TERMINATION IDENTIFICATION

A. Permanently identify all cables, wires, terminal boards, terminal blocks and other equipment in accordance with the manufacturer’s shop drawings or product data.

B. Identify all control cables and wires:

1. All indoor locations:
   a. Length to permit a minimum of 2-3 revolutions around cable or wire.

C. Identification shall be applied to both ends of all control cables, wires, etc., within 2 inches of termination. Marking pens, embossed plastic tape markers or other temporary methods will not be acceptable.

3.9 EQUIPMENT MOUNTING

A. Disconnects & Control Equipment:

1. In sight of equipment served, with operating handle at 48-54" AFF.
2. As close as practical to motor, etc.
3. For large on-grade or roof mounted equipment, (i.e. chillers, ACU's, etc.), mount to equipment housing or frames.

B. Allow for proper clearance of electrical items and equipment served.

3.10 DEMONSTRATION

A. Provide for equipment manufacturers' established representatives to demonstrate to Owner, the correct operation, safety, adjustments and maintenance of all electrical equipment and systems under this contract.

COMPARABLE PRODUCT SUBMITTAL FORM

Table of Compliance (Sample)
Shop Drawing & Product Data Submittal

1. The Contractor shall prepare a Table of Compliance Form similar in format to the sample shown below to facilitate and expedite the Shop Drawing and Product Data Review. Failure to comply with this requirement will be basis for rejecting the Submittal.
2. The Table of Compliance Form will list and compare the performance parameters as the submitted equipment to that listed on equipment schedule and specifications as basis of design. All non-compliance items (differences) must be explained in full, indicating their impact, if any, on maintainability, durability, energy use, operating costs, code compliance and environmental considerations.

(Sample)
TABLE OF COMPLIANCE

EQUIPMENT: _____ SPEC. SECTION: _____

BASIS OF DESIGN SAMPLE ITEMS	DRAWINGS	SUBMITTED	EXPLANATION
Input KW, amps, etc.			
Input Voltage range			
Efficiency rating			
Mfg's Recommended OCPD and MCA ratings			
Heat output (Btu/hr)			
Overload capability (%)			
Adjustable Range			
Battery backup (minutes)			
NEMA rating or size			
Material thickness (ga)			
Material Type (steel, alum, non-metallic, etc.)			
Interrupting Rating			
Cable Category (5e, 6)			
Length x Width x Height			
Weight			
Fuel consumption (gensets)			
Specifications:			
Quality assurance compliance			
(NEMA)			
(UL)			
Specifications: List each specification paragraph			
Etc.			
Other:			

END OF SECTION

SECTION 260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS & CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Building wires and conductors.
2. Cables and cable assemblies.
3. Splices and connectors.
4. Acceptance testing of conductors, feeders, etc.
5. Load balancing.

B. Related Sections:

1. Section “Common Work Results for Electrical.”
2. Section “Grounding & Bonding for Electrical Systems” for coordination with grounding equipment and attachments.
3. Section “Raceways and Boxes for Electrical Systems.”

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1.	ASTM B3	Soft or Annealed Copper Wire
2.	ASTM B8	Concentric Lay Stranded Copper Conductors
3.	ASTM B174	Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
4.	ASTM B230	Standard Specification for Aluminum 1350-H19 Wire for Electrical Purposes
5.	ASTM B231	Concentric-Lay-Stranded Aluminum Conductors
6.	ASTM B496	Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
7.	ASTM 901	Standard Specification for Compressed Round Stranded Aluminum Conductors Using Single Input Wire Construction

B. Underwriters Laboratory (UL):

1.	UL 4	Standard for Armored Cable
2.	UL 44	Standard for Thermoset-Insulated Wires and Cables
3.	UL 62	Standard for Flexible Cord and Cables
4.	UL 83	Thermoplastic-Insulated Wires and Cables
5.	UL 486A	Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors.
6.	UL 486B	Standard For Wire Connectors and Soldering Lugs for Use With Aluminum Conductors.

7.	UL 854	Service-Entrance Cables
8.	UL 910	Standard for Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air
9.	UL 1424	Standard for Cables for Power-Limited Fire-Alarm Circuits
10.	UL 1569	Standard for Metal-Clad Cables
11.	UL 1479	Standard for Fire Tests of Through-Penetration Firestops
12.	UL 1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords

1.4 SUBMITTALS

A. Submittal Requirements of this section:

1. Building wires and conductors.
2. Cables and cable assemblies.

B. Product data, including construction, materials, performance data, etc.

C. Product Test Reports: Certified copies of manufacturer's design and routine factory tests required by the referenced standards.

D. Provide submittal data for each cable or conductor type.

1. To verify specifications have been met/exceeded.
2. Indicate UL listing for all products.

1.5 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT

A. Packing, Shipping, Handling and Unloading:

1. Deliver wire and cable according to NEMA WC-26, “Binational Wire and Cable Packaging Standard.”

B. Storage and Protection:

1. Store wires and cables out of rain.
2. Protect from physical damage.
3. Guard against nicks and scratches.

PART 2 PRODUCTS

2.1 METAL CLAD CABLE (MC)

A. Type MC metal clad cable for branch circuit applications.

1. Interlocking aluminum or galvanized steel armor.
2. THHN insulation, 90^{o}C rated.
3. Solid Conductors through #10 AWG: Soft or annealed per ASTM B3.
4. Stranded copper conductors for #8 AWG and larger, per ASTM B8.
5. Phase identified conductors.
6. Insulated (green) equipment grounding conductor.
7. Internal, overall, non-metallic tape shield around all conductors.
8. UL 83, 1479, 1569 and 1581 listed.

9. NEC 230, 300, 320, 330, 518, 520, 530, 605 and 645 compliant.
10. AFC MC, MC-Tuff, MC-Lite, or equal.

B. Type MC metal clad cable for feeder applications.

1. Interlocking aluminum alloy (AA-8000) armor.
2. XHHW insulation, 90°C rated.
3. Copper, compact stranded conductors per ASTM B8.
4. Phase identified conductors.
5. Bare equipment grounding conductor.
6. Internal, overall, non-metallic tape shield around all conductors.
7. UL 83, 1479, 1569 and 1581 listed.
8. NEC 230, 300, 320, 330, 518, 520, 530, and 645 compliant.
9. MC Cable by Service Wire, Pirelli, Service Wire, Alcan, or equal.

2.2 FIRE ALARM METAL CLAD CABLE (MC)

A. Type MC metal clad cable with isolated ground conductor:

1. For use on fire alarm system circuits, as required.
2. Interlocking galvanized steel armor.
3. Continuous red identifying stripe.
4. TFN insulated, solid copper conductors.
5. Copper ground conductor(s).
6. UL Listed Fire Alarm Cable
7. Rated for use in plenums.
8. UL Listed for cable trays.
9. Rated for through penetrations of 1, 2 and 3-hour fire walls.
10. Individually twisted pairs and shielding, as required per fire alarm system manufacturer.
11. Fire resistant and low smoke.
12. UL 62, 83, 910, 1424, 1479, 1569, and 1581 listed.
13. NEC 300-20, 330, 518, 530, 645, 725, 760 compliant.
14. AFC Type MC Fire Alarm/Control Cable.

2.3 600 VOLT BUILDING WIRE

A. Copper Building Wire:

1. UL 44, 83 and 854 Listed, 600 volt, 90°C:
2. All conductor sizes indicated are based on copper conductors.
3. Copper, stranded for #8 AWG, and larger.
   a. Concentric per ASTM B3.
   b. Compact round per ASTM B496.
4. #12 AWG minimum conductor size.
5. Thermoplastic Insulation:
   a. Interior #8 and smaller: THWN or THHN
   b. Interior #6 and larger: THWN or THW
   c. All exterior wiring: THWN or THW
6. Provide wires as manufactured by Pirelli, Service Wire Corp, Okonite Company, Southwire, Carol Cable, or equal.

B. Aluminum Alloy Conductors:

1. Permitted in lieu of copper for feeders, services or equipment branch circuits rated 60 amps or greater, except as noted.
2. Aluminum conductors are NOT permitted for
   a. Fire Pump feeders.
   b. Final/direct connections to:
      1) Motors, compressors, fans, pumps, AHU's, RTU's, etc
      2) Chillers, including chiller manufacturer's disconnect or VFD.
      3) Generators.
      4) UPS system input and output terminals.
3. Construction
   a. Aluminum alloy (AA-8030) conductors per ASTM B230.
   b. Compact stranded construction per ASTM 901.
   c. XHHW-2 cross-linked polyethylene insulation.
   d. UL Listed for wet (75^0C) or dry (90^0C) locations.
   e. Minimum size #4 AWG.
4. Alcan Cable, "Stabiloy XHHW-2" or approved equal.

2.4 SPLICES & CONNECTORS

A. Splices & Connectors for copper conductors:

1. Dry locations:
   a. #10 AWG and smaller: Insulated, solderless pressure type.
   b. #8 AWG and larger: Hydraulic pressure indentation type, Burndy "Hy-dent", T&B or equal.
2. In handholes, manholes and direct buried locations:
   a. Silicone filled wire-nuts (King, or equal).
   b. Compound filled splice or connectors.
   c. Suitable for immersion in water.

B. Splices & Connectors for aluminum conductors:

1. All locations: Use only with UL Listed bolted pressure or compression type connectors.
   a. UL Listed, marked AL7CU or AL9CU per UL 486B.
   b. Use with oxide inhibiting compound.
   c. Use aluminum alloy hardware per ANSI requirements.

2.5 LOW VOLTAGE CABLING

A. Cables for low voltage systems shall be as specified in other sections. If not specified, cables shall be per system manufacturer's recommendations.

B. All low voltage cabling installed on this project shall be UL Listed, plenum rated cable, unless installed in metal conduit.

2.6 FLEXIBLE POWER CORDS

A. Flexible power cords for equipment drops in kitchens, labs and/or manufacturing areas:

1. EDPM insulated stranded bare copper per ASTM B174.
2. Non-hygroscopic fillers.
3. Yellow jacket impervious to oils, water, acids, sunlight, etc.; ozone, cut and abrasion

resistant. Jacket shall bear manufacturer's name, cable size and rating, etc. along the entire length with permanent printing.

4. UL Listed, type SOOW-A (600V) or SJOOW-A (300V).
5. Carol Super VuTron III, Royal 5-Crown Powerflex 105 Plus, American Mustang.

PART 3 EXECUTION

3.1 APPLICATION

A. Feeders:

1. Type THW, THHN/THWN, XHHW copper conductor, in raceway.
2. Type MC, multi-conductor copper, 90C insulation, interlocked steel armor sheath.
3.

B. Branch Circuits:

1. Type THHN/THWN, copper conductor, in raceway.
2. Type MC cable, copper conductor, 90C insulation.

C. Fire Alarm Circuits:

1. Type THHN/THWN, copper conductor, in raceway.
2. Type MC Fire Alarm cable, copper conductor, 90C insulation.

D. Class 1 Control Circuits:

1. Type THHN/THWN, copper conductor, in raceway.

E. Class 2 Control Circuits:

1. Power-limited cable, concealed in building finishes.
2. Type THHN/THWN, copper conductor, in raceway.
3. Type MC cable, copper conductors.

3.2 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and the NECA “Standard of Installation.”

B. Remove existing wire from raceway before pulling in new wire and cable.

C. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.

1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.

E. Conductor Splices: Keep to minimum.

1. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
2. Use splice and tap connectors that are compatible with conductor material.

F. Wiring at Outlets: Install with at least 12 inches (300 mm) of slack conductor at each outlet.

G. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, per manufacturer's published torque values or per UL 486A.

H. Use of Aluminum Conductors:

1. Panel and feeder schedules are generally based on copper conductors, unless specifically noted as aluminum.
2. Where aluminum is to be used, as permitted in these specs, the contractor is responsible for increasing the conductor sizes to the equivalent ampacity per NEC tables.
3. Where required as a result of larger aluminum conductors, provide increased conduit sizes.
4. Ground conductors shall also be provided, per NEC article 250.
5. Provide all required lugs, connectors, etc., rated for aluminum conductors.

I. MC Cable Installation Requirements:

1. Installed concealed in finished areas.
2. Do not expose, except for final connections to modular furniture.
3. Group all MC cables running together in bundles with nylon cable ties.
4. Route bundles neatly through ceiling cavities.
5. In high ceiling, or large plenum areas, install all MC cables in groups, tight to underside of deck, within steel joist webbing.
6. Avoid constant changes in direction and elevation of bundles.
7. Install perpendicular and parallel to column lines, except for final separation from bundles.
8. Support bundles at regular intervals, per NEC, independent from ceiling hanger wires.
9. Provide adequate clearance above accessible ceiling tiles, minimum of 18."
10. Where circuits exit panelboards not located in electrical rooms or closets, conductors shall be installed in EMT conduit to a wire trough above the panel and finished ceiling, in an accessible location. MC cable shall then be permitted to extend to the branch circuit devices.
11. Where circuits exit panelboards located in electrical rooms or closets, conductors shall be installed in EMT conduit to a wire trough outside the electric room, above the finished ceiling in an accessible location. MC cable shall then be permitted to extend to the branch circuit devices.

3.3 CONSTRUCTION

A. Food Service Equipment connections: All power cord or sealtite conduit connections shall be of sufficient length to permit removal and unplugging of equipment. Cord/conduit length, however,

shall not allow any cord or conduit to lay on the floor when equipment is in final operating position.

B. Generators, motors, vibrating or rotating equipment shall be stranded copper for all sizes. Solid wire not permitted.

3.4 FIELD QUALITY CONTROL

A. General:

1. Before making tests, complete all connections at panels, fixtures and other equipment.
2. Install fuses and have all wiring continuous from service equipment to utilization outlets.
3. Correct all undesirable ground, open and short circuit conditions.
4. Provide source of temporary power for making tests if normal building power is not available at the time.

B. Acceptance Testing: Take and record the following readings on systems 600 volts and below:

1. Provide megger tests of all feeder conductors, including ground conductors for the following:
   a. Service entrance conductors
   b. Panelboard, MCC and dry transformer feeder conductors
   c. Emergency system feeders including feeders between generators, ATS', panels, switchboards.
   d. Fire Pump feeders (normal and emergency feeders)
2. Indicate measured Ammeter readings on all phases and neutral of each feeder to indicate balance.
3. Ammeter readings on all phases of each polyphase motor. Include nameplate full load current of each motor on data sheet.

C. Test Reports:

1. Certify that all overload devices have been set in accordance with data shown on the drawings and/or manufacturer's recommended setting.
2. Send final certified test reports and Certifications to Architect and Owner for approval, in accordance with Section "Submittals."

3.5 ADJUSTING

A. General:

1. Make and perform all adjustments after building distribution system and all branch circuits are installed and operating.
2. Make all ammeter measurements during regular working hours, when all personnel and equipment are working, to represent typical building conditions.

B. Feeder Balancing:

1. Make adjustments to branch circuit connections within branch circuit panelboards. Balance the load between each phase, as practicable.
2. After branch panels are balanced, perform balancing of phase loads on distribution panels and switchboards.
3. Report ammeter readings before and after adjustments for each panel or switchboard.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid grounding of electrical systems and equipment.
2. Basic requirements for grounding for protection of life, equipment, circuits, and systems.
3. Specialized grounding systems for specific installations.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section “Fire Detection and Alarm.”
2. Section “Common Work Results for Electrical.”
3. Section “Low Voltage Electrical Power Conductors and Cables” for grounding conductors and attachments.
4. Section “Low Voltage Electrical Distribution” for grounding, bonding and interconnection of 600V class distribution equipment.

1.3 SUBMITTALS

A. Submittal Requirements of this section:

1. Exothermic Weld materials.
2. Grounding/bonding clamps.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

B. Installation Quality: In accordance with recognized trade organizations and standards.

1. NFPA 70, “National Electrical Code.”
2. UL 467, “Grounding & Bonding Equipment.”
3. IEEE.
4. ANSI/EIA/TIA 607, “Commercial Building Grounding and Bonding Requirements for Telecommunications.”

C. Requirements of power company, relating to grounding of utility company transformer pads.

1.5 SEQUENCING

A. General Sequencing:

1. Install all subsurface grounding equipment after completion of grading and excavations to avoid disturbance of components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. A.B. Chance Co.
2. Cooper Power Systems
3. O-Z/Gedney Co.
4. Erico Cadweld
5. Harger

2.2 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper.

2.3 WIRE AND CABLE CONDUCTORS

A. General: Comply with Section “Low Voltage Power Conductors and Cables.” Conform to NEC, except as otherwise indicated, for conductor properties, including stranding.

B. Grounding Electrode Conductor: Stranded cable.

C. Insulated Ground Wire:

1. Minimum sizes per NEC or larger as indicated.
2. Quantities and sizes as per drawings.
3. Green insulation.

D. Bare Ground Wires:

1. For equipment bonding jumpers, equipment enclosures to the ground bus or lug, bonding conduit grounding fitting, and elsewhere as required.
2. # 6 AWG minimum for bonding jumpers.
3. Solid Conductors: Soft or annealed per ASTM B3, “Soft or Annealed Copper Wire.”
4. Stranded copper per ASTM B8, “Concentric Lay Stranded Copper Conductors.”

2.4 MISCELLANEOUS CONDUCTORS

A. Ground Bus: Bare annealed copper bars of rectangular cross section.

B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.

C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as

indicated.

2.5 CONNECTOR PRODUCTS

A. General: Listed and labeled as grounding connectors for the materials used.

B. Pressure Connectors: High-conductivity-plated units.

C. Bolted Clamps: Heavy-duty units listed for the application.

D. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

PART 3 EXECUTION

3.1 APPLICATION

A. Equipment Grounding Conductor Application: Comply with NEC Article 250, “Grounding” for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

1. Feeders and Branch Circuits: Install separate insulated equipment grounding conductors with circuit conductors. Terminate on panelboard or switchboard grounding bus bar, or on ground lug or bus in equipment enclosure, cabinet, etc. Splicing of equipment grounding conductors is not permitted.
2. Panelboards: All equipment grounding conductors shall terminate on a single ground busbar within the equipment enclosure. Bus bar shall be bonded to enclosure.
3. Nonmetallic Raceways: Provide insulated equipment ground conductor in raceways with each branch circuit unless raceway is designated for telephone or data cables.
4. Air Duct Equipment Circuits: Provide insulated equipment grounding conductor to duct-mounted electrical devices operating at 120VAC and above, including humidifiers, air cleaners, heaters, etc. Bond the grounding conductor to each such unit and to the air duct.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

3.3 CONNECTIONS

A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
2. Make connections with clean bare metal at points of contact.
3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections involving dissimilar details with inert material such as red lead

paint to prevent future penetration of moisture to contact surfaces.

6. Aluminum conductors shall have antioxidant coatings at all connections and shall have UL Listed AL-CU lugs as needed.
7. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torque requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors" and 486B, "Wire Connectors for Use with Aluminum Conductors."

B. Conductor Terminations:

1. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs.

C. Metallic Raceways:

1. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing.
2. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing.
3. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

D. Compression-Type Connections:

1. Use hydraulic compression tools.
2. Use tools and dies recommended by the manufacturer of the connectors.
3. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

E. Moisture Protection:

1. Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

3.4 FIELD QUALITY CONTROL

A. General:

1. Before making tests, complete all connections at panels, fixtures and other equipment.
2. Install fuses and have all wiring continuous from service equipment to utilization outlets.
3. Correct all undesirable ground, open and short circuit conditions.
4. Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.

B. Acceptance Testing: Take and record the following readings on applicable systems, as described below:

1. Feeder Equipment Grounding Conductor Tests:
   a. Perform test by the 2-point method to verify impedance in the ground system between installed components, including, but not limited to the following:
      1) Service switchgear, switchboard, panelboard or transformer and main

grounding busbar.

2) Branch panelboards to feeder source.

2. Neutral-Ground Bond Testing:
   a. Test distribution system for presence of neutral-to-ground bonds at points other than service entrance and/or separately derived sources.
   b. Remove permitted N-G bond at point of common coupling, and verify no continuity between neutral and ground systems.
   c. Record the measured isolation (megohms) between the neutral and ground systems.
   d. Where continuity is found, provide further investigation to locate and remove such bonds.

3.5 ADJUSTING

A. General:

1. Make and perform all adjustments after all building grounding systems are complete.

B. Deficiencies of Service or Building Ground Systems:

1. Where ground resistance exceeds specified values, notify the Architect immediately.
2. Modify the grounding system to reduce resistance values.
3. Provide additional ground rods, interconnected with the others, installed at least 10 feet between rods.
4. Retest ground resistance after modifications.
5. Where values still exceed those specified, the Architect will provide additional direction.

C. Unintentional Bonding of Grounds, Neutrals, etc. of Service or Building Ground Systems:

1. Perform additional testing and measurements to locate the unintentional bonds.
2. Remove unintentional bonds.
3. Retest system(s) to prove desired isolation of systems.

D. Reports:

1. Prepare test reports, certified by the testing organization, of the ground resistance at each test location.
2. Include observations of weather and other phenomena that may affect test results.
3. Indicate measures taken to improve test results.
4. Provide all final measurements of system isolation tests (megohms).

END OF SECTION

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Conduits.
2. Conduit fittings and supports.
3. Device and outlet boxes.
4. Pull and splice boxes.

B. Related Sections: The following sections contain requirements that relate to this Section:

1. Section “Common Work Results for Electrical.”
2. Section “Grounding & Bonding for Electrical Systems” for coordination with grounding equipment and attachments.
3. Section “Low Voltage Electrical Power Conductors and Cables” for conductors to be installed in raceways.

1.3 SUBMITTALS

A. Submittal Requirements of this section:

1. Conduits.

B. Descriptive Data:

1. To verify specifications have been met/exceeded.
2. Indicate UL listing for all products.
3. Manufacturer's specifications, data sheets.
4. Catalog cuts.
5. Dimensional drawings.
6. Capacity ratings.
7. Information required indicating contract compliance.
8. Clearly indicate the exact size or rating proposed.

C. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements.

1.4 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT

A. Packing, Shipping, Handling and Unloading:

1. Transport and handle all equipment to prevent bending, distortion or damage to

products.

B. Storage and Protection:

1. Store all materials out of rain.
2. Protect from physical damage.
3. Guard against nicks and scratches on finished surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide the named “Basis of Design” manufacturer and model (“Basis of Design” fixtures are indicated on the drawing fixture schedule), or a comparable product of one of the other following named manufacturers:

1. Steel Conduits & Fittings:
   a. Allied Tube & Conduit
   b. American Electric/Steel City

2.2 METAL CONDUIT AND TUBING

A. Rigid Galvanized Steel Conduit (RGS):

1. ANSI C80.1 Rigid Steel Conduit, Hot dip Galvanized
2. UL 6 Electrical Rigid Metal Conduit - Steel.
3. Meets NEC Article 344, “Rigid Metal Conduit.”
4. Material: Steel heavy-wall, hot dip galvanized inside and outside.
5. Joints: Standard pipe thread; furnished with coupling; shipped with thread protector through 2-inch size.
6. Minimum Size: 3/4 inch.

B. Intermediate Metal Conduit (IMC):

1. ANSI C80.6 Intermediate Metal Conduit - Zinc Coated.
2. UL 1242 Intermediate Metal Conduit.
3. Meets NEC Article 342 Intermediate Metal Conduit.
4. Material: Steel only, intermediate wall thickness, hot dipped galvanized.
5. Joints: Standard Pipe Thread, furnished with coupling, shipped with thread protector through 2-inch size.
6. Minimum Size: 3/4 inch.

C. Electrical Metallic Tubing (EMT):

1. ANSI C80.3 Electrical Metallic Tubing - Zinc Coated.
2. UL 6 Rigid Metal Conduit.
3. Meets NEC Article 358, “Electrical Metallic Tubing.”
4. Material: Steel, thin-wall, electro-galvanized.
5. Minimum Size: 3/4 inch.

D. Flexible Metal Conduit (Greenfield):

1. Zinc-coated steel.

2. UL 1 Flexible Metal Conduit.
3. Meets NEC Article 350, “Flexible Metal Conduit.”
4. Material: Steel, hot dip galvanized.
5. Minimum Size: 3/4 inch.

E. Liquid tight Flexible Metal Conduit (Sealtite):

1. UL 360 Liquidtight Flexible Steel Conduit.
2. Meets NEC Article 351, “Liquidtight Flexible Metal Conduit and Liquidtight Flexible Nonmetallic Conduit.”
3. Flexible steel conduit with PVC jacket.
4. Galvanized flexible steel core.
5. Extruded PVC jacket, gray or black.
6. Minimum Size: 3/4 inch.

2.3 CONDUIT FITTINGS

A. All fittings to match conduit material and to be suitable for the purpose intended. All fittings shall be UL Listed.

B. Expansion Fittings:

1. Weather tight construction.
2. Copper braid bonding strap & clamps.
3. Crouse Hinds, or equal.

C. RGS/IMC Fittings:

1. Threaded with insulated bushings.
2. Galvanized steel or malleable iron.
3. Double locknuts.
4. Crouse Hinds, Steel City, Bridgeport, or equal.

D. EMT Fittings:

1. Compression type "Concretight" or "Raintight.”
2. Zinc plated steel body and steel nut.
3. Insulated throats.
4. Setscrew fittings not permitted.

E. Sealtite Conduit Fittings:

1. Threaded ferrule, malleable iron compression nut and body.
2. Nylon sealing ring.
3. NEMA FB-1, “Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.”

F. Flexible Metal Conduit/MC Cable Fittings:

1. 360^{o} squeeze type.
2. Malleable iron or cast zinc bodies.
3. Insulated throat.

2.4 CONDUIT SUPPORTS

A. Single suspended feeder conduit:

1. 1/2" - 2" Conduit: Adjustable hangers with 3/8" rods.
2. > 2" Conduit: Adjustable hangers with 1/2" rods.
3. Kindorf C-149 or C-150, B-line, or equal.

B. Groups of suspended conduits:

1. Steel channels with conduit straps.
2. 2" threaded rods, minimum.
3. Kindorf, B-Line, or equal.

C. Flexible metal conduit, MC Cable:

1. UL Listed Caddy Clips, or similar attachment methods.

D. Surface mounted conduit:

1. 1 or 2-hole pipe straps.

2.5 DEVICE & OUTLET BOXES

A. Indoor boxes - zinc-coated or cadmium plated steel, NEMA OS-1.

B. Device boxes for surface mounting in unfinished spaces:

1. One-piece, zinc-coated drawn steel, NEMA OS-1.
2. Square boxes with rounded corners and no sharp, protruding edges.
3. Knockouts on all four sides.
4. Pre-drilled mounting holes, and ground wire screw holes.
5. Raised device coverplates for switches or outlets, as required. T&B RS Series.
6. Thomas & Betts, or equal.

C. Outlet boxes in un-plastered brick or block walls shall be provided with deep square-cut device covers.

D. Furnished all boxes with appropriate covers.

E. No sectionalized boxes shall be used.

F. Provide “stud-to-stud” or “dual box to stud” mounting brackets to insure all adjacent boxes are level. Thomas & Betts, or equal

2.6 TELECOMMUNICATION OUTLET BOXES

A. Back boxes:

1. Recessed outlets:
   a. 4" x 4" x 2-1/2” deep steel, recessed device box.

b. Single-gang steel reducer plate (plaster ring).

2.7 JUNCTION AND PULL BOXES

A. Dry locations:

1. 12 gauge galvanized sheet steel minimum.
2. Flat covers secured in position by round head brass or stainless steel 300 grade machine screws.
3. NEMA OS-1, "Sheet Steel Outlet Boxes, Covers and Box Supports."

B. All boxes sized to meet the requirements of the NEC.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine areas to receive cable trays. Make adjustments to elevations, routing, etc. to coordinate with other work including beams, lights, ducts, pipes, etc.

3.2 APPLICATION

A. General Exterior Conduit Applications:

1.	Above grade, building surfaces:	IMC, RGS
2.	Roof surfaces:	IMC
3.	Below covered roofs/overhangs:	IMC, EMT
4.	Motors, pumps, etc.	Sealtite

B. General Interior Conduit Applications:

1.	All panelboard feeders:		
	a.	Above slab:	EMT
2.	HVAC equipment circuits:		
	a.	(>30 amps):	EMT
	b.	(≤ 30 amps):	EMT, MC Cable
	c.	Below floor slab:	RGS, PVC*
		1) *RGS required where conduit penetrates through slab.	
3.	Branch circuits (lighting, receptacles):		
	a.	Above accessible ceilings:	EMT, MC Cable
	b.	Above inaccessible ceilings:	EMT, MC Cable
	c.	Concealed in CMU walls:	EMT, PVC
	d.	Within solid masonry walls:	EMT, PVC
	e.	Concealed within stud walls:	EMT, MC Cable
	f.	Surface mounted, finished areas:	Wiremold *
		1) *Only with Architect's prior approval	
	g.	Surface mounted, unfinished areas:	EMT
	h.	Surface mounted (kitchen areas):	RGS
	i.	In or below slab on grade to flush floor boxes:	PVC

4. Final Connections to Lights, dry transformers, small motors, vibrating equipment:
   a. Indoor, dry locations: Greenfield
   b. Outdoor, damp locations: Sealtite

3.3 INSTALLATION

A. General:

1. Coordinate layout and installation of all raceways, cable trays, boxes and other equipment with other construction elements to ensure adequate headroom, working clearance, and access and to eliminate interference problems.
2. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
3. Do not cut or drill structural members without permission of Architect. Provide reinforcing for opening as directed by Architect.
4. Pierce metal deck where required for installation of electrical equipment.
5. Support raceways and equipment as required by NEC, manufacturers, and as specified elsewhere.
6. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer.
7. Tighten connectors and terminals, including screws and bolts, per manufacturer's published torque values, or per UL 486A, “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors” where not specified.
8.

3.4 CONSTRUCTION

A. Flexible Connections: Use maximum of 6 feet of flexible conduit for connections to equipment subject to vibration, noise transmission, or movement, and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections. Provide flexible connections as follows:

1. Connections to motors between rigid conduit and connection box on motor.
2. Connections to equipment containing motors.
3. Connections to equipment subject to movement caused by rotation, vibration or oscillation.
4. Connections from rigid conduit system to recessed lights.
5. Other applications, as indicated.

B. Supports: Provide all supports, hangers, braces and attachments required for the work of this section.

3.5 CONDUIT INSTALLATION

A. General Installation Requirements:

1. Install all conduit concealed, unless not possible.
2. Surface mounting only as approved by Architect.
3. Minimum size 3/4” inch, unless noted otherwise.
4. Minimum 6" clearance from flues, heating pipes, or other hot surfaces above 80^{o}F.
5. Parallel and perpendicular to walls, structural members, ceilings and interior surfaces; install plumb.
6. Polypropylene or nylon pull line in each empty conduit.

7. Use capped bushings or plugs during construction.
8. Clean and cap all conduits left empty for future use.
9. In masonry, install prior to wall construction and accurately set all outlets.
10. On walls below grade, use stand-off brackets. Maintain minimum 2" space between conduit and wall surface.
11. Where conduit passes through exterior walls, floor or roof, install appropriate fittings and materials to make openings watertight. Repair pierced vapor barriers vapor-proof. Provide flashing for each conduit piercing the roof.
12. On walls in kitchens, use stand-off brackets to maintain minimum 2" space between conduit and wall surface, per Health Department requirements.

B. Exposed Conduit in Exposed Ceiling Areas:

1. Install all conduit tight to underside of deck, above all ducts, piping, etc.
2. Install conduits within joist webbing and through spaces between steel beams and structure, as high as possible.
3. Install parallel with building walls, beams and main structural elements.
4. Minimize offsets by coordinating with other trades prior to installation.
5. Install pull and junction boxes where least visible. Install on far side of ducts, etc., as visible from the majority of room viewpoints.

C. Flexible Conduit Installation Requirements:

1. Group all flexible conduits running together in bundles with nylon cable ties.
2. Route bundles neatly through ceiling cavities.
3. Avoid constant changes in direction and elevation of bundles.
4. Install perpendicular and parallel to column lines, except for final separation from bundles.
5. Support bundles at regular intervals, per NEC, independent from ceiling hanger wires.
6. Provide adequate clearance above accessible ceiling tiles, minimum of 18."
7. Where flexible conduit or MC cable is used for final connections to motors, lights, etc., maximum length shall be 6 feet.

D. Fittings & Terminations:

1. Provide expansion fittings in all conduit where crossing building expansion joints.
2. Provide expansion fittings in all runs of PVC conduit, a minimum of 1 between every 2 fixed points.
3. Tighten setscrews of threadless fittings with suitable tool. Tighten compression fittings within wrenches.
4. Terminations: Use two locknuts, one inside and one outside the box. Provide insulated bushings or throats.
5. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
6. Sealing Fittings: Install per manufacturer's instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. Install raceway sealing fittings on conduit at the following points and elsewhere as indicated:
   a. Entering/leaving hazardous locations.
   b. Passing from warm locations to cold locations, such as the boundaries of refrigerated spaces.
   c. Where otherwise required by the NEC.

3.6 DEVICE & OUTLET BOX INSTALLATION

A. General Requirements:

1. Install all boxes plumb and level.
2. Install boxes at heights required. Refer to Section “Wiring Devices.”
3. Install recessed boxes flush with final finished surface.
4. Secure all boxes such that no movement occurs during normal use.
5. Install ceiling mounted boxes with sufficient support and rigidity to prevent movement during normal connecting and disconnecting procedures.
6. Install power and low voltage device boxes at same heights from floor or counters.
7. Consistent Mounting Heights: Provide installation of boxes at the same and consistent mounting heights throughout project. Where multiple switch boxes or power and low voltage boxes are installed in close proximity, use “stud-to-stud” or “dual box to stud” mounting brackets to insure all boxes are level.

3.7 CLEANING

A. General:

1. Remove paint splatters and other spots, dirt, and debris.
2. Touch up scratches and marred finishes to match original finishes.
3. Clean front of all coverplates, etc. using methods and materials recommended by manufacturer.

END OF SECTION

SECTION 262000 - LOW VOLTAGE ELECTRICAL DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Panelboards.
2. Contactors
3. Enclosed and automatic circuit breakers.

B. Related Sections:

1. Section “Common Work Results for Electrical” for concrete pads, bollards, labeling, and other general requirements.
2. Section “Grounding & Bonding for Electrical Systems” for grounding and bonding requirements.
3. Section “Low Voltage Power Conductors and Cables” for 600V conductors.

1.3 SUBMITTALS

A. Submittal Requirements of this section:

1. Enclosed and automatic circuit breakers.
2. Panelboards.

B. Product data: Include dimensions, construction, materials, performance data, etc.

C. Provide submittal data for each product type.

1. To verify specifications have been met/exceeded.
2. Independent laboratory test data where requested.
3. Clearly indicate or state all options, etc.:

D. Submit the following for each panelboard:

1. Manufacturer/cat. number.
2. Surface or flush mounting.
3. Main lugs or breaker ratings.
4. Integral surge protection devices (SPD).
5. Special lug configurations (double main lugs, feed through lugs, etc.).
6. Non-linear ratings, oversized neutrals, etc.
7. Specific listing of all installed breakers, spares and spaces, including installed position within panel or switchboard.
8. Interrupting rating of components and assemblies.
9. Bus materials and ratings.
10. Additional information to show compliance with specifications or drawings.

E. Product Test Reports: Certified copies of manufacturer's design and routine factory tests required by the referenced standards.

F. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements, Section “Common Work Results For Electrical”, and as follows:

1. All post-installation inspection checklists.
2. Installer’s pre-startup checklist.
3. Post installation load test results.
4. Preventative maintenance schedule for each unit.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms “Listed and Labeled”: As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.
3. Where equipment consists of multiple components, the entire assembly or product shall be UL Listed and Labeled, or Labeled by a testing organization acceptable to the Authority Having Jurisdiction per the NEC.

B. Single-Source Responsibility:

1. The complete performance of assembled panelboards and/or switchboards, including all integral accessories, shall be the sole responsibility of the equipment supplier. It is the installer’s responsibility to ensure that all factory and field installed accessories and loose components used in the system, meet these specifications, and perform up to the stated and tested standards.

C. Manufacturer/Vendor Requirements:

1. Coordinate the components of the system and their arrangements electrically and mechanically.
2. Manufacturer shall be experienced in manufacturing equipment of the types and capacities indicated that have a record of successful in-service performance for a minimum of 10 years.
3. Maintain, within 50 miles from site, a maintenance and service organization complete with parts inventory and repair facility. Service shall be available on a 24-hour basis.
4. Start up services and post installation tests, as specified.

D. Installation Quality: In accordance with recognized trade organizations and standards.

1. ANSI American National Standards Institute
2. ASME American Society of Mechanical Engineers
3. ASTM American Society for Testing and Materials
4. IEEE Institute of Electrical and Electronics Engineers
5. IEEE C2 “National Electrical Safety Code”
6. NEC National Electrical Code
7. NECA National Electrical Contractor’s Association “Standards of Installation”.
8. NEMA National Equipment Manufacturers Association

9.	NETA	National Electrical Testing Association
10.	NFPA	National Fire Protection Association
11.	UL	Underwriter's Laboratories

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Provide all transportation of equipment to site.
2. Provide for rigging needed for unloading, and setting large panels or switchboards into final position.

B. Storage and Protection:

1. Where unit is to be installed indoors, without enclosure, store in covered building or offsite to prevent exposure to weather, etc.
2. Apply temporary heat according to manufacturer's recommendations within enclosure of each switchgear or switchboard section throughout periods during which equipment is not energized and is not under normal control of temperature and humidity.

1.6 PROJECT CONDITIONS

A. Existing Electrical service to the facility:

1. 277/480 V
2. 3 phase, 4 wire.
3. Grounded wye.

1.7 SEQUENCING

A. General Sequencing:

1. Coordinate panelboard and switchboard installation with exterior and/or interior construction.
2. Provide for sub-grade or subslab roughins.
3. Coordinate construction of concrete pads with switchboard location.
4. Provide positioning and roughins such that required clearances are maintained after final installation.

1.8 WARRANTY

A. Special Warranty: Extended product warranty over and above that required by General Conditions of this contract.**-

1. Surge Protective Devices:
   a. Warranty shall be by the SPD manufacturer.
2. Warranty period of five (5) years from initial start up.
3. Warranty includes all parts, labor, travel expenses, with no deductibles.
4. Installer shall complete and file all necessary documents to assure fulfillment of warranty requirements.
5. Deliver warranty documents to Owner in O & M manuals.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, provide a system by the named "Basis of Design" manufacturer, or a comparable product of one of the other following named manufacturers:

1. Automatic Circuit Breakers:
   a. Square D/Schneider Electric (basis of design)
   b. General Electric
   c. Siemens
   d. Cutler-Hammer
2. Contactors:
   a. Square D/Schneider Electric (basis of design)
   b. General Electric
   c. Siemens
   d. Cutler-Hammer
3. Panelboards:
   a. Square D/Schneider Electric (basis of design)
   b. General Electric
   c. Siemens
   d. Cutler-Hammer

2.2 AUTOMATIC CIRCUIT BREAKERS

A. UL Listed, automatic circuit breakers for installation within panelboards and switchboards, or with enclosed cabinets and trim.

B. Circuit breakers:

1. Molded case, thermal magnetic, inverse time, unless noted otherwise.
2. Adjustable magnetic trip settings for thermal-magnetic breakers $\geq$225 amps.
3. Ratings as per drawings.
4. Accessories, as noted.
   a. Mechanical kirk key interlocking.
   b. Shunt trip.
   c. Undervoltage trip.
5. UL Listed Service Entrance use, where required.
6. Rated for 3ϕ delta systems where applicable.
7. Square D, or approved equal.

C. Ground Fault Interrupter (GFI) branch breakers:

1. Installed in branch circuit panelboards, where indicated.
2. Single or two pole, per panel schedule.
3. Class A protection, 6 mA trip for receptacle circuits.
4. Equipment ground fault protection, 30mA trip for heat trace or other non-receptacle circuits.

D. Enclosure and trim:

1. NEMA 1 enclosure, unless noted otherwise.
2. Deadfront cover.

3. Padlock provisions for locking breaker handle in ON or OFF position.
4. Rust-inhibiting phosphatized primer.
5. Factory finish paint (ANSI 61 gray).

2.3 LIGHTING CONTACTORS

A. UL listed for tungsten, fluorescent and/or HID ballast lighting application, 600 VAC.

1. Electrically operated, electrically held.
2. 120V control power transformer with prim/sec fusing.
3. 120 volt coil, controlled as indicated.
4. Number of poles per drawings.
5. Minimum 30 Amp rating without derating for load.
6. Enclosure: NEMA 1 for dry, indoor areas; NEMA 3R for damp, wet or exterior locations.
7. HOA switch installed on enclosure door.
8. Square D, or comparable product by previously named manufacturers.

2.4 PANELBOARDS

A. UL Listed, factory assembled, circuit breaker panelboards with cabinets and trim, branch breakers.

B. Enclosure and trim:

1. NEMA 1 enclosure unless noted otherwise.
2. Front-hinged door with lock.
   a. All panels keyed alike.
   b. Factory finish paint (ANSI 61 gray) on all surfaces.
   c. Rust-inhibiting phosphatized primer.
   d. Provide minimum (2) keys per lock.
3. Galvanized back box.
4. Recessed or surface mounting as indicated.

C. Ratings:

1. Fully rated interrupting ratings as per schedules.
2. UL Listed for Service Entrance, where applicable.
   a. Provide neutral to ground bonding.
3. Amp ratings as per drawing schedules.

D. Construction:

1. Main lugs or breaker per drawing schedules.
2. Double main lugs for connection of Type 1 SPD on line side of panels.

3. Main breakers with additional line side lugs or termination lugs for connection of line side Type 1 SPD.

4. All phase, neutral and ground bus bars shall be copper .
5. Interior equipment ground bar bonded to enclosure. Fully sized per NEC and UL, with sufficient lugs to accommodate all incoming and outgoing equipment grounding conductors.

6. Panels shall accept plug-on and bolt-on branch breakers.
7. Plug-on branch breakers for ratings ≤60 Amps.
8. Bolt-on branch breakers, unless noted, for ratings > 60 Amps.
   a. Use of connecting links, bars, etc. not permitted.
9. Sequence (A-B-C) bussing.
10. Up to 84 poles in single width panel, as noted on drawings.
11. Provide double width panels, where indicated, to include.
    a. Separate back boxes and front cover for each section.
    b. Poles equally divided between sections.
12. Molded case, thermal magnetic branch and main breakers.

E. Accessories:

1. Typewritten directory on panel door interior.
2. Internal or external SPD protection, for panels indicated on drawing riser diagram.

F. Panelboard types (Square D models, or comparable product by previously named manufacturers):

1. 120/208V branch circuit (≤600A) NQ

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine the conditions under which the equipment shall be delivered, installed, and operated. Make all allowances required for operation, access and maintenance of the equipment, per Codes and manufacturers.

3.2 INSTALLATION

A. General Requirements:

1. Install all equipment, as indicated.
2. Maintain minimum working space at live parts according to manufacturer's written instructions and NEC.
3. Provide all required access space per NEC for controls, fuses and items requiring maintenance access.

B. Rough-in:

1. Roughin all underslab or below grade conduits, ducts, etc. prior to setting panels, switchboards or other equipment in place.
2. Coordinate exact stubups with proposed manufacturer's equipment installation drawings and the work of other trades in this contract.
3. Roughin for all required circuits, controls, connections, etc. as required by proposed equipment, even if not explicitly indicated on plans.
4. Make minor adjustments to locations so as to maintain required front working clearances and clearance above and below per NEC.

C. Panelboard Installation:

1. Comply with all requirements of NFPA 70, "National Electrical Code," Article 110,

"Requirements for Electrical Installations," and Article 408, "Switchboards and Panelboards."

2. Install panels with sufficient support from structure to prevent movement.
3. Arrange for blocking in stud walls, as required.
4. For multiple section panels, provide all nipples, conduit and conductors to continue the full feeder size between sections. For sections not installed side by side, provide extended feeder length, as required in rigid metallic raceway.
5. Install conduits for recessed panels 2" back from front edge of panel.
6. Provide recessed panelboards with 1" empty conduits installed from the panelboard top to accessible ceiling space as below:

TOTAL NUMBER OF SINGLE POLE SPARES AND SPACES	NUMBER OF 1" EMPTY CONDUITS
1 - 5	Two
6 - 10	Four
11 - 20	Five
More than 21	Ten

7. Balance loading on all panelboards as closely as possible and to the satisfaction of the Architect, after all branch circuits are connected and loads energized.
8. Provide typed panelboard directories in each section to properly identify the circuits. Labeling shall include:
   a. Type of circuit: Lights, Outlets, etc.
   b. Room or rooms served, by room name or number.
   c. Special equipment: Fire alarm, copier, etc.

D. Circuit Breaker Installation:

1. Install circuit breakers in panelboards, or with enclosure, as required.
2. GFI and AFI circuit breakers: Provide circuits with dedicated neutral conductors. Connect neutral through breaker at panelboards, per manufacturer's instructions.
3. Provide labels on all protected outlet coverplates to indicate "GFI PROTECTED" or "AFI PROTECTED", as applicable.

3.3 CONSTRUCTION

A. Interface with Other Work:

1. Provide connections between proposed distribution equipment and other work of this contract:
   a. Underground services and feeders.
   b. Fire Pump.
   c. Automatic transfer switches.

B. Grounding: Ground switchboards, panelboards, all metallic service and distribution equipment frames and enclosures per NEC and as specified in Section "Grounding & Bonding For Electrical".

C. Connections: Tighten joints, connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torque requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors," and 486B, "Wire Connectors for Use with Aluminum Conductors."

3.4 FIELD QUALITY CONTROL

A. General:

1. Perform inspections and testing to ensure installation complies with Contract Documents, is operational within industry and manufacturer's tolerances, is adjusted to specific project parameters, and is suitable for energizing.
2. Acceptance Testing: Provide for acceptance testing of electrical equipment specified in this section, as follows, and as required in Section “Common Work Results for Electrical”.
3. Schedule tests and provide notification at least one week in advance of test commencement.
4. Provide a set of Contract Drawings to the testing agency.
5. Provide manufacturer's installation and testing instructions to the testing agency.
6. Provide complete shop drawing data on all equipment.
7. Provide written results of all tests. Include date, equipment ID, name of testing company and technician, and results of each individual test. Provide pass/fail indication for each test.

B. Pre-Testing Inspections:

1. Inspect accessible components for cleanliness, mechanical, and electrical integrity, for presence of damage or deterioration, and to ensure removal of temporary shipping bracing. Do not proceed with tests until deficiencies are corrected.
2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, where not available, those of UL Standards 486A and 486B.
3. All settings, as specified in this section, shall be properly set and verified prior to equipment testing.

C. Acceptance Testing:

1. Panelboard Tests: After installing equipment, perform the following tests, at a minimum:
    a. Perform insulation resistance tests, phase-phase and phase-ground for all buses and main breaker(s).
    b. Perform continuity tests of all grounds, and bonded components.
    c. Perform tests to confirm proper bonding of neutrals to ground, where intended.
    d. Perform tests to confirm isolation of neutrals and grounds, except at intended locations.
    e. Perform tests to confirm isolation of isolated grounds and equipment grounds, except at single intended location.
    f. Perform overpotential tests per ANSI 37.20c.
    g. Operation of auxiliary contacts and devices.
    h. Operation of all gauges, displays and control equipment.

D. Test Failures: Compare test results with specified performance or manufacturer's data. Correct deficiencies identified by tests and retest. Remove and replace malfunctioning components with new, and retest.

E. Test Labeling: Upon satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to the unit.

3.5 IDENTIFICATION

A. Identify all distribution system components and wiring in accordance with Section “Common Work Results For Electrical”.

1. Provide engraved nameplate for each individual switchboard, switchgear, panelboard, fusible switch, enclosed breaker, etc. , which identifies the equipment per project nomenclature.

B. Provide permanent warning signs on all electrical switchgear, switchboards, on electrical room doors, and on fenced yards containing such equipment. Warning signs shall be as specified in section “Common Work Results for Electrical”.

3.6 ADJUSTING

A. General:

1. Set all field adjustable parameters to those as specified.
2. Set field adjustable pickup and time delay ranges of Ground Fault Systems and solid state breakers as indicated.

3.7 CLEANING

A. General:

1. Inspect interior and exterior of installed equipment and switchgear.
2. Remove paint splatters and other spots, dirt, and debris.
3. Touch up scratches and mars of finish to match original finish.
4. Remove protective films, etc. from all devices, controls, etc.
5. Remove debris, insulation and wire clippings, dirt, etc. from interior of all equipment.
6. Remove dirt, debris, etc. from top of all equipment.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. A/C switches.
2. Receptacles.
3. Device plates and covers.

B. Related Sections:

1. Section “Common Work Results for Electrical.”
2. Section “Low Voltage Electrical Power Conductors and Cables” for connecting wiring, cables and conductors.
3. Section “Raceways & Boxes for Electrical Systems” in which devices are to be installed.

1.3 SUBMITTALS

A. Submittal Requirements of this section:

1. A/C switches.
2. Receptacles.
3. Connectors.
4. Device plates and covers.
5. Pin/sleeve connectors.

B. Product data for each device type:

1. Manufacturer's specifications, data sheets.
2. Wiring & connection diagrams, for dimmers, etc.
3. Capacity ratings, NEMA configurations, etc.
4. Information required indicating contract compliance.
5. Device color.
6. UL Listing.

C. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements, and Section “Common Work Results For Electrical”.

1.4 QUALITY CONTROL

A. Product Coordination Responsibility

1. The contractor shall insure that all proposed control and/or dimmer switches are fully

compatible and matched with the proposed light fixtures.

2. Contractor shall confirm compatibility of proposed controls/switches with proposed lighting fixtures prior to submitting for approval or ordering.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:

1. Deliver and store wiring devices and accessories according to manufacturers' instructions.
2. Do not store in unheated areas of high humidity, which might create corrosion or other deterioration.
3. Do not store in areas subject to high temperatures, which might cause deterioration or deformation of products.

1.6 SEQUENCING

A. General Sequencing:

1. Sequence installation of devices and equipment of this section such that damage to installed equipment is minimized.
2. Install device plates after all wall finishes have been completed.

B. Electrical Division Sequencing, Coordination, and Integration:

1. Provide installation of wiring devices after supporting raceways and boxes are permanently installed.
2. Provide coordination of proposed wiring devices with actual cord/plug requirements of attached equipment.
3. Match wiring devices to plug connectors for Owner-furnished equipment.
4. Match wiring devices to plug connectors for equipment furnished under other Divisions.
5. Do not install permanently wired flexible connectors and associated cables/service cords until attached equipment is in place.

PART 2 PRODUCTS

2.1 WIRING DEVICES - GENERAL

A. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices"

B. Color: White except as otherwise indicated or required by Code.

C. Fed Spec grade (WC896) for switches and (WC596) for receptacles, UL Listed. All devices shall be of one manufacturer.

D. Prewired pigtail connectors that accommodate Fed Spec receptacles, GFCIs and switches are approved. Must be crimped and welded terminal right angle application within the connector.

2.2 A/C SWITCHES

A. Toggle Switches:

1. Silent mechanical type rated 20 ampere, 120/277VAC.

2. Fed. Specification #WS896-E.
3. 1-piece Lexan cam and toggle.
4. 20 amp rating.
5. Single pole, 3-way or 4-way, per drawings.
6. Back and side wiring provisions.
7. Arrow-Hart #1991 Series, Leviton #1221 Series, Pass & Seymour PS20AC series, Hubbell CS*120 series, or equal.

2.3 RECEPTACLES

A. Receptacles:

1. Construction, spec-grade.
2. Duplex NEMA 5-20R, 120 volt, 20 amp, 3 wire, U-ground.
3. Federal Specification #WS596-F.
4. Lexan or nylon body, metal yokes.
5. Arrow Hart #5362, Leviton #5362, Pass & Seymour 5362A, Hubbell R20 series, or equal.

B. Ground Fault Interrupting (GFI) Receptacles:

1. Class A, UL943 listed, feed-thru type.
2. Screw terminal connections.
3. GFCI Receptacles shall have SafeLock protection. If critical components are damaged and ground fault protection is lost or if mis-wired, power to receptacle is disconnected.
4. End-of-life provision shall render outlet incapable of delivering power upon failure of GFCI function.
5. Reverse Line Mis-wire: receptacle shall not provide power if the hot and neutral wires are reverse wired.
6. Arrow-Hart #VGF20, Pass & Seymour, or comparable product by Hubbell, Cooper, Leviton.

C. Emergency Receptacles:

1. All Emergency outlets to have RED bodies & cover plates.
2. Arrow Hart #5362-RD, or equal

D. Special Receptacles:

1. NEMA configurations per drawings.
2. Specification grade.
3. Lexan or nylon body, metal yokes.
4. Locking or straight-blade configurations, per plans.
5. Leviton V-0-MAX, Arrow Hart, Hubbell, or equal.

2.4 DEVICE PLATES & COVERS

A. Single and combination types that mate and match with corresponding wiring devices. Provide for every switch and outlet.

B. Interior Plate Finishes:

1. Finished Spaces: Stainless steel, satin-finish, type 302, 0.04” thick.
2. Unfinished Spaces: Galvanized steel.

3. Emergency Outlets: Red lexan or nylon plate with “EMERGENCY” engraved in front.

C. Features include the following:

1. Plate-Securing Screws: Stainless steel, galvanized or colored, to match plate finish.
2. Arrow-Hart, Leviton, Pass & Seymour, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Install all equipment plumb and level.
2. Install devices tight to boxes, etc. such that no movement occurs during normal connecting and disconnecting procedures.
3. Install coverplates tight to surrounding surface. Coverplate shall not provide the only means of support for wiring devices.

B. Rough-in: Unless noted otherwise on drawings, the following mounting heights shall be used:

1. Wall receptacles: 18" AFF to center.
2. Counter top receptacles: 6" above counter to bottom of box.
3. Wall switches: 48" AFF to center.

C. Identification:

1. Permanently identify all general-purpose and dedicated equipment receptacles in all spaces in accordance with the project nomenclature.
   a. At every receptacle, identify source panel and circuit number (i.e. RP1-12) via machine printed label (i.e. Brother P-Touch, or equal) applied at top of cover plate. Printing shall be black, minimum 1/4” high text. Label shall be visible with plug installed, as practicable.

3.2 CLEANING

A. General:

1. Clean all construction debris from within outlet boxes, prior to close up.
2. Remove all paint, joint compound and other marks from devices and coverplates.

END OF SECTION

SECTION 265000 - LIGHTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Lighting fixtures
2. LED Modules & Drivers
3. Occupancy sensors

B. Related Sections:

1. Section “Finishes” for coordination with mounting surfaces and materials.
2. Section “Common Work Results for Electrical” for concrete pads, labeling, and other general requirements.
3. Section “Grounding & Bonding for Electrical Systems” for grounding and bonding requirements.
4. Section “Low Voltage Power Conductors and Cables” for 600V conductors.
5. Section “Raceways and Boxes for Electrical Systems” for conduit and raceway connections.
6. Section “Wiring Devices” for control switches, wallbox dimmers, etc.

1.3 REFERENCES

A. ANSI

1.	ANSI C78.1	American National Standard for Fluorescent Lamps- Rapid-Start Types -Dimensional and Electrical Characteristics.
2.	ANSI C78.377	Specifications for the Chromaticity of Solid State Lighting Products
3.	ANSI C82.4	Ballasts for High Intensity Discharge and Low-Pressure Sodium Lamps
4.	ANSI C82.6	Reference Ballasts for High Intensity Discharge Lamps - Methods of Measurement
5.	ANSI C82.11	High-Frequency Fluorescent Lamp Ballasts

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Performance of the lighting fixtures and controls is based on the specified and/or indicated products. It is the full responsibility of the installer to insure that any differences in products do not deviate from the intended design or performance.

1.5 SUBMITTALS

A. Submittal Requirements of this section:

1. Individual lighting fixtures.

2. Emergency battery inverter ballasts.
3. Occupancy sensors.
4. LED Modules/Drivers
5. Certain fixtures have been selected based not only on performance, but on appearance, finish, shape, etc. Any substitutions shall be equal in performance and construction, as well as in appearance, as judged by the Owner or Architect. Where no equals are available, as determined by the Architect, submit the specified fixture.

B. Descriptive Data:

1. Manufacturer's specifications, data sheets.
2. Catalog cuts.
3. Dimensional drawings.
4. Installation Instructions.
5. Wiring & connection diagrams.
6. Capacity ratings, performance curves.
7. Information required to indicate contract compliance.
8. Clearly indicate and/or mark options, etc.:
    a. Manufacturer/cat. number.
    b. Lamp type, number of lamps, etc.
    c. LED lamp input wattage, lumen output and color temperature (K).
    d. Coefficient of Utilization (C.U.) charts.
    e. Isofootcandle curves for exterior fixtures.
    f. Construction data, materials, lens type, reflector material, housing, as applicable.
    g. Warranty data.
    h. Color charts, where applicable.
    i. Fixture samples when requested.

C. Calculations:

1. Computer footcandle calculations, for any area when requested, and for the following areas:
    a. High bay warehouse storage areas.
    b. Gymnasiums
    c. Auditoriums/Cafeterias
    d. Parking Lots
    e. Representative Classroom areas
    f. Media Center/Libraries
    g. Open Office areas
2. Calculations, shall utilize the following parameters:
    a. 0.80 maintenance factor.
    b. 80/50/20 reflectances.
    c. Work plane – 30 inches AFF.
    d. Include racks or other solid obstacles, as shown.
3. Calculations, shall indicate the following information:
    a. Fc printout showing fc levels at 2 ft intervals, throughout illuminated areas (10 ft intervals for exterior calculations).
    b. Average, maximum and minimum fc levels.
    c. Ave/min and Ave/max ratios.
    d. Total quantity of fixtures.
    e. Total input watts for lighting system.

D. Wiring Diagrams:

1. Inverter ballasts, confirming the proposed wiring/control method.
2. Occupancy sensors.
3. Dimmer switches or controls.
4. Low voltage control systems.
5. Low voltage contactor panels.

E. Shop Drawings:

1. Low voltage contactor panels.

F. Samples:

1. Provide fixture samples, when requested.
2. Sample shall be identical to the proposed fixture in color, lamp, physical size, etc.
3. Sample shall have a cord and plug, for connection to 120V, 20A wall receptacle.

G. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements, Section , and as follows:

1. Provide relamping chart of all fixtures used on project and the corresponding lamp information.
2. Include lamp manufacturer, catalog number, color temperature and any special features (i.e. quartz restrike HID).
3. Control system programming, setup and user controls.

1.6 ELECTRONIC AUTOCADD DOCUMENTS

A. Requests for electronic Autocadd documents will be accommodated to the contractors and installers upon receipt of Kibart's Electronic Document Release Form and payment for time and expense for document preparation. Refer to Section "Common Work Results for Electrical" for additional information and costs.

1.7 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
3. Where equipment consists of multiple components, the entire assembly or product shall be UL Listed and Labeled, or Labeled by a testing organization acceptable to the Authority Having Jurisdiction per the NEC.

B. Single-Source Responsibility

1. The complete performance of the assembled fixtures, mounts, poles, etc. including all accessories shall be the sole responsibility of the supplier. It is the installer's responsibility to ensure that all factory and field installed accessories and loose components used in the system, meet these specifications, and perform up to the stated and tested standards.
2. Insure that the complete fixture assembly complies with all individual component

specifications, including ballasts, lamps, etc.

3. Pole mounted fixtures: The manufacturer shall be responsible for the proper fit and performance of the fixture and pole, including attachment hardware, support arms, etc.

C. Manufacturer/Vendor Requirements:

1. Fixture manufacturer(s) shall have a minimum 15 year record of fixture manufacturing and in-service products of similar construction in the North American market.
2. Ballast manufacturers shall have a minimum of 15 years of producing electronic ballasts for the North American market. Manufacturers shall be certified to ISO 9001 Quality System Standards.
3. Furnish lighting fixtures indicated, complete with lamps, ballasts and mounting and/or suspension hardware.
4. Furnish interior lighting fixtures with proper trim kits, framing kits, supports, etc.
5. Furnish exterior fixtures mounted on the building with required backboxes to match mounting surfaces. Also include all pole mounted fixtures with pole standards.
6. Drawing fixture schedule generally indicates required features and/or performance. Manufacturers' catalog numbers are noted for reference and may not include all suffixes and prefixes of required features. Provide fixtures with all the features of the base catalog number provided and all additional options indicated.
7. Verify that proposed controls and other components which are to interface with the fixtures, ballasts, etc. are fully compatible with the fixture, ballast and lamp manufacturers' written instructions.
8. LED source manufacturers shall provide testing in accordance with LM-80. Along with a valid method of projecting LM-80 test results to L50 & L70 lumen maintenance values based on recommended operating conditions.
9. LED fixture manufacturers shall perform their own of junction temperature, drive current and other relevant factors and base the fixtures L50 & L70 values on LM-80 extrapolations provided by the LED source manufacturer.
10. LED fixture manufacturers shall base published photometric data on test results from an independent NI ST – traceable testing lab using photometry in accordance with LM-79.

D. Product Coordination Responsibility

1. The contractor shall insure that all proposed fixtures are fully compatible and matched with the proposed control and/or dimmer switches.

E. Installer Qualifications:

1. Experienced in the installation and connection of all proposed fixture types, control components, and all other specified equipment.

F. Installation Quality: In accordance with recognized trade organizations and standards.

1.	ANSI	American National Standards Institute
2.	ASME	American Society of Mechanical Engineers
3.	ASTM	American Society for Testing and Materials
4.	IEEE	Institute of Electrical and Electronics Engineers
5.	NEC	National Electrical Code
6.	NECA	National Electrical Contractor's Association "Standards of Installation."
7.	NEMA	National Equipment Manufacturers Association
8.	NETA	National Electrical Testing Association
9.	NFPA	National Fire Protection Association

10. UL Underwriter's Laboratories

1.8 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Provide all transportation of unit(s) to site.
2. Provide for rigging needed for unloading poles, crossarm assemblies, and other large equipment, and setting into final position.

B. Storage and Protection:

1. Store all fixtures in original packaging, as recommended by manufacturer.
2. Store all fixtures in covered storage or building, out of the weather, until installation.
3. Protect fixtures from physical damage and deterioration due to excessive heat, moisture, etc.
4. Do not store electronic or sensitive components (i.e. occupancy sensors, control systems, etc.) in areas of high heat or humidity, which might create corrosion or other deterioration.
5. Provide covers for all aluminum blade louvered fixtures to prevent dirt, fingerprints, etc.
6. Store poles in horizontal position, on-grade with proper supports to prevent sagging and scratches.

1.9 PROJECT CONDITIONS

A. Fire Rated Ceilings: Fixtures shall be compatible with ceiling or ceiling assembly fire rating per Architectural drawings. Provide rated fixtures or tenting of light fixtures to maintain rating of ceiling. Refer to Architectural drawings and specifications for locations and rating requirements.

1.10 SEQUENCING

A. General Sequencing:

1. Coordinate layout and installation of fixtures with other installations.
2. Provide input to coordinated construction layout drawings to insure fixtures are installed as designed. Revisions to locations and elevations from those indicated shall be made only after consulting the Engineer/Architect, as required to suit field conditions and as approved by the Owner.
3. Coordinate actual fixture depths and locations with piping, ductwork, cable trays, bulkheads, and other ceiling mounted equipment, etc. prior to rough-in.

1.11 WARRANTY

A. Special Warranty: Extended product warranty over and above that required by the Contract and General Conditions of this contract.

1. Linear fluorescent ballasts: 5 years parts and labor replacement.
2. Emergency LED inverter ballasts: 5 years.
3. LED fixtures (complete assembly): 3 years
4. HID ballasts: 3 years
5. Vandal-resistant fixture housing/lenses: Lifetime.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide the named "Basis of Design" manufacturer and model ("Basis of Design" fixtures are indicated on the drawing fixture schedule), or a comparable product of one of the other following named manufacturers:

1. Interior Lighting Fixtures:
   a. Columbia Lighting
   b. Lithonia Lighting
   c. Cooper Lighting
   d. General Electric Co.
   e. Prescolite
   f. Lightolier
   g. Progress
   h. Kenall Lighting
   i. Daybrite Lighting
   j. Ledalite
   k. Focal Point Lighting
   l. New Star
   m. Finelite, Inc
   n. Hubbell Lighting
   o. Guth Lighting
   p. H.E. Williams
2. Exterior Lighting Fixtures:
   a. Lithonia Lighting
   b. Cooper Industries - Crouse Hinds Lighting
   c. General Electric Co.
   d. Prescolite
   e. Kenall Lighting
   f. New Star
   g. Spaulding
   h. Gardco
   i. FC Lighting
3. Vandal Resistant Lighting Fixtures:
   a. Columbia Lighting
   b. Lithonia Lighting
   c. Cooper Industries
   d. Kenall Lighting
   e. New Star
   f. Luminaire Lighting
4. Lamps:
   a. General Electric
   b. Osram/Sylvania
   c. Philips Lighting Electronics
   d. Venture Lighting
5. LED Modules & Drivers:
   a. Philips Advance
   b. CREE
   c. Samsung
6. Occupancy Sensors
   a. Watt Stopper
   b. Sensor Switch

c. Hubbell
d. Square D
e. Leviton

2.2 GENERAL REQUIREMENTS

A. Listing/Labeling:

1. UL listed and labeled fixtures and wiring.
2. UL Damp or Wet location listed, as indicated or required.
3. UL hazardous area listed for Class, Division, and Group.

B. Mounting Accessories:

1. Fixture schedule generally indicates catalog number for lay-in tile ceilings.
2. Refer to Architectural drawings for ceiling types.
3. Provide fixture surface mounting kits, recessed framing kits, hardware, etc., as required.

2.3 CONSTRUCTION FEATURES

A. Exterior Fixtures:

1. Cast aluminum housing, unless noted.
2. Dark bronze finish, or as selected by Architect.
3. UL Listed for Damp or Wet Location, as required.
4. Weatherproof gasketing.
5. Corrosion resistant hardware and materials.
6. Photocell as indicated.

B. LED Fixtures:

1. LED light Source shall be shielded from direct view (interior fixtures).
2. One piece die cast housing designed specifically for LED lamps/drivers.
3. Thermal control to ensure cool running LED's.
4. All LED fixtures shall have a similar color temperature (degree K) rating to prevent visible lamp color differences.
5. Replaceable LED module and driver.
6. Post-installation adjustment possible from above or below ceiling without use of tools.
7. All LED fixtures, modules and drivers shall be RoHS compliant.

C. LED Exit Light Fixtures:

1. Backlit LED lamp source through stencil face(s) with translucent diffuser panel(s).
2. Listed as a qualifying NEMA Premium Exit Sign Program fixture.
3. Compliant with NEMA's "*EM-1 Standard for Premium Exit Signs*".
4. Tested in accordance with applicable UL and CSA Standards.
5. Products shall bear a special mark to indicate NEMA compliance.
6. Thermal control to ensure cool running LED's.
7. RED LED's and/or panels.

2.4 LED MODULES & DRIVERS

A. Minimum Requirements:

1. U.L. Listed.
2. High Efficiency, solid state driver.
3. Minimum rated life of 50,000 hours at 70%.
4. 3500K color temperature, unless otherwise noted or specified.
5. CRI of 80 (minimum).
6. RoHS compliant.
7. Dimmable and compatible with all 0-10V dimming switches.
8. Philips Xitanium drivers, or approved equal.

B. Construction Features:

1. Driver shall be include all metal-can construction for optimal thermal performance.
2. Driver shall operate from 50/60 Hz input source of 120V through 277V with sustained variations of +/- 10% (voltage) with no damage to the Driver.
3. Output shall be regulated to +/- 5% across published load range.
4. Minimum input Power Factor > 0.90 for for 50-100% of full load.
5. Input current Total Harmonic Distortion (THD) < 20%.
6. Class A sound rating.
7. Minimum operating temperature of -4^{o}F.
8. Driver shall tolerate sustained open circuit and short circuit output conditions without fail and auto-resetting without need for external fuses or trip devices.
9. UL Listed for Damp and Dry locations.
10. Integral common mode and differential mode surge protection of 2.5kV(100kHz 30ohm ring wave).
11. Integral thermal foldback to reduce driver power above rated case temperature to protect the driver if temperatures reach unacceptable levels.
12. Meets NEMA 410 for in-rush current limits.
13. Integral means of limiting surges to the LEDs.
14. Underwriters Laboratories (UL) recognized Class 2 per UL1310.
15. 5-year limited warranty from date of manufacture against defects in material or workmanship, including replacement.
16. Dimmable drivers shall be controlled by a Class 2 low voltage 0-10VDC controller with dimming range controlled between 1 and 8VDC with source current 150µA.

C. Outdoor LED Driver Construction Features:

1. Integral common mode and differential mode surge protection of 3kV(1.2/50µs, 2ohm combination wave).
2. Minimum operating temperature of -40^{o}F.

2.5 LINE VOLTAGE OCCUPANCY SENSORS

A. Sensor requirements:

1. 120V or 277V operation, as applicable.
2. Sensitivity adjustment with LED for calibration.
3. Manual-On control of load(s) per 2015 IECC requirements.
4. 5 year warranty from manufacturer.
5. Adjustable sensitivity and time delay settings.

B. Wall Switch PIR Sensor:

1. Passive infrared.
2. 180° coverage.
3. Coverage: 900 sq. ft. maximum, 300 sq. ft. for desktop activity.
4. Maximum load (incand. or fluor); 800W @ 120V, 1200W @ 277V.
5. 2 level, 36 segment fresnel lens.
6. Adjustable 2-200 fc daylight sensor to maintain illumination (remains off when above set fc level).
7. Button(s) for Manual-On of load(s) in compliance with 2015 IECC.
8. Individual manual buttons for dual-circuit or bi-level controls, where indicated.
9. WattStopper PW-100 (single circuit) or PW-200 (dual circuit) series, Hubbell

C. Ceiling Mounted Ultrasonic Sensor:

1. Ultrasonic, 25kHz +0.005%
2. 360° coverage.
3. Complete with power pack, relays.
4. 500, 1000, or 1500 sq. ft. coverage, as required.
5. Ganging of 1-3 sensors per power pack for large areas.
6. WattStopper W500A/1000A/1500A/2000H series, Hubbell OMNI, or approved equal.

D. Dual Technology Sensor:

1. PIR and Ultrasonic.
2. Universal wall/ceiling mounting bracket.
3. Coverage: DT-200 (2000sf @ 10’ mtg height); DT-300 (1200sf @ 8’ mtg height).
4. Complete with power pack, relays.
5. Internal auxiliary contact for misc. functions.
6. Ganging of 1-3 sensors per power pack for large areas.
7. Adjustable 3-430 fc daylight sensor to maintain illumination (remains off when above set fc level).
8. WattStopper DT-200 (wall) or DT-300 (ceiling) , Hubbell OMNI, or approved equal.

E. Universal voltage power pack
1. UL Listed, plenum rated.
2. 120/277VAC input.
3. 24VDC, 225mA output.
4. Provides 24VDC for operation of compatible occupancy sensors and low voltage manual wall switches.
5. Field adjustable DIP switches for Auto or Manual On operation.
6. WattStopper BZ-150.

F. Low Voltage Switches
1. Momentary contact, for interface with universal power pack(s).
2. Provides signal for manual on-off control.
3. Suitable for 24VDC operation, as required.
4. LED indicator light
5. WattStopper LVSW series (quantity of buttons per subscript on drawings), or similar.

2.6 DIGITAL OCCUPANCY SENSORS AND CONTROLLERS

A. Sensor requirements:

1. Suitable for use on 120V or 277V lighting systems, as applicable.

2. 24VDC operation.
3. Sensitivity adjustment with LED for calibration.
4. Uses Cat 5e cable for interconnection of components.
5. 5 year warranty from manufacturer.
6. Adjustable sensitivity and time delay settings.
7. Manual-On control of load(s) per 2015 IECC requirements.

B. Ceiling Mount Digital Dual Technology Sensor

1. Input voltage: 24VDC from DLM network.
2. DML local network connection: 1 RJ45 port via RJ45 plug and coupler.
3. Infrared (IR) transceiver.
4. Ultrasonic frequency.
5. Plug n' Go automatic configuration.
6. WattStopper LMDC-100.

C. Ceiling Mount Digital Ultrasonic Sensor

1. Input voltage: 24VDC from DLM network.
2. DML local network connection: 2 RJ45 ports.
3. Infrared (IR) transceiver.
4. Ultrasonic frequency.
5. Plug n' Go automatic configuration.
6. WattStopper LMUC-100.

D. Ceiling Mount Digital PIR Sensor

1. Input voltage: 24VDC from DLM network.
2. DML local network connection: 2 RJ45 ports.
3. Infrared (IR) transceiver.
4. Ultrasonic frequency.
5. Plug n' Go automatic configuration.
6. WattStopper LMPC-10.

E. Wall Mount Digital Dual Tech Sensor

1. Input voltage: 24VDC from DLM network.
2. DML local network connection: 2 RJ45 ports.
3. LCD display and pushbuttons for setting sensor and system parameters.
4. Infrared (IR) transceiver.
5. Ultrasonic frequency.
6. Plug n' Go automatic configuration.
7. WattStopper LMDX-100.

F. Universal Dimming Room Controller(for fixtures to be dimmed that do not have 0-10v dimming capability)(for use with dimmable screw-in lamps)

1. Maximum 20A combined load per Room Controller; each output rated for 20A: tungsten, MLV, ELV or LED (forward phase compatible transformers or drivers)
2. Operates on 120//277 VAC 50/60Hz
3. Class 2 outputs to DLM local network: 24VDC, 150mA across 4 RJ45 ports
4. Plug n' Go automatic configuration.
5. On/Off/Dim button for each load.
6. WattStopper LMRC-220 series

G. Dimming Room Controller (for fixtures to be dimmed that have 0-10v dimming capability)

1. Maximum 20A combined load per Room Controller; each output rated for 20A
2. Operates on 120/230//277 VAC 50/60Hz
3. Class 2 dimming control signal : 0-10VDC, sinking or sourcing (automatiuc adjustment based on load)
4. Class 2 outputs to DLM local network: 24VDC, 250mA across 4 RJ45 ports
5. Plug n' Go automatic configuration.
6. On/Off/Dim button for each load.
7. WattStopper LMRC-210 series

H. Dimming Photosensor (for fixtures to be dimmed that have 0-10v dimming capability)

1. Single zone
2. Ceiling mounted
3. DLM local network connection☹1) RJ45 port via RJ45 plug and coupler (included)
4. Full range dimming: .2VDC(min) to 10 VDC(100% lighting) output voltage
5. Setpoints from 20 -60 footcandles
6. WattStopper LMLS-305

I. Room Controller

1. 1 relay or 2 relay.
2. 0-10 volt output per relay.
3. Operates on 120/230/277 VAC 50/60Hz 20 amp feed.
4. Plug n' Go automatic configuration.
5. On/Off/Dim button for each load.
6. WattStopper LMRC-101(for single relay room controller) or LMRC-102 (for dual relay room controller).

J. Capacity Dimmer and Power Booster (for use with light fixtures with reverse phase dimming)

1. 120VAC
2. Handles up to 8 amps of incandescent or electronic loads
3. UL Listed
4. Status indicator
5. Vantage STPERW101

K. Digital Wireless Configuration Tool(for digital occupancy sensor configuration)

1. Easy to read LED screen
2. Adjustable occupancy sensor parameters include sensitivity, time delay, trigger and re-trigger modes.
3. Remotely reconfigures DLM daylighting controller settings (day and night set point, raise and lower levels)
4. WattStopper LMCT-100

2.7 DIGITAL SWITCHES

A. Digital Dimmer Wall Switches (for single zone location)

a. 24VDC from DLM local network
b. DLM local network connection: (2) RJ45 ports
c. Infrared transceiver
d. Hidden configuration button to access “Push ‘n’ Learn”
e. 7 LED dimming level indicator
f. Control Button with LED indicator
g. 5 year warranty
h. White finish
i. Wattstopper LMDM 101W

B. Digital Dimmer Wall Switches (for multi-zone(scene) location)

a. 24VDC from DLM local network
b. DLM local network connection: (2) RJ45 ports
c. Infrared transceiver
d. Hidden configuration button to access “Push ‘n’ Learn”
e. Control button with 4 scene/zone buttons
f. ON/Off-Raise/Lower Master Paddle
g. Control Button with LED indicator
h. 5 year warranty
i. White finish
j. Wattstopper LMSW-105W

C. Custom Switch Button Engraving

2.8 LOW VOLTAGE CONTROL CABLING

A. Cables for low voltage dimming or control systems shall be as recommended by the control system manufacturer.

B. All low voltage cabling installed on this project shall be UL Listed, plenum rated cable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine the conditions under which the equipment shall be delivered, installed, and operated. Make all allowances required for operation, access and maintenance of the equipment, per Codes and manufacturers.

3.2 INSTALLATION

A. Fixture Installation - General:

1. Support all fixtures independent of ceiling systems, ducts and piping.
2. Provide hangers from purlins, joists, beams, etc., for support of all boxes and fixtures.
3. Provide trapeze hanger supports for fixtures under ducts, large pipes, etc.
4. Galvanized steel for all hangers, channels, bolts, etc.
5. No fixtures shall be supported solely by grid or gypsum board ceilings.

6. Maintain required clearances around fixtures according to manufacturer's written instructions.

B. Recessed Fixture Frames:

1. Support recessed fixtures with galvanized tie wires, at two opposite corners of fixture.
2. Provide framing for all recessed fixtures.
3. Plaster frames for plaster or GWB ceilings.
4. Provide sloped ceiling adapters, where applicable.
5. Make electrical connections using flexible conduit, concealed above finished ceilings.

C. Surface Mounted Fixture:

1. Install fixtures tight to ceiling or wall surface with no visible gaps.
2. Support fixture using rigid rods, channels, etc. Do not support from ceiling grid system or with wires.
3. Tighten attaching hardware evenly and per manufacturer's instructions to prevent warping or distortion of fixtures.
4. Provide recessed backbox to allow fixture mounting tight to surface.
5. Make electrical connections through rear of fixture, concealed as practicable.

D. Suspended Fixture:

1. Provide hangers, rods, suspension cables, etc. for suspended fixtures, per drawings.
2. Install fixtures level and will all support rods or cables plumb.
3. Securely attach fixture to rigid supports, where applicable, to prevent wobble.
4. For continuous row fixtures, install rows straight and level. Provide supports at intervals, per manufacturer.
5. Make electrical connections from above, through top of fixture(s). Minimize visible cable or hollow rod wiring drops by using through-wiring of continuous row fixtures, as permitted by manufacturer.

E. Electrical, Mechanical and Utility Room Fixture Installation:

1. Drawings provide the general layout of fixtures, quantities, circuiting, etc.
2. Provide adjustments to fixture locations, elevations and supports, as required to coordinate fixtures with installed mechanical and electrical system equipment and maintain an even lighting distribution.
3. Do not install fixtures fully or partially above pipes, conduits, flues, hangers, or other equipment.
4. Install fixtures over walkways and where light will illuminate equipment fronts, controls, etc. Do not locate directly above boilers, chillers, switchboards, etc.
5. Fixtures shall be installed where accessible for future lamp and ballast maintenance, without need for special scaffolding, other than step ladders.

F. General Coordination:

1. Even, symmetrical spacing of fixtures.
2. Coordinate with diffusers, grilles and access panels in ceilings to establish a symmetrical pattern.
3. Drawings are general in nature and show approximate mounting locations of exterior lights. Coordinate during construction to center fixtures where applicable and coordinate with other wall mounted materials (downspouts, etc.).

G. Occupancy Sensor Installation:

1. Install in ceiling or wall, per actual manufacturer's instructions. Drawings are not to be used for exact placement.
2. Infrared only sensors:
   a. Maintain maximum distance from heating registers, convectors, unit heaters, and other moving hot air sources.
   b. Do not aim sensing elements at open doors or windows.
3. Ultrasonic only sensors:
   a. Do not aim sensing elements at open doors or windows.

3.3 CONSTRUCTION

A. Grounding: Ground fixtures, housings, poles, and supporting equipment frames and enclosures per NEC and as specified in Section "Grounding & Bonding For Electrical Systems."

B. Connections: Tighten joints, connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torque requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors".

3.4 ADJUSTING

A. General:

1. Adjust aiming of all fixtures with adjustable optics or housings.
2. Rotate downlight trims for proper orientation of louver blades or wall wash reflectors.

B. Occupancy Sensor Adjustments:

1. Provide masking or blocking of PIR sensors, as required to limit sensitivity to within the intended room/area only.
2. Provide field adjustments to sensitivity and range, appropriate to the activity planned in the area, coverage area, etc.
3. Provide shielding to limit sensitivity to nearby illumination sources, as required.
4. Re-adjust any sensors for improved operation per Owner direction.
5. Adjust footcandle level settings for sensors with daylight sensing.
6. Set "Time Delay Off" adjustments, as follows:
   a. Toilet Rooms: 15 minutes
   b. Individual Offices: 15 minutes
   c. Conference Rooms: 15 minutes
   d. Break/Lunch Rooms: 15 minutes
   e. Utility or Storage Rms: 15 minutes
   f. Public Corridors: 30 minutes
   g. Other areas not listed: 30 minutes

C. Photocell Sensor Adjustments:

1. Where possible, set photocell "direction" toward North sky.
2. Provide field adjustments to lighting sensitivity, appropriate to the activity planned in the area.

3. Provide shielding to limit sensitivity to any nearby illumination sources, as required.
4. Re-adjust any sensors for improved operation per Owner direction.

3.5 CLEANING

A. General: Clean all fixtures after work of all trades is complete, and prior to turnover to Owner.

1. Remove paint splatters and other spots, dirt, and debris.
2. Touch up scratches and mars of finish to match original finish.
3. Remove protective films, etc. from all devices, controls, etc.
4. Remove all wire clippings, etc. from interior of fixtures.
5. Adjust louvers, shielding, etc. for proper and consistent orientation.
6. Thoroughly wipe clean all surfaces with degreaser/cleaner, suitable for material.
7. Leave no visible dirt or fingerprints on lenses, louvers, housings, reflectors, lamps, etc.

3.6 DEMONSTRATION

A. Owner Demonstrations: Provide a factory trained representative for each system and type of equipment, for the purpose of training owner's personnel:

1. Discuss proper operation, maintenance, and use of all equipment.
2. Demonstrate periodic Owner testing and/or inspection of equipment.
3. Demonstrate adjustment to Owner-accessible equipment and systems.
4. Instructors shall be fully knowledgeable of the installed equipment and all components.
5. Training shall be completed at the project site following Owner occupancy, at Owner’s discretion.
6. Schedule after all final tests, adjustments and Owner's acceptance.
7. Training shall include use of delivered O&M manuals for each system or equipment.

B. Occupancy Sensor Demonstration:

1. Provide working demonstration for each type of sensor installed.
2. Explain function, delay settings, adjustments, etc.

3.7 COMMISSIONING FOR 2012 & 2015 IECC

A. This project includes Commissioning (Cx) of lighting and automatic controls, as required by 2012 & 2015 IECC, Section 408. Contractor shall provide for all commissioning requirements per C408.3, including functional performance testing, adjustments, and documentation.

B. The Commissioning Agent (CxA) shall perform functional performance testing (FPT) in accordance with C408.3.1. At the conclusion of the FPT’s, and within 90 days from date of Certificate of Occupancy Submit the following to the owner, architect and code officials, as applicable:

1. FPT procedures used during the Cx process.
2. Results of the functional performance testing.
3. Issues Log identifying deficiencies found during the FPT’s and corrective actions.
4. Report of all devices/equipment tested, adjustable setpoints (as left), tested performance, etc.

END OF SECTION

Division 28

Electronic Safety And Security

SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division01. Specification Sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Fire Alarm control panel(s)
2. Audio/visual alarm notification appliances.
3. Voice evacuation system.
4. Auxiliary NAC power supplies.
5. Automatic detection devices.
6. Manual alarm initiating devices.
7. Remote annunciation.
8. Addressable relays, control and monitoring devices.
9. Magnetic door holders.
10. All system cabling and raceways.
11. System programming.
12. System testing.

A. Related Sections: The following sections contain requirements that relate to this Section:
1. Section “Common Work Results for Electrical” for general requirements, submittal requirements, coordination, project conditions, labeling, fire stopping, commissioning, equipment supports, installation and construction requirements, demolition, quality control, identification, and all other applicable paragraphs.
2. Section “Grounding & Bonding for Electrical Systems” for grounding, requirements of equipment.
3. Section “Low Voltage Electrical Power Conductors and Cables” for cabling requirements.
4. Section “Raceways & Boxes for Electrical Systems” for conduit, raceway and box requirements.

B. Permits and Fees:

1. Apply, pay for and secure all permits, required by the Authorities Having Jurisdiction and necessary for specified work of this section, prior to start of work, in accordance with contract General Conditions and Division 01.
2. Deliver all certificates to the Owner prior to final acceptance of work.

1.3 SYSTEM DESCRIPTION

A. General System Description:

1. This section includes furnishing, assembly, construction, installation, connection and testing of a complete 24 Volt, analog addressable, microprocessor based fire alarm system.

2. This Section includes fire alarm systems, including manual stations, detectors, signal equipment, controls, wiring, raceways, and devices.

B. System Design Requirements: Installer shall meet the entire intent of these specifications and associated drawings. Deviations from specified equipment and/or operation of the system shall be at Installer's risk, unless written notification is made with the Shop Drawing submittal and such items are approved in writing.

C. Alarm Initiation:

1. Following devices shall cause a general alarm condition:
   a. Manual pull stations.
   b. Sprinkler flow or pressure switches.
   c. CO detectors
   d. Dry-pipe or pre-action sprinkler system activation.
   e. Heat or area smoke detectors.
   f. Linear beam smoke detectors>
   g. Sub-Alarm systems.
   h. Automatic suppression system activation (FM200, etc).
   i. Kitchen grease hood fire suppression system activation.

D. Alarm Verification:

1. Control panel shall contain an alarm verification cycle to verify individual alarm signals and eliminate false alarms caused by transient conditions such as cigarette smoke, dust, etc.
2. Dry contact initiating devices, manual pull station, heat detector, water flow switch, etc. shall bypass verification cycle and immediately register an alarm.

E. Smoke Detector Sensitivity Adjust:

1. A means shall be provided for adjusting the sensitivity of any, or all, addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

F. Point Disable:

1. Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

G. System History Recording and Reporting:

1. The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

H. Automatic Detector Maintenance Alert:

1. The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

I. Pre-Alarm Function:

1. The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field-adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

J. Software Zones:

1. The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.

K. Alarm Functions:

1. During a general alarm condition:
   a. Flashing (strobe) visual alarm signals, synchronized, throughout building. Strobes shall continue to flash until the system has been reset. Strobes shall not stop operating when the "Alarm Silence" is pressed.
   b. Audible Voice Evacuation message signals.
   c. Activate control relay to override (mute) all local sound and/or PA systems.
   d. Activate control relay to unlock all access control or door entry lock systems.
   e. Red "ALARM" LED lit on control panel and remote annunciator panels.
   f. Specific LCD alpha-numeric alarm message display on panels.
   g. Digital communicator contacts Central Monitoring Station and transmits point identification.
2. Initiate the following additional action through specified fire alarm device activation
   a. Elevator capture and recall (primary floor, alternate floor and fireman’s hat) from devices.
      1) Lobby smoke detectors.
      2) Machine room smoke & heat detectors.
      3) Elevator controller location smoke & heat detectors (for machine-room-less systems).
      4) Shaft smoke & heat detector.
      5) Smoke and heat detectors shall also cause general alarm.
   b. Shunt trip elevator breaker(s) via control relays from heat detector alarm signals:
      1) Machine room heat detectors.
      2) Elevator controller location heat detectors (for machine-room-less systems).
      3) Shaft top heat detector.
      4) Elevator pit heat detector.
      5) Smoke and heat detectors shall also cause general alarm.

c. Shut down air handling equipment via addressable control relay at each associated AHU, RTU, etc. from duct smoke detector alarm or HVAC shutdown signal.
   1) Duct smoke detectors shall also cause Supervisory signal.
   2) Internal audible device shall sound at the control panel or command center.
   3) Illuminate alarm status LED's at remote test station, and remote graphic/LED annunciators.

d. Close smoke dampers via control relay initiated by associated duct smoke detectors.
   1) Duct smoke detectors shall also cause Supervisory signal.
   2) Internal audible device shall sound at the control panel or command center.
   3) Illuminate alarm status LED's at remote test station, and remote graphic/LED annunciators.

e. Release magnetically held doors via control relay, initiated by local smoke detector(s) at door.
   1) Smoke detectors shall also cause general alarm.

L. Alarm Silence:

1. Silence alarms using keyed ALARM SILENCE switch.
   a. Silences horns and turns off
   b. Visual alarms shall continue to flash until system is reset.
   c. Displays ALARM SILENCE LED and LCD message on control panel.
   d. Displays ALARM SILENCE LED and LCD message on graphic annunciator(s).

M. Alarm Resound:

1. Following Alarm Silence, any subsequent alarm shall immediately resound all audio and visual alarm devices. Silencing shall in no way, prohibit the resounding of additional alarms.

N. System Reset:

1. Reset system using keyed SYSTEM RESET switch(es) on fire alarm control panel and remote annunciator panels.

O. Manual Functions:

1. HVAC Manual Shutdown switches per NFPA 90A Standard for the Installation of Air Conditioning and Ventilation Systems.
   a. Shutdown switch(es) at the FACP or annunciator panel shall cause all HVAC units to shut down.
   b. Operation of HVAC switch(es) shall register a Supervisory signal with the FACP.
   c. Switch activation shall cause Supervisory LED for "HVAC SHUTDOWN SWITCH ACTIVATED".

P. Alarm Simulation:

1. Simulates activation of alarm initiating device.
2. Disconnect switch prevents alarm signals to city or municipal monitoring circuit.

Disconnect switch use shall transmit a supervisory signal, however.

Q. Elevator Shunt Trip Monitoring:

1. Shall cause the following at Fire Alarm Control and Remote Annunciator Panel(s):
   a. Provide for monitoring of elevator shunt trip control circuit voltage per NFPA 72 3.9.4.4.
   b. Provide relay connected to shunt trip control voltage just prior to shunt trip test button and fire alarm control relay which initiates shunt trip.
   c. Monitor relay contacts via an addressable control relay.
   d. Relay activation shall cause Supervisory LED for "ELEVATOR SHUNT TRIP – LOSS OF CONTROL POWER" upon loss of control voltage.
   e. Supervisory LED's shall light during this condition.
   f. Display appropriate LCD messages.
   g. Digital communicator contacts Central Monitoring Station and transmits Supervisory signal and point identification.

R. Generator Monitoring:

1. Shall cause the following at Fire Alarm Control and Remote Annunciator Panel(s):
   a. Supervisory LED for "GENERATOR RUNNING" shall light whenever the generator starts.
   b. Supervisory LED for "GENERATOR TROUBLE" shall light during any generator alarm or trouble conditions.
   c. Display appropriate LCD messages.
2. Generator monitoring points shall <u>not</u> transmit signals via digital communicator.

S. Sprinkler System Components:

1. Device shall perform as follows:
2. General ALARM condition:
   a. Water Flow switches.
   b. Sprinkler pressure switches.
   c. Pre-Action system control panel alarms.
3. TROUBLE signal condition:
   a. Dry pipe air compressor power loss and/or pressure loss.
   b. Pre-Action system control panel Trouble condition.
4. SUPERVISORY signal condition:
   a. Valve Tamper switches.
5. Light appropriate LED at annunciators.
6. Display appropriate LCD message at annunciators.
7. Digital communicator contacts Central Monitoring Station and transmits appropriate signal and point identification.

T. Kitchen Grease Hood Extinguishing System Connections:

1. Each hood system activation shall:
   a. Cause general ALARM condition in building.
   b. Display LCD message "KITCHEN HOOD EXTINGUISHING SYSTEM."
   c. Shut off cooking appliance gas supply via electric solenoid valve(s).
   d. Shut off cooking appliance power via shunt trip breaker(s).
   e. Digital communicator contacts Central Monitoring Station and transmits Alarm signal and point identification.

U. Supervisory Signals:

1. Supervisory signals shall:
   a. Light common Supervisory LED at all annunciators.
   b. Light specific zone LED at all annunciators.
2. Display appropriate LCD message at annunciators.
   a. Sound audible warning tone at all annunciators.

V. Trouble Signals:

1. Trouble signals shall:
   a. Light Supervisory LED(s) at all annunciators.
   b. Display specific LCD message at all annunciators.
   c. Sound audible warning tone at all annunciators.
2. The following shall cause a trouble signal:
   a. Loss of AC power.
   b. Wiring open circuit, short or ground fault.
   c. Standby battery or charger failure.
   d. Open or grounded circuit.
   e. Disconnection of control panel module, card, cable.
   f. Each alarm and trouble LED failure.
   g. Remote annunciator open or grounded circuit.
   h. Other functions specified herein.

W. System Wiring and Supervision:

1. Initiating Device Circuits: Initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be:
   a. Class A (Style "D" or "E")
2. Signal Line Circuits (SLC):
   a. For SLC's covering more than one fire/smoke compartment, a wire-to-wire short shall not affect the operation of the circuit from the other fire/smoke compartments.
   b. The signaling line circuit connecting network panel/nodes, remote annunciators, command centers, shall be
      Class A (style 7).
      The media shall be copper except where fiber optic cable is specified on the drawings.``
   c. SLC's connecting to addressable/analog devices including, detectors, monitor modules, control modules, isolation modules and notification circuit modules shall be
      Class A (style 6 or 7).
   d. SLC connecting to the audio communications (pre-amp signal), amplifiers, and nodes shall be
      Class A (style 6).
      The circuit shall be power limited.
   e. SLC connecting to the two-way communications circuit (riser) shall be
      Class A (style 6).

3. Notification Appliance Circuits: All notification appliance circuits shall be
   Class A (Style "Z")

4. Voice Evac audio circuits shall have minimum rating of: 50 watts @ 25V audio, and 35 watts @ 70V audio

5. The notification circuits shall be power limited. Non-power limited circuits are not acceptable.

6. Each alarm and trouble LED on main and remote annunciators shall be supervised.

X. Walk Test Feature:

1. Control panel switch shall allow a one man functional test of each alarm and supervisory device on the system. Walk-Test shall:
   a. Disable city or municipal connection.
   b. Disable digital communicator after sending Supervisory signal.
   c. Bypass functional control relays (i.e. elevator capture, air handler shut down).
   d. Control panel and remote annunciators shall illuminate the Supervisory LED and display appropriate LCD message.
   e. Activation of any alarm initiating device shall:
   f. Cause audible and visual alarm devices to pulse one round of code.
   g. Control panel shall automatically reset without use of the keyed reset switch.
   h. Auto reset time shall be adjustable to allow automatic reset of detectors and manual reset of N.O. contact devices. Momentary opening of an initiating or notification appliance circuit shall cause the alarm signals to sound for 4 seconds to indicate the trouble condition.

1.4 SUBMITTALS

A. General: Submit each item in this Section according to the conditions of the contract and Division 01 Specification Sections.

B. Submittals shall also comply with the submittal procedures and requirements of electrical Specification Sections.

C. Submittal Requirements of this section:

1. Fire Alarm control panel(s)
2. Audio/visual alarm notification appliances.
3. Voice evacuation system.
4. Auxiliary NAC power supplies.
5. Digital communicator.
6. Automatic detection devices.
7. Manual alarm initiating devices.
8. Remote annunciator panel.
9. Graphic panel.
10. Addressable relays, control and monitoring devices.
11. Magnetic door holders.
12. System cabling.
13. List of all system program points with device ID.

D. Descriptive Data for Each Product:

1. To verify specifications have been met/exceeded.
2. Clearly indicate or state all options, etc.:
   a. Manufacturer/cat. number.
   b. Manufacturer's options.
   c. Accessories.
   d. Indicate point of connections with other equipment or systems.
   e. Bill of materials showing quantities and model numbers.
   f. Manufacturer's data on all proposed equipment.
   g. Highlight or clearly indicate all items to be provided.
   h. Catalogued by the control system manufacturer.
   i. UL Listing of each component individually.
   j. UL Listed for use in proposed system.
   k. Approved by local Fire Dept., Fire Marshal, or other local authority, where required.
   l. Combined components of several manufacturers are not permitted unless proof of UL approval with the proposed control panel is provided.

E. System Information:

1. Device schedule matrix indicating all devices and conditions down left side, and all functions across top. Fill in matrix to indicate functions, responses, etc. associated with each device or condition.
2. Written sequence of operation for all modes:
   a. Alarm conditions.
   b. Trouble conditions.
   c. Supervisory signal conditions.
   d. Manual switch functions (i.e. HVAC shutdown).
   e. Other functions (Drill, Reset, etc.).
   f. Digital Communicator functions.

F. Shop Drawings:

1. Graphic Annunciator Panels:
   a. Submit full scale drawing of proposed graphic.
   b. Submittal to accurately represent the proposed final graphic with color lines, line thicknesses, text font and size, etc.
   c. Indicate all accessories to scale in proper position; keyed switches, LCD panels, LED's, buttons, etc.

G. Floor Plans:

1. Scaled Floor Plans of each building level shall be furnished, to indicate:
   a. Scaled floor plans of all building areas.
   b. Location and type of all proposed devices.
   c. Proposed address location or identifying number for each device.
   d. Plans shall include fire alarm supplier's company name, phone number, etc.

H. Calculations:

1. Battery calculations for each control panel and power supply.
2. Voltage drop calculations for each Notification Appliance Circuit.
3. Voice Evacuation audio amplifier sizing calculations.
4. Battery calculations for voice evacuation audio system.

I. Wiring Diagrams:

1. Wiring connection diagrams for each proposed component.
2. Schematic wiring diagram for entire system, showing all connected devices, cable types, cable sizes, etc.
3. Indicate all points of connection between proposed fire alarm system and other devices: sprinkler switches, door holders, extinguishing system control panels, etc.

J. Submittal Deviations from Contract Documents:

1. Submittals shall explicitly identify any deviations from the drawings, specifications or design intent, including, but not limited to:
   a. Different products used.
   b. Products used in different locations from where shown or specified.
   c. Changes to intended application, location, etc.
   d. Changes to ratings, detector type or sizes, etc.
   e. Differences in physical size which will create installation, clearance or access problems or Code violations.
2. Contractor shall clearly and specifically identify each such deviation, substitution or change to the contract documents to Architect's attention via note, clarification, etc. It is NOT considered to be explicitly identified simply by showing a device on the plans or including a product page in the submittal.

K. Quality Assurance:

1. Product Test Reports: Certified copies of manufacturer's design and routine factory tests required by the referenced standards.

L. Approval of Authority Having Jurisdiction:

1. Submit copies of Shop Drawings to Authority having Jurisdiction. Submit for review and approval, as required for permit.
   a. Proposed system and all components.
   b. Remote Annunciator Panel with graphic, as applicable.
2. Provide to the Architect a copy of the transmittal and application submitted to AHJ for record.
3. Provide to the Architect a copy of the AHJ's review comments and/or approval for record.
4. Comply with all AHJ comments. Make all necessary corrections, and resubmit to AHJ, as required, with copy to the Architect.
5. Provide copy of all written comments and directions to Owner and Architect.

M. Closeout Submittals: Submit in accordance with the General Conditions and Division 01 requirements, and Section "Common Work Results for Electrical", and as follows:

1. Operational Information: Provide full instruction manual to cover all aspects and components of the installed system and to be used to supplement the Owner Demonstration:
   a. System reset.
   b. Alarm acknowledge/silence.
   c. Component reset.
   d. Programming.
   e. History log and information retrieval.

2. Maintenance Data: Provide for all equipment and accessories to include in the "Operating and Maintenance Manual" specified in Division 01.
   a. Include recommended periodic tests of equipment in service, and test parameters. Provide manufacturer's recommended test procedures, frequency and type of tests.
   b. Specify cleaning procedures for all components.
3. As-Built Drawings: Provide three (3) full-size copies of all plans, drawings and schematics to the owner after the acceptance test. The drawings shall be revised to show all terminal designations, location of all junction boxes, terminal cabinets, devices, wiring and conduit routings. Drawings, etc. shall be delivered as part of the O&M Manual package.
4. Record of Completion form, as required by NFPA 72 National Fire Alarm Code.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
3. Where equipment consists of multiple components, the entire assembly or product shall be UL Listed and Labeled, or Labeled by a testing organization acceptable to the Authority Having Jurisdiction per the NEC.

B. The contractor shall have in-house engineering and project management capability consistent with the requirements of this project. Qualified and approved representatives of the system manufacturer shall perform the detailed engineering design of central and remote control equipment. Qualified and approved representatives of the system manufacturer shall produce all panel and equipment drawings and submittals, operating manuals. The contractor is responsible for retaining qualified and approved representative(s) of those system manufacturers specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

C. Single-Source Responsibility:

1. The complete performance of the assembled system, including all accessories shall be the sole responsibility of the supplier. It is the installer's responsibility to ensure that all factory and field installed accessories and loose components used in the system, meet these specifications, and perform up to the stated and tested standards.

D. Manufacturer's Requirements: Proposed equipment manufacturer must meet the following:

1. All products designed and manufactured to ISO 9001 standards.
2. Engaged in manufacturing of fire alarm systems at least 5 years.
3. System shall be of latest design. No obsolete or pending obsolete parts shall be used.
4. Maintain current stock of all spare parts at local service organization.
5. Provide local maintenance and service with location less than 50 miles from project site.
6. Provide list of technical support staff, project experience, training, etc. as requested. Staff must be factory trained or have received on-site training from manufacturer.
7. Provide technical support to installer.
8. Make all final connections, adjustments, and supervision for system testing.
9. Provide all system programming.

10. Provide references upon request:
    a. Names of (6) similar projects in size and scope.
    b. Contact person and phone number for each project.
11. System design shall be by Certified NICET Level III technician or registered Fire Protection Engineer.

E. Field Certifications and Labeling:

1. UL UOJZ Certification of system.
    a. Provide the services and equipment of a UL Listed alarm service company, capable of and authorized to issue a UL Certificate for the equipment described herein, and all connected wiring and devices that form the entire system. The alarm service company shall issue the UL Certificate stating that the system and its installation are in compliance with the established requirements of UL.
    b. Costs associated with this certification, including the first year maintenance contract, shall be included in the base bid.

F. Installer Qualifications: Engage an experienced factory-authorized Installer to perform work of this Section.

1. Installing contractor must meet the following:
    a. Factory trained to install the proposed system.
    b. Has installed a minimum of 6 comparable systems within local area.
2. Provide references upon request:
    a. Names of (6) similar projects in size and scope.
    b. Contact person and phone number for each project.

G. Installation Quality: In accordance with listed Codes, recognized trade organizations and standards.

1. ADA Americans with Disabilities Act
2. ANSI American National Standards Institute
3. ASME American Society of Mechanical Engineers
4. FM Factory Mutual Approval Guide
5. NFPA National Fire Protection Association
6. UL Underwriter's Laboratories

H. Comply with the latest version of following codes and regulations as adopted by the Authority Having Jurisdiction, unless otherwise specified.

1. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
2. International Code Council (ICC):
    a. IFC International Fire Code
    b. IBC International Building Code
    c. IRC International Residential Code
3.
4. National Fire Protection Association (NFPA):
    a. NFPA 70 National Electrical Code
    b. NFPA 72 National Fire Alarm Code
    c. NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems
    d. NFPA 92A Smoke Control Systems
    e. NFPA 92B Smoke Management Systems in Malls, Atria, and Large Areas

f. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures
g. NFPA 2001 Clean Agent Extinguishing Systems

5. Underwriters Laboratories (UL):
   a. Fire Protection Equipment Directory
   b. Electrical Construction Materials Directory
   c. UL 268 Smoke Detectors for Fire Protective Signaling Systems.
   d. UL 268A Smoke Detectors for Duct Applications.
   e. UL 521 Heat Detectors for Fire Protective Signaling Systems.
   f. UL 228 Door Closers-Holders, With or Without Integral Smoke Detectors.
   g. UL 464 Audible Signaling Appliances.
   h. UL 38 Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
   i. UL 346 Waterflow Indicators for Fire Protective Signaling Systems.
   j. UL 864 Control Units and Accessories for Fire Alarm Systems
   k. UL 1971 Signaling Devices for the Hearing-Impaired.
   l. UL 1481 Power Supplies for Fire Protective Signaling Systems.
   m. UL 1711 Amplifiers for Fire Protective Signaling Systems
   n. UL 1635 Digital Alarm Communicator System Units
   o. UL 2572 Control & Communication Units for Mass Notification Systems
6. State of Maryland Fire Prevention Code.
7. American Insurance Association Fire Protection Code (Article 14)
8. Americans with Disabilities Act Accessibility Guidelines (ADAAG)
9. ANSI/ASME 17.1 Safety Code for Elevators & Escalators.

1.6 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:

1. Provide protection of all control panels and peripheral devices from excessive heat and humidity. Do not install equipment before building is under roof and fully enclosed.
2. Protect all sensitive electronic components from dust and debris. Cover all control panels until ready for startup.
3. Provide dust covers for all detectors, until ready for system startup and testing.

1.7 PROJECT CONDITIONS

A. Existing Conditions: Interface with existing fire alarm system(s), as follows:

1. Existing system shall be removed completely upon acceptance of proposed system.

B. Ionization Detector Disposal:

1. General:
   a. Provide all labor, materials, equipment, transportation, documentation and services necessary for the proper removal and disposal of all ionization smoke detectors containing radioactive materials, removed from the existing building(s).
   b. Contractor is responsible for legal and proper disposal and associated costs for transportation, containers, landfilling, documentation, etc. as may be required.
   c. Contractor shall provide return of existing detectors to the existing manufacturer (where such return is possible). Contractor shall be responsible for coordination, transportation, costs, etc. associated with the return of the

materials.

2. Applicable Regulations:
   a. Applicable sections, latest editions and addenda of the following government regulations, codes, industry standards and recommended practices, form a part of this specification. Nothing in these specifications is to be construed as permitting work not conforming to these regulations.
   b. Department of Transportation (DOT) Title 49, Code of Federal Regulations (CFR) Part 173 subpart J.
   c. Environmental Protection Agency (EPA) Title 40, CFR 761. Part 761.
   d. Federal Occupational Safety & Health Administration (OSHA) Title 29, CFR 1910 Sections 106, 133, 134, and 144.
   e. State Occupational Safety & Health Administration.
   f. All applicable County and City codes, ordinances and regulations.
   g. The contractor is cautioned that he is responsible for ascertaining the extent to which these regulations affect the operations resulting from this solicitation and to comply therewith.
3. Containerization & Marking:
   a. Place all detectors in containers, DOT and/or EPA approved for the intended use.
   b. All containers used shall be properly sealed, marked, labeled and dated.
4. Documentation:
   a. Provide Owner with comprehensive information on all firms to be involved in disposal work activities as part of this contract prior to commencement of the project. Such information shall include a minimum of:
   b. Name, address, telephone number and EPA ID number, State Transporter's ID number and Hauler Registration Number of the firm(s) responsible for the transportation.
   c. Name, address, telephone number and EPA ID number of the firm(s) responsible for storage and/or ultimate disposal/destruction of all materials.

1.8 SEQUENCING AND SCHEDULING

A. Existing Fire Alarm Equipment:

1. Maintain fully operational until new equipment has been tested and accepted.
2. As new equipment is installed, label it "NOT IN SERVICE" until new equipment is accepted.
3. Remove tags from new equipment when put into service and tag existing fire alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal:

1. After acceptance of the new fire alarm system, remove existing disconnected fire alarm equipment, devices, controls and wiring and restore damaged surfaces.
2. Package operational fire alarm and detection equipment that has been removed; deliver to Owner.
3. Remove from site and legally dispose of remainder of existing material.

1.9 MAINTENANCE

A. Keys: Provide minimum of six (6) keys of each different type used on the project. Keys shall be identified by an appropriate number, stamped on the key or on a metal tag attached thereto.

B. Extra Materials:

1. Furnish extra materials described below, at completion of project, that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
2. Deliver spare parts to Owner with signed delivery ticket specifically itemizing all parts delivered.
3. Furnish the following items, in quantities listed:
   a. Manual pull stations: two (2)
   b. Photoelectric smoke detectors with addressable base: Two (2).
   c. Heat detectors with addressable mounting base (135^{o}F Fixed/ROR): two (2).
   d. Alarm signal horns: two (2).
   e. Low Frequency alarm signal horns: three (3).
   f. 15 candela strobe light: five (5).
   g. Combination horn/15 candela strobe: three (3).
   h. Combination speaker/15 candela strobe: two (2).

1.10 SYSTEM STARTUP

A. System Programming:

1. Performed by a technician, trained and certified by manufacturer.
2. All custom and standard functions.
3. Addresses and modules as applicable.
4. Control functions and monitoring.
5. Message displays with signal type (i.e. smoke detector, sprinkler tamper, etc.) and a custom location message.
6. Location messages shall be approved by Owner to determine exact wording of each location, room, floor or space.
7. Provide additional reprogramming services as required for additional devices added during construction, changes due to Final Inspection comments, and Owner changes of display messages, etc. prior to Owner's final acceptance of system.

PART 2 MATERIALS

2.1 MANUFACTURER

A. Available Manufacturers: Subject to compliance with requirements, provide a system by the named "Basis of Design" manufacturer, or a comparable product of one of the other following named manufacturers:

1. Fire Alarm Control Units and Accessories:
   a. Edwards Systems Technologies (Basis of Design)
   b. Simplex Time Recorder Co.
   c. Siemens (Cerberrus)
   d. Notifier

2. Graphic Annunciator Panels:
   a. Quality Engraving & Design, Inc.
   b. Light Engineered Displays, Inc.
   c. WSA, FAA series

2.2 MANUAL PULL STATIONS

A. Addressable Manual Alarm (Pull) Station:

1. Listed under UL 38 Manual Signaling Boxes for Fire Alarm Systems.
2. Addressable, double action, toggle switch type.
3. Cover locks in down position after use.
4. Lexan, red with raised white letters.
5. Semi-flush in finished areas; surface in unfinished areas.
6. Keyed or tool reset.
7. Field set device "address" location.
8. Screw terminal wiring connections.
9. EST Model SIGA-278.

2.3 SMOKE DETECTORS

A. All system smoke detectors:

1. Listed under UL 268 Smoke Detectors for Fire Protective Signaling Systems.
2. Supervised for power failure.
3. LED on detector to indicate:
   a. Pulsing - power available.
   b. Steady - alarm activation.
4. Addressable base with twist lock mounting.
5. #30 mesh insect screen.
6. Closed back to prevent insect and dust entry.
7. Corrosion and vibration resistant.
8. Shielded against EMI and RFI.
9. Interchangeable detector heads.
10. Screw terminal wiring connections.
11. Factory serial number to identify particular detector, its location, and sensitivity setting.
12. Auxiliary N.O. alarm contacts in detectors used for:
    a. Door holder release.

B. Photoelectric Smoke Detectors:

1. No required replacement or readjustment after alarm.
2. Adjustable sensitivity within UL specifications to compensate for ambient conditions.
3. Operable with 10-95% RH.
4. 3.3 % nominal sensitivity, field adjustable.
5. Easily disassembled for cleaning.
6. EST Model SIG-PS

C. Duct Smoke Detectors:

1. Listed under UL 268A Smoke Detectors for Duct Applications.
2. Photoelectric type.
3. 3.3 % nominal sensitivity, field adjustable.
4. Easily disassembled for cleaning.
5. Mounted on exterior of and accessible side of ductwork.
6. Sampling tubes matched to the size/shape of duct.
7. Functional test circuit to simulating smoke for alarm.
8. 6 levels of sensitivity adjustment.

9. Red Alarm, green Power and yellow Trouble LED's.
10. Powered from Fire Alarm Control Panel.
11. Remote Test & LED station.
    a. Key operated test switch.
    b. Red alarm LED.
    c. Green power-on LED.
12. Duct detectors shall cause Supervisory Signal only.
13. EST SIGA-SD.

2.4 HEAT DETECTORS

A. All system heat detectors:

1. Listed under UL 521 Heat Detectors for Fire Protective Signaling Systems.
2. Supervised for power failure.
3. Addressable base with twist lock mounting.
4. Construction to prevent insect and dust entry.
5. Corrosion and vibration resistant.
6. Interchangeable detector heads.
7. Screw terminal wiring connections.
8. Rated for 30 foot spacing.

B. Fixed Temperature Heat Detector:

1. Fusible alloy thermal element.
2. Low profile design.
3. Element drops 1" to indicate detector operation.
4. Replaceable elements without disassembling detector.
5. Temperature rating 135^{o}F or 195^{o}F, as indicated.
6. EST Model SIGA-HFS

C. Combination Fixed & Rate Of Rise Heat Detectors:

1. Self-restoring.
2. Rate-of-rise of 5^{o}F/minute.
3. Fixed temperature rating of 135^{o}F or 195^{o}F as indicated.
4. Fixed temperature fusible alloy element.
5. Replaceable fusible element without disassembly.
6. EST Model SIGA-HRS

D. Moisture Resistant Heat Detectors – (For Elevator Pits):

1. Self-restoring.
2. Rate-of-rise of 5^{o}F/minute.
3. Fixed temperature rating of 135^{o}F or 195^{o}F as indicated.
4. Fixed temperature fusible alloy element.
5. Sealed to moisture and corrosive environments.

2.5 MISCELLANEOUS INITIATING DEVICES

A. Provide connections, wiring, resistors, etc. for all contact closure devices listed and/or described herein.

2.6 TROUBLE SIGNAL INITIATING DEVICES

A. Disconnecting any signal-initiating device shall cause a trouble signal at the Fire Alarm Control Panel.

2.7 ADDRESSABLE MONITORING MODULES

A. UL 864 listed for Control Units and Accessories for fire Alarm systems.

B. Provide addressable monitoring modules for all contact closure devices listed and as required:

1. For alarm initiation:
   a. Sprinkler water flow switches.
   b. Kitchen hood extinguishing system activation.
   c. Hardwired alarm devices monitored by system.
   d. All other alarm initiating devices.
2. For Trouble signals:
   a. Sprinkler air pressure switches.
3. For Supervisory signals:
   a. Sprinkler Valve Tamper switches.
   b. Generators - Trouble or Running conditions.
   c. Elevator – Loss of Shunt Trip Control Voltage
   d. HVAC Shutdown Swtich(es).

C. Single device addressable monitoring module for connection to contact closure alarm, trouble or supervisory signal devices. Latching function for momentary contact devices.

D. EST Model SIGA-CT1 for single address; or use SIGA-CT2 for dual addresses.

2.8 ADDRESSABLE CONTROL RELAYS

A. UL 864 for Control Units and Accessories for fire Alarm systems.

B. Addressable for control of elevator recall, AHU shutdown, etc.:

1. Provide interface between fire alarm control panel and all other systems and equipment controlled by the fire alarm system:
   a. HVAC unit shutdown.
   b. Damper closure.
   c. Fire/smoke door holder release.
   d. (3) for Elevator recall (primary, alternate and fireman’s hat).
   e. Elevator breaker shunt trip activation.
   f. Shunt trip circuit activation (grease hood extinguishing system).
   g. Gas solenoid shutoff (grease hood extinguishing system).
   h. Door Access Control or controlled entry systems for global door unlock.
   i. Priority Override for sound and PA system muting.
2. Single device addressable control module.
3. Field selectable address through DIP or rotary switches.
4. Form C contacts for misc. control functions.
5. Locate relay within 36" of controlled equipment.
6. Form C relay contacts, rated for voltage and amperage of controlled load.
7. UL Listed for fire alarm use and application.
8. Metal NEMA 1 enclosure with status LED.

9. Provide for future connections for kitchen equipment shutdown, HVAC Manual Shutdown, etc. where indicated.

C. EST Model SIGA-CR

2.9 LINE ISOLATION MODULES

A. Interior Circuit Protection:

1. Provide line isolation modules on alarm initiating devices circuits to isolate every 50 initiating devices. Also, provide isolation for all circuits between buildings and for every other floor in high-rise buildings.

B. EST Model SIGA-IM.

2.10 NOTIFICATION APPLIANCES

A. Alarm Horns:

1. Listed under UL 464 Audible Signal Appliances.
2. Electro-mechanical optical diaphragm type.
3. Mylar cone and 10 ounce magnet.
4. Red thermoplastic grille.
5. Semi-flush in finished areas.
6. 3-3-3 temporal pattern.
7. Minimum sound pressure level of at least 92 dBA average at 10'.
8. Filed selectable high or low dB setting. All horns set to High dB output at installation.
9. Single or double projection horns, as indicated.
10. Water sealed, vermin proof, re-entrant type. Weatherproof mounting and gaskets in damp or wet areas.
11. EST model G1R-HD

B. Alarm Lights:

1. Listed under UL 1971 Signaling Devices for the Hearing Impaired.
2. Xenon strobe unit.
3. Clear polycarbonate lens.
4. "FIRE" marked in white letters on red housing.
5. Flash rate of 1 Hz. Self synchronized flash of all strobes.
6. Field-configurable ratings of 15, 30, 75 or 110 candela, set per drawings and to meet room application per NFPA.
7. Candela rating setting visible on exterior of installed unit.
8. ADA compliant - must meet 75 cd on-axis requirement.
9. Semi-flush mounted.
10. EST G1R-VM

C. Alarm Speaker:

1. Listed under UL 1480 Speakers for Fire Protective Signaling Systems.
2. High efficiency, weather resistant transducers.
3. Voice and/or tone signaling.
4. Die cast aluminum housing and red grill.
5. Semi-flush mounted in finished areas.

6. Sound pressure level of 88 dBA at 10 feet.
7. Weatherproof and gaskets where exposed to weather.
8. All Ceiling and wall speakers shall be EST Genesis series.

2.11 SURFACE MOUNTED FIRE ALARM DEVICE BACKBOXES

A. Surface mounted metal boxes for mounting of fire alarm devices (where flush mounting is not possible):

1. NEMA 1 smooth steel construction.
2. Red finish to match alarm devices.
3. Concealed knockouts (scored on inside of box only) for entry of surface raceway.
4. No visible or open unused knockouts.
5. Minimum 1-3/4" deep.
6. Single or double gang box as required for each device.
   a. 1-gang for single strobes.
   b. 2-gang for horn/strobes, pull stations.
7. Wiremold # R5700 Series, or equal.

2.12 NOTIFICATION APPLIANCE POWER EXTENDER PANELS

A. NAC Power Extender Panel:

1. Listed under UL 864 Control Units for Fire Protective Signaling Systems.
2. UL Listed for use with fire alarm system.
3. Receives input from FACP through appliance circuit.
4. Four general alarm circuits, Style Y or Z at 2 amps each.
5. Flush mounted in finished areas.
6. Individual circuit trouble LED’s.
7. Internal 8 amp power supply, batteries and charger.
8. 120 VAC input.
9. Power ON and TROUBLE LED’s.
10. EST BPS series.

2.13 FIRE ALARM CONTROL PANEL (FACP)

A. FACP for operation of complete 24 VDC, addressable system.

B. General: Comply with UL 864 Control Units and Accessories for Fire Alarm Systems..

C. Device designations and quantities shall be as shown on drawings and provided additionally as required to connect all specified functions.

D. Multi-processor based FACP, custom field programmable through operator interface buttons on the control panel. Panel shall contain a minimum of:

1. The control panel shall include the following capacities:
2. Support up to 2500 analog/addressable points.
3. Support network connections up to 63 other control panels and annunciators.
4. Support multiple digital dialers and modems
5. Support multiple communication ports and protocols
6. Support up to 1740 chronological events.
7. The network of control panels shall include the following features:

8. Ability to download all network applications and firmware from the configuration computer from the configuration computer from a single location on the system.
9. Provide electronic addressing of analog/addressable devices.
10. Provide an operator interface control/display that shall annunciate, command and control system functions.
11. Provide an internal audible signal with different programmable patters to distinguish between alarm, supervisory, trouble and monitor conditions.
12. Provide a discreet system control switch provided for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details switch.
13. Provide system reports that provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.
14. Address modules for multiple (99-127) addressable devices per module. Minimum of 25% capacity for additional devices without adding modules.
15. 2 Alarm Notification Device circuits (Expandable to 6).
16. 4 form C auxiliary "Alarm" contacts.
17. 2 Audio output circuits for voice evacuation messages.
18. Pre-recorded digital voice evacuation message.
19. Alarm resound after initial alarm has been silenced.
20. 2 form C auxiliary TROUBLE dry output contacts.
21. Control relays for all functions specified.
22. One person Walk Test function.
23. Class A or B supervision of initiating circuits.
24. Municipal (City) connection (reverse polarity).
25. Transient voltage protection for connections to City and power supply.
26. Supervised remote annunciator outputs if so equipped.
27. Switch selectable programming of system functions.
28. Ground and brownout protection.
29. Supervised battery(ies) and charger circuit.
30. Low and No voltage battery supervision.
31. Field programmable and expandable.
32. Secure access protection of programming.
33. Individual circuit disconnect and disable switches.
34. Supervised serial or hardwired remote annunciator outputs.
35. Alarm resound feature.
36. Trouble silenced reminder.
37. Field programmable Trouble alarm status LED's.
38. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
39. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.
40. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
41. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Pre-alarm, selected by detector, to indicate impending alarms to maintenance personnel.
42. The ability to display or print system reports.
43. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
44. PAS pre-signal, meeting NFPA 72 3-8.3 requirements.

E. Control Panel Annunciation:

1. Common System LED Signal Lamps:
   a. Red ALARM.
   b. Yellow SUPERVISORY.
   c. Yellow TROUBLE.
   d. Green POWER ON.
2. Lamp test switch.
3. Audible alarm and trouble buzzer.
4. Control Panel LCD Message Annunciator:
   a. 80 character backlit LCD message display.
   b. Alphanumeric English language display.
   c. Display/Action keypad for user interface.
   d. Custom programmable messages.
   e. Custom programmable function buttons.
   f. Identify the type of alarm, trouble, or supervisory signal, the device, and location. Each addressable device shall be identified by device address, device type, physical location, and other custom programmed information per Owner.

F. Physical construction:

1. 16 gauge cold rolled steel.
2. Rust inhibiting finishes. Red outer finish.
3. Semi-flush in finished areas; surface mounted in unfinished spaces.
4. Key lockable door with lexan cover over visible displays.
5. UL Listed and shall bear the UL Label.
6. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures.
7. Accommodate all components and allow ample gutter space for interconnection of panels and field wiring.
8. Identify each enclosure by an engraved, red, laminated, phenolic-resin nameplate. Lettering on the enclosure's nameplate shall not be less than 1 inch high. Identify individual components and modules within the cabinets with permanent labels.

G. Control Modules: Types and capacities required to perform all functions of the fire alarm systems. Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

H. Address Modules: Provide in sufficient quantity to connect all required addressable devices plus the required spare addresses, as specified previously.

I. Control Switches:

1. Alarm Silence.
2. Trouble Silence.
3. System Reset.
4. Battery Test.
5. All switches clearly, permanently labeled.
6. Custom programmable switches.
7. Key enable function programmable for all buttons.

J. Network Communication

1. The network architecture shall be based on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol. The protocol shall be based on ARCNET or equivalent. The network shall use a deterministic token-passing method. Collision detection and recovery type protocols are not acceptable substitutes due to life safety requirements. In addition, there shall be no master, polling computer, central file computer, display controller or other central element (weak link) in the network which, on failure, may cause complete loss of network communications or cause major degradation of network capability. There shall be no cascading of CPUs or master-slave relationships at the network level to facilitate network communications.
2. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations. Each node/panel shall communicate on the network at a baud rate of not less than 312 KBPS (kilo bits per second).
3. A node may be an intelligent Fire Alarm Control Panel (FACP), Network Control Station PC (NCS) or Network Control Annunciator (NCA). The network shall be capable of expansion to at least 103 nodes.
4. Each network node address shall be capable of storing Event equations. The event equations shall be used to activate outputs on one network node from inputs on other network nodes.
5. The network shall be capable of communicating via wire or fiber optic medium. A wire network shall include a fail-safe means of isolating the nodes in the unlikely event of complete power loss to a node.

K. Manufacturer and Model Number:

1. Edwards EST-3. (Basis of Design)
2. Simplex Series 4020.
3. Siemens (Cerberrus) MXL-IQ.
4. Notifier Onyx Series NFS2-640

2.14 BATTERIES

A. Self contained batteries mounted within main control panel.
1. Rated for (24) hours of non-alarm monitoring plus (5) minutes of alarm conditions.
2. Sized for 120% of Amp-Hour requirement per calculations
3. Sealed lead acid type, maintenance free.
4. Minimum projected life of 5 years.
5. Automatic operation upon loss of primary power.

B. Accessories:

1. Solid state automatic transfer switch to switch to battery power if the normal AC input voltage falls below 15% of nominal. The audible system trouble tone shall sound upon loss of AC input, and "LOSS OF AC POWER" message shall be displayed.

C. Automatic, variable rate battery charger:

1. Capacity for 150% of the connected system load while maintaining batteries fully charged.

2. Capable of recharging batteries from fully discharged to fully charged in 4 hours.
3. Fully supervised charger output.

D. Battery Test switch to disconnect power supply and operate all notification appliances from the standby batteries, without sending central station alarm or initiating other auxiliary functions (i.e. elevator capture, HVAC shut down, etc.).

2.15 REMOTE LCD ANNUNCIATOR

A. UL 864 Control Units and Accessories for Fire Alarm Systems.

B. Provide remote annunciator panel(s) where indicated:

1. Flush mounted in wall.
2. Serial communications with control panel.
3. Hinged lexan cover with lock keyed same as control panel.
4. All LED's mounted behind lexan cover.
5. Vandal resistant construction.
6. Integral piezo-electric alarm sounder.
7. LED Signal Lamps:
   a. Red ALARM.
   b. Yellow SUPERVISORY.
   c. Yellow TROUBLE.
   d. Green POWER ON.
8. Audible alarm and trouble buzzer.
9. Lamp test pushbutton (accessible without opening cover).
10. Keyed control switches (Clearly labeled):
    a. Alarm Silence.
    b. Trouble Silence.
    c. System Reset.
11. 80 character backlit LCD English language display.
    a. User interface buttons.
    b. Custom programmable function buttons.

2.16 NON-ILLUMINATED BUILDING GRAPHIC PANEL

A. Provide building graphic display at location of Remote Annunciator Panel.

1. Graphic shall be a scaled drawing of building.
2. Each geographic zone and floor shall contain:
   a. Designation Label (i.e. 2nd Floor, Labs, etc.).
3. Identification of fire alarm and/or sprinkler zones, per AHJ.
4. North arrow.
5. Label all:
   a. Entry points.
   b. Stair towers.
   c. Fire Dept. Siamese connections.
   d. Fire and smoke barrier walls.
   e. Standpipes.
   f. Elevators.
   g. Valve vaults, post indicator valves, etc.
   h. "You Are Here" designation.
   i. Location of main fire alarm control panel.

B. Orient the panel for specific mounting location.

C. Frame: Satin-finished anodized aluminum.

D. Cover: Vandal resistant, 1/8" clear lexan panel to cover entire graphic.

E. Backing Panel: White PVC or similar material.

F. Graphic Work: Silk-screened on mylar media behind lexan. Field replaceable graphic without need for removal of panel, etc.

1. Building plan exterior outline: 1/8" wide black.
2. Interior building graphics, lines: 1/32" wide black.
3. Zone boundaries: 1/16" wide red.
4. Lettering: 1/4" high minimum, black letters.
5. YOU ARE HERE label: 1/4" high, red letters

2.17 AUDIO AMPLIFIER AND MICROPHONE CABINET

A. Provide an audio amplifier for distribution of pre-recorded and/or live voice evacuation messages.

1. Listed under UL 1711 Amplifiers for Fire Protective Signaling Systems.
2. Enclosed cabinet installed at location of the FACP.
3. Integral batteries and charger.
4. Batteries sized for 60 hours of standby operation and 15 minutes of alarm activation on all system devices.
5. Amplifier and battery capacity sized 120% of actual building speaker load (with all speakers at highest taps).

B. Provide a remote mounted microphone cabinet for manual broadcast of live evacuation instructions.

1. Flush mounted adjacent to the fire alarm remote annunciator panel, unless noted otherwise.
2. Cabinet shall contain microphone, mic bracket, mic jack, and all required controls.
3. Hinged, lexan cover to restrict access to mic and controls.
4. Supervised wiring to amplifier cabinet.

2.18 HVAC MANUAL SHUTDOWN SWITCH

A. Description: HVAC Manual Shutdown Switch for Fire Dept. shut down of all HVAC equipment per requirements of NFPA 90A.

1. Location as approved by local Authority.
2. With all required relays, wiring, contacts, switches, and interfaces for interrupting HVAC equipment run circuits or power wiring.
3. Blue lexan housing, semi-flush mounting.
4. Maintained position pushbutton (Turn to reset). PUSH label on center of button.
5. Label as HVAC SHUTDOWN.
6. Top-hinged, clear lexan cover to discourage tampering.
7. Safety Technology International, Inc. #SS2-4-3-1, or equal.

2.19 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Electromagnet operates from a dedicated power source and requires no more than 3 W to develop 25-lb holding force.

1. Listed under UL 228 Door Closers-Holders With or Without Integral Smoke Detectors.

B. Material and Finish: Match door hardware.

C. Powered from 24VDC power supplied from the FACP. Released by removal of the 24VDC power.

2.20 SYSTEM FIELD WIRING

A. All cables:

1. Solid copper conductors, #16 AWG minimum unless otherwise required by the system manufacturer.
2. Twisted pair or cabled construction, as required for specified system.
3. UL 1424 Listed, Cables for Power Limited Fire Alarm Circuits.
4. Compliant with NEC Art. 760.
5. Plenum rated, unless installed in metallic conduit or raceway.

B. Addressable Data Cables:

1. #18 AWG minimum unless otherwise required by the system manufacturer.
2. UL Listed, NEC type FPLP.
3. Aluminum polyester foil shield with 20AWG stranded drain wire.
4. Plenum rated cables:
   a. 150°C halar insulation.
   b. Flexible plenum rated jacket (red color).
   c. WestPenn Plenecon II, or equal

C. Notification Appliance and Control Circuit Cables:

1. Minimum gauges unless otherwise required by the system manufacturer or circuit loading.
   a. Notification circuits #14 AWG minimum
   b. Control circuits #16 AWG minimum
2. Multiple conductor cable assembly.
3. UL Listed, NEC type FPLR.
4. Plenum rated cables:
   a. 150°C halar insulation.
   b. Flexible plenum rated jacket (red color).
   c. WestPenn Plenecon II, or equal.

2.21 KEYS

A. Keys and locks to be identical for all equipment:

1. Control panel.

2. Annunciator panel(s).
3. Manual station reset.
4. Duct detector test stations.
5. Keyed switch functions (i.e. Fire Pump).

PART 3 INSTALLATION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine the conditions under which the equipment shall be delivered, installed, and operated. Make all allowances required for installation and maintenance of the equipment, per Codes and manufacturer.

3.2 PREPARATION

A. Protection: Protect all existing systems and components, which will be affected by the work. Protect against contamination from dust, dirt and moisture. Take precautions to protect against electrical surges, shorts, etc. which may damage existing equipment.

3.3 INSTALLATION

A. Rough-in: Mounting height for individual devices shall be as follows (all dimensions above finished floor):

1.	Manual stations	48" to top of device
2.	Alarm Horns, Lights	80" to bottom (and >>6" below ceiling)
3.	Alarm Speakers	80" to bottom
4.	Fire Alarm Control Panel	72 inches to top
5.	LCD Annunciator Panels	60 inches to center, unless noted.
6.	HVAC Shutdown Switch	60 inches to center, unless noted
7.	Graphic Annunciator Panels	72 inches to top
8.	Building Graphic Panels	72 inches to top
9.	Remote Microphone Panels	60 inches to top
10.	Duct detector remote station	60 inches to center

B. Manual Pull Stations: Mount semi-flush in recessed back boxes with operating handles 48 inches above the finished floor or lower as indicated.

C. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

D. Ceiling Smoke Detectors:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Maintain proper clearances from air registers, grills.
3. Coordinate with other ceiling devices such as lights, speakers, etc.
4. Install ceiling-mounted detectors not less than 4 inches from a side wall to the near edge.
5. Install detectors located on the wall at least 4 inches, but not more than 12 inches, below the ceiling.
6. For exposed solid-joist construction, mount detectors on the bottom of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction.
7. Install detectors no closer than 60 inches from air registers.

8. Do not install detectors within 10 ft of any cooking appliances.

E. Heat Detectors in Elevator Pits, Shafts & EMR:

1. Comply with NFPA 72 National Fire Alarm Code and ANSI 17.1.
2. Install heat detectors within 18” of sprinkler heads.

F. Duct Smoke Detectors:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Comply with NFPA 90A Standard for the Installation of Air Conditioning and Ventilation Systems.
3. Mount where accessible after all equipment is installed.
4. Mount only in conditioned spaces, unless a wet/harsh-location detector is used.
5. Where mounted on ducts on roofs or outside buildings, detector housing shall be mounted on the vertical sides of ducts. Do not mount on top of ducts. Install detector and housing within outer metal enclosure.
6. Use of area smoke detectors mounted inside of duct is NOT acceptable.
7. Test stations installed where readily accessible and visible inside building.
8. Remote test stations mounted on nearest wall or flush in ceiling tile directly below device.
9. Label each remote test station as to supply or exhaust and unit/equipment:
   a. AHU-10
   b. SUPPLY DUCT
10. Provide wiring connections to equipment and systems controlled by the fire alarm system, including:
    a. Air handling equipment.
    b. Smoke dampers.

G. Audible Alarm-Indicating Devices:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Comply with ADA Americans with Disabilities Act.
3. Install at height to match visual alarm indicating devices.
4. Install on flush-mounted back boxes with the device-operating mechanism concealed behind a grille or as indicated.
5. Combine audible and visual alarms at the same location into a single unit.
6. Exterior devices shall be installed at 10 feet above the finished grade.

H. Visual Alarm-Indicating Devices:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Comply with ADA Americans with Disabilities Act.
3. Install at 80" AFF to device bottom, and at least 6" below the ceiling.
4. In corridors, install not more than 15 feet from ends of corridor.

I. Addressable Monitoring Modules and Relays:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Mount addressable fire alarm system device (monitor module or relay) within 36 inches of the controlled or monitored device or equipment.
3. Install module or relay in metal junction/device box, with rigid or flexible conduit and

wiring to respective monitored or controlled equipment.

J. Fire Alarm Control Panel (s):

1. Comply with NFPA 72 National Fire Alarm Code.
2. Surface mount in unfinished areas, or as indicated.
3. Install semi-flush in finished areas.
4. Provide ceiling smoke detector in room with FACP, per NFPA 72.

K. Notification Appliance Circuit Power Supply Panel(s):

1. Comply with NFPA 72 National Fire Alarm Code.
2. Surface mount in unfinished areas, or as indicated.
3. Install semi-flush in finished areas.
4. Provide ceiling smoke detector in room with each panel, per NFPA 72.

L. Remote and Graphic Annunciators: Arrange as indicated, with mounting height of cabinets as indicated.

1. Surface mount in unfinished areas, as indicated.
2. Install semi-flush in finished areas.
3. Install and orient graphic panels to match building orientation as installed.

M. Wiring Within Enclosures & Cabinets: All wiring shall be installed in a workmanlike manner:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Train parallel, or perpendicular, to surfaces.
3. All connections made to terminal blocks.
4. Label each terminal in accordance with the wiring diagram for identification.
5. Crimp-on terminal spade lugs or approved pressure type terminal block connections.
6. Terminal cabinet to be installed where circuit risers originate or where any circuit tap is made.
7. All wiring within panels shall be readily accessible without removing any component parts.
8. Mark each terminal according to the system's wiring diagrams.

N. Field Wiring:

1. Comply with NFPA 72 National Fire Alarm Code.
2. Install all wiring in conduit or metal raceway according to Section "Raceways & Boxes for Electrical Systems." Conceal raceway except in unfinished spaces and as indicated.
3. Identify conduit and boxes with red paint at regular intervals. (all boxes and every 8-10 LF).
4. UL Listed Fire Alarm MC Cable may be used in lieu of EMT.
5. Do not mix fire alarm wiring with wiring of any other system.
6. Use distinctive color coding for insulation.
   a. Distinct from all power wiring colors.
   b. Different colors for IDC, NAC and SLC wiring.

O. Cable Taps: Use numbered terminal strips in junction, pull or outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

3.4 CONSTRUCTION

A. Connections to Existing Fire Alarm System(s):

1. Provide all temporary connections, wiring, relocations, etc. of existing fire alarm system to insure that no area is left without proper protection during construction.
2. Remove all existing (original building) fire alarm devices, controls and wiring, unless noted otherwise.

B. Interface with Other Work: Coordinate fire alarm system connections and equipment locations with other contractors and/or equipment prior to ordering or installing any wiring, materials, etc.

1. Duct Detector Installation:
   a. Furnish all wiring, relays, contacts, etc. to break HVAC unit control circuits.
   b. Connections to fire alarm under this section.
   c. Final connections from control relay wiring at HVAC equipment shall be provided under mechanical Division of work.
2. HVAC Manual Shutdown:
   a. Provide manual shutdown controls to shut off all air handling equipment in the contract area(s).
   b. Provide addressable control relays for shut down of all air handling units.
   c. Provide control relay with N.C. contacts and wiring to each individual AHU. Locate relay within 36” of AHU circuit connection.
   d. Alternately, for buildings with DDC system(s), provide control relay with N.C. contacts and wiring to the individual DDC system control panel(s) to signal shutdown for all AHU’s. Locate relay within 36” of DDC panel connection.
   e. Activating the HVAC shutdown switch shall, through fire alarm system programming, cause each relay to open its associated contacts, shutting down all air handling units in the building.
   f. Final connections to AHU control circuits or to DDC system and associated DDC system programming shall be by mechanical Division.
3. Magnetic Door Holders:
   a. Provide smoke detectors at all magnetic holder locations, per NFPA.
   b. Magnetic door holders are provided under another Division.
   c. Smoke Detectors with Relay Base: Provide detectors with relay base for release of magnetic holder(s) upon local smoke condition.
   d. Addressable Relays: Provide addressable control relays for release of magnetic door holder(s) upon local smoke condition.
   e. Line Voltage Magnetic Holders: Where magnetic holders are powered from building 120VAC system, provide relays with suitably rated contacts.
   f. Coordinate voltage and connections of existing and/or approved magnetic holders.
4. Door Access Control System:
   a. Provide interface with existing system to cause release of all electrically locked doors during a fire alarm condition, per NFPA.
   b. Addressable Relays: Provide addressable control relays for connection to door access control panel.
   c. Secure the services of the Owner’s authorized service company to make final connections to the existing access system control panel.
5. Elevator System(s):
   a. Provide for the services of the Owner’s present qualified elevator service technician to make all final connections to elevator controllers. Include all costs in this contract.

C. Grounding:

1. Refer to Section “Grounding & Bonding for Electrical Systems” for general requirements, in addition to those specified herein.
2. Ground cable shields and equipment according to system manufacturer's instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.
3. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.
4. Ground equipment and conductor and cable shields.
5. For audio circuits, minimize, to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

D. Interior Circuit Isolation:

1. Provide line isolation modules for all interior initiating device circuits and/or signal line circuits between buildings, between floors of buildings, and to group devices in groups not to exceed 50 on each isolation module.

E. Underground Circuit Protection:

1. Provide lightning protection for all underground or exterior circuits, as per NEC.

F. Electrical Power:

1. Connect control panel primary power to 120 VAC power system, as indicated.
2. Provide dedicated circuit.
3. Clearly label "FIRE ALARM" on panelboard directory.
4. Locking clip for breaker handle to lock in "ON" position, but not prevent tripping of breaker.
5. Fire Alarm Power Supply Disconnect: Where system is served from an enclosed breaker or fusible switch, paint red and label "FIRE ALARM".

G. Identification: Identify system components, wiring, cabling, and terminals according to Section “Common Work Results for Electrical”.

3.5 REPAIR/RESTORATION

A. Restore all finishes, equipment and surfaces to original condition, where affected by the work of this section.

B. Comply with all requirements as specified in Section “Common Work Results for Electrical”.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Provide services of a factory-authorized service representative to supervise the final connection of all system cabling at the control panels, and associated components and accessories.
2. Be present and supervise all pretesting of cabling system prior to connections to control

equipment.

3. Be present and supervise the adjustment of all settings, components and accessories.
4. Provide all system programming, based on project conditions, room names (per Owner direction), etc.
5. Assist in the troubleshooting, as necessary to provide a system free from all faults, trouble conditions, etc. prior to required testing by AHJ.

B. Pretesting:

1. After installation, align, adjust, and balance the system and perform complete pretesting.
2. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications.
3. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved.
4. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.

D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.

E. Provide all testing to certify the system is complete and fully operable.

1. All tests required by Authority Having Jurisdiction.
2. Provide written statement of successful test results.
3. Submit letter to Owner and Architect.
4. Perform tests in presence of Owner or Authorized Representative.
5. Manufacturer's technician shall be present to make adjustments related to the testing.

F. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72 National Fire Alarm Code. Minimum required tests are as follows:

1. Absences of grounded, shorted or open circuits.
2. Each initiating device functions as specified.
3. Abnormal conditions on any supervised circuit or device provided specified trouble signals.
4. Batteries can operate the system for minimum 30-minute test, including 5 minutes of alarm.
5. Alarm signals are audible in all building areas.
6. The system shall be operable under the specified trouble conditions.
7. Automatic battery operation upon loss of AC power.
8. All auxiliary functions are executed correctly, completely and as required.
9. Communicator successfully transmits to UL Central Station.
10. Verify the absence of unwanted voltages between circuit conductors and ground.
11. Test all conductors for short circuits using an insulation-testing device.
12. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.
13. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.

14. Test signal line, initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of the initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
15. Test each initiating and indicating device for alarm operation and proper response at the control unit.
16. Test smoke detectors with actual products of combustion.
17. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.
18. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
19. Magnetically held doors are released by associated local smoke detectors.
20. Motor operated smoke dampers operate and reset properly in response to duct smoke detector activation.
21. HVAC manual shutdown switch(es) function properly to shut down appropriate HVAC units.
22. General alarm condition initiates global unlock condition in door access control and/or door entry lock systems
23. General alarm condition mutes all local sound systems, as specified.
24. Test Grease Hood Extinguishing System installations:
    a. Extinguishing system control panel alarm and trouble conditions are correctly monitored by building FACP.
    b. Automatic and Manual Activation/alarm of Extinguishing System initiates specified actions, signals and responses from local and building FACP.
        1) Building wide general alarm condition
        2) Shunt trip of all electric appliances below hood.
        3) Shut off of gas solenoid valve (where applicable).
25. Test Elevator System installations:
    a. Test each individual smoke detector in EMR and shaft for proper cab recall response to primary or alternate floor and Fireman's Hat light activation.
    b. Test each individual heat detector in EMR, pit and shaft for elevator power shunt trip activation.
    c. Remove power from shunt trip control circuit and verify initiation of Supervisory condition at building FACP.

G. Submit a completed "Record of Completion" as included in NFPA 72

H. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

I. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log upon the satisfactory completion of tests.

J. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

K. Inspections by AHJ:

1. Arrange all required inspections by the local Fire Department, Fire Marshal, or Authority Having Jurisdiction.
2. Notify all parties of Inspection and results.
3. Perform all adjustments, changes, etc. required.
4. Provide for re-inspections, if required.

3.7 ADJUSTING

A. Sensitivity Adjustments:

1. Initial Settings: Provide initial setting of detector sensitivity prior to final testing, based on assumed room use.
2. Final adjustments: Provide adjustments to detector sensitivity after Owner occupancy, where required, due to actual room use, environmental conditions, false alarms, etc.

B. Audio System Adjustments:

1. Initial Settings: Provide initial tap setting of speaker volume prior to final testing, based on assumed room use, background noise, etc.
2. Final adjustments: Provide adjustments to tap settings after AHJ inspections and Owner occupancy, where required, due to actual differences in room use, environmental conditions, background noise, etc.

3.8 CLEANING

A. General:

1. Remove paint splatters and other spots, dirt, and debris.
2. Touch up scratches and marred finishes to match original finish.
3. Clean front panels of all control panels, annunciators, graphic panels, etc. using methods and materials recommended by manufacturer.
4. Remove dust covers from all smoke detectors.

3.9 DEMONSTRATION

A. Fire alarm system manufacturer shall provide a factory trained representative for purpose of training owner's personnel:

1. Discuss proper operation, maintenance, and use of system.
2. Demonstrate the following specific tasks, as applicable:
   a. Alarm acknowledge/silence.
   b. System reset.
   c. Individual device reset.
3. Instructor shall be fully knowledgeable of the installed system and all components.
4. Training shall be completed at the project site following Owner occupancy, at Owner’s discretion.
5. Schedule after all final tests, adjustments and Owner's acceptance.
6. Training shall include use of delivered O&M manuals.

END OF SECTION