



TOPEKA METRO

**REQUEST FOR BIDS
QSS HVAC Equipment Upgrade
TO-25-03**

**Appendix 2
Engineer's HVAC Electrical Written
Specifications**

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SECTION 260100 - ELECTRICAL PROVISIONS**1. PART 1 - GENERAL****1.1. RELATED DOCUMENTS**

All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Electrical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

This DIVISION requires the furnishing and installing of complete functioning Electrical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.

Refer to Architectural, Structural and Mechanical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing conduit in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 2933 SW Woodside Dr., Suite C, Topeka, KS, 66614, PHONE 785-273-2447, FAX 785-273-0456, EMAIL scott.mckinley@pkmreng.com.

Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.

When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review. "Provide" means to furnish and install in a satisfactory working condition.

1.4. QUALIFICATIONS

The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

Locations of equipment, conduit and other electrical work are indicated diagrammatically by electrical drawings. Layout work from dimensions on Architectural and Structural Drawings. Verify equipment size from manufacturers shop drawings.

Study and become familiar with contract drawings of other trades and in particular general construction drawings and details in order to obtain necessary information for figuring installation. Cooperate with other workmen and install work in such a way to avoid interference with their Work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.

Any conduit, apparatus, appliance or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other Work caused by this contractor, subcontractor, workers or any cause whatsoever, shall be restored as specified for new work.

Do not scale electrical drawings for dimensions. Accurately layout work from dimensions indicated on Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.

The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

The intent of these specifications is to allow ample opportunity for the Contractor to use their ingenuity and abilities to perform the work to their and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.

Material and equipment installed under this contract shall be first class quality, new, unused and without damage.

In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.

Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.

Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.

If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.

In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service requirements necessary to accommodate such substitution.

Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of \$50 per sheet, \$100 minimum and \$25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all conduits passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as

voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which Electrical Contractor could have been informed before bids were taken.

Electrical Contractor shall be familiar with equipment provided by other Contractors that require electrical connections and control. Follow circuiting shown on drawings for lighting, power and equipment connections.

Make required electrical connections to equipment provided under Architectural and Mechanical divisions of this project. Receive and install electric control devices requiring field installation, wiring, and service connection. Equipment supplied by the automatic temperature control contractor shall be installed by the mechanical or automatic temperature control subcontractor. Make required internal field wiring modifications indicated on wiring diagrams of factory installed control systems for control sequence specified. These field modifications shall be limited to jumper connections and connection of internal wiring to alternate terminal block lugs. The cost for field modifications requiring rewiring of factory installed control systems for equipment provided by General or Mechanical Contractors shall be included in base bid of the respective contractor. All temperature control wiring shall be by a licensed electrician under the supervision of temperature control contractor.

Check electrical data and wiring diagrams received from Mechanical Contractor of compliance with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of Architect-Engineer for a decision.

Provide safety disconnect switches, contactors, and manual and magnetic motor starters for mechanical and electrical equipment requiring such devices. Omit these devices where included as part of factory installed prewired control systems provided with mechanical equipment. With exception of factory installed devices, provide safety disconnect switches, contacts and motor starters by one manufacturer to allow maximum interchangeability of repair parts and accessories for these devices.

To maximum extent possible electrical controls in boiler rooms, equipment rooms, and control rooms shall be grouped in accessible locations and arranged according to function. Where possible use group control panels and combination starters in lieu of individually enclosed devices.

1.16. CODES, ORDINANCES, RULES AND REGULATIONS

Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.

Conform to latest editions and supplements of following codes, standards or recommended practices.

2021 International Building Code
 2021 International Energy Conservation Code as amended by City.
 2021 International Fire Code
 2015 Uniform Mechanical Code
 2018 Uniform Plumbing Code
 2023 National Electrical Code
 2010 Americans with Disabilities Accessibility Guidelines (ADAAG).
 2015 Life Safety Code

1.17. SAFETY CODES:

National Electrical Safety Code Handbook H30 - National Bureau of Standards
 Occupational Safety and Health Standard (OSHA) Department of Labor
 Safety Code for Elevators ANSI A17.1

1.18. NATIONAL FIRE CODES:

NFPA No. 54	Gas Appliances & Gas Piping Installation
NFPA No. 70	2023 National Electric Code
NFPA No. 90A	Air Conditioning & Ventilation Systems
NFPA No. 91	Blower and Exhaust Systems
NFPA No. 101	Life Safety Code

1.19. UNDERWRITERS LABORATORIES INC.:

All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

1.20. MISCELLANEOUS CODES:

ANSI A117.1 - Handicapped Accessibility
 ASHRAE 90.1 1989
 Americans with Disabilities Act (ADA)

Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect/Engineer in writing before proceeding with work so that necessary changes can be made. However, if Electrical Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

Electrical Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect/Engineer with request for final review.

Contractor shall include in bid any charges by local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exact which part of the work is to be performed by whom.

2. PART 2 – PRODUCTS

Not Used

3. PART 3 - EXECUTION

3.1. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

Submit with shop drawings of equipment, three sets of operating and maintenance instructions and parts lists for all items of equipment provided. Instructions shall be prepared by equipment manufacturer.

Keep in safe place, keys and wrenches furnished with equipment under this contract. Present to Owner and obtain receipt for same upon completion of project.

Prepare a complete brochure, covering systems and equipment provided and installed under his contract. Submit brochures to Architect/Engineer for review before delivery to Owner. Contractor at his option may prepare this brochure or retain an individual to prepare it for him. Include cost of this service in bid. Brochures shall contain following:

- Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under Section this specification.
- Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
- Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of system.
- Record Set Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to Architect at end of the project. After the originals are changed to reflect the blue line set, a copy shall be included in the brochure.

Provide brochure bound in black vinyl three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

- Project name and address.
- Section of work covered by brochure, i.e., Electrical.

3.2. CUTTING AND PATCHING

Contractor shall do cutting and patching of building materials required for installation of work herein specified. Cut no structural members without Architect's approval and in a manner approved by him.

Patching shall be by contractors of particular trade involved and shall meet approval of Architect.

Drilling and cutting of openings through building materials requires Architect's review and approval. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.

Damage of building finishes caused by installation of electrical equipment, fixtures, outlets and other electrical devices shall be repaired at Contractor's expense to approval of Architect.

3.3. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundations and provide proper anchor bolts and isolation as shown or specified.

Level, shim, and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instruction. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

Provide electrical floor mounted equipment with 3-1/2" high concrete bases unless shown or specified otherwise. Electrical contractor shall size all pads. General contractor shall form all pads, provide and place all concrete for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.

Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Electrical contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect/Engineer for review before proceeding with fabrication or installation.

Provide 3-1/2" high concrete housekeeping pad as specified above where two or more conduits penetrate floor below panelboards.

3.4. START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

Electrical Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.

All owner training sessions shall be orderly and well organized and shall be video taped using VHS format. At the end of the owner training, the "training tape" shall become the property of the Owner.

3.5. FINAL CONSTRUCTION REVIEW

At final construction review, Electrical Contractor and the major sub-contractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by Architect/Engineer, that the work complies with purpose and intent of plans and specifications. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 260100

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**1. PART 1 - GENERAL****1.1. RELATED DOCUMENTS**

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

2. PART 2 – PRODUCTS

Not Used

3. PART 3 - EXECUTION**3.1. IDENTIFICATION OF WIRING AND EQUIPMENT**

Provide identification and warning signs to wiring and equipment as listed in schedule. Handwriting shall not be acceptable. Signs and tags shall be as follows:

- TYPE 1: Laminated phenolic plastic with black Gothic condensed lettering by Seton or Wilco.
- TYPE 2: Self-sticking ½” wide plastic tape with high gloss surface and embossed lettering by Brady, Seton or Dymo.
- TYPE 3: Self-sticking flexible vinyl with oil resistant adhesive for -20 degrees to 300 degrees F. temperatures by Brady, Seton or as approved.
- TYPE 4: Self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications, by Brady, Seton or as approved.

Provide lighting and power panelboards with Type 1 sign minimum of 1-1/4” x 6” indicating panel designation and electrical characteristics. Mount inside of panel door on circuit breaker trim flange just below breakers.

Provide disconnect switches, motor starters, time clocks, contactors and controllers, control panels, etc. with Type 1 sign ¾” x 5” indicating equipment served and “Warning Danger” sign.

Provide Type 2 tape at feeder terminal lugs to switchboards and panelboards. Tape shall indicate conduit size, conductor type and AWG size. Tape shall be located so as to be easily read with conductors installed.

Provide feeders and branch circuit home runs with Type 3 wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number.

Provide electrical equipment and accessible wiring enclosures operating at voltage above 240 volts with Type 4 “Danger High Voltage” warning sign and voltage marker applied to front door or cover of device or enclosure. Provide large equipment such as transformers and main distribution equipment with Type 3 sign indicating all electrical characteristics.

Panels shall have branch circuit directory holders with clear plastic cover. Provide neatly typed list of branch circuit loads corresponding to branch circuit numbers.

All wires for branch circuit work shall be color coded.

3.2. NEUTRAL AND GROUND WIRES

Where individual circuit homeruns (hots, neutral, and ground as part of a single circuit) are indicated on the plans, these shall be individual circuits with individual neutrals and grounds (no sharing of neutrals and grounds).

Where shared circuit homeruns (hots, neutral, and ground as part of separate circuits) are indicated on the plans, these shall be allowed to share one (common) neutral for three (3) circuits from different phases occurring in one (1) conduit run. When additional circuits occur in conduit run, additional neutrals shall be installed. Conduit shall be upsized and conductors shall be de-rated based on NEC current carrying conductor tables counting all hots and neutrals as current carrying conductors.

3.3. TESTS RECORDING, REPORTING TESTS AND DATA

Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.

Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.

Record amperes-per-phase at normal or near-normal loading of each item of equipment furnished and/or connected.

Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.

Record voltage and ampere-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load.

Submit at least two (2) typewritten copies of data noted above to Architect-Engineer for review prior to final inspection.

Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

3.4. CLEANING AND PAINTING OF MATERIALS AND EQUIPMENT

Before energizing switchboards, transformers, panelboards, starters, variable frequency drive and other similar electrical equipment, Contractor shall thoroughly vacuum out all dirt, dust and debris from inside of equipment and shall thoroughly clean outside and inside of equipment.

Touch-up painting and refinishing of factory applied finishes shall be by Electrical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.

Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.

After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.

Where extensive refinishing is required equipment shall be completely repainted.

3.5. EXCAVATION AND BACKFILL

Perform necessary excavation to receive work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.

Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.

Conduct excavations so no walls or footings are disturbed or injured.

Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by A/E.

Mechanically tamp backfill under concrete and pavings in 6" layers to 95% standard density, Reference Division 2.

Backfill trenches and excavations to required heights with allowance made for settlement.

Tamp fill material thoroughly and moistened as required for specified compaction density.

Dispose of excess earth, rubble and debris as directed by Architect.

When available, refer to test hole information on architectural drawings or specifications for types of soil to be encountered in excavations.

3.6. FIRE BARRIERS

Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.

Equivalent by Dow, Chemelex, 3M.

All holes or voids created by the electrical contractor to extend conduit or wiring through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

3.7. TEMPORARY COVERINGS

Provide temporary covering over all electrical panels, distribution panelboards, outlet boxes and other equipment as required to keep same free from damage due to moisture, plaster, paint, concrete or other foreign materials. Any equipment with finish damaged by moisture, paint, plaster or other foreign materials shall be cleaned and refinished as directed by the Architect without additional cost to the Owner.

All temporary openings in conduits shall be covered with metal or plastic caps.

END OF SECTION 260500

SECTION 262000 - WIRING MEANS, METHODS, AND MATERIALS**1. PART 1 - GENERAL****1.1. RELATED DOCUMENTS**

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

2. PART 2 – PRODUCTS**2.1. CONDUITS**

All conduit delivered on the job shall be stored at least 12” above grade, roof, or floor. Keep the interior of all conduits clean. Conduits containing moisture or foreign material will not be accepted and shall be thoroughly cleaned and dried before installation.

2.1.1. Steel Conduit

Contractor may use either rigid steel or EMT for all main feeder circuits to switchboards and panelboards unless specifically indicated on plans.

2.1.2. Galvanized Rigid Steel Conduit

Conduit shall be hot dipped galvanized and shall bear a UL label. Conduit shall also meet Federal Specification W-WC-581 and ANSI C80.1.

2.1.3. EMT Conduit

Conduit shall be galvanized steel electrical metallic tubing and bear a UL label. Conduit shall conform to Federal Specification WWC-563 and ANSI specification C80.3.

2.1.4. Outside and Wet Location Flexible Conduit

Flexible conduit shall have a water resistant non-sleeving polyvinyl chloride jacket with a general temperature range of -40 degrees C to + 60 degrees C. Conduit shall bear a UL label.

2.1.5. BX Flexible Conduit

3/8” may only be used from JB to lighting fixture as per NEC 350. Other sizes shall be secured at 4-1/2 foot maximum intervals by mechanically fastening to structure. A ground wire shall be run in conduit. Contractor shall use flexible conduit for connections to motors and equipment mounted on resilient mounts or vibration isolators. Maximum length of flexible conduit shall be 8’-0”.

2.1.6. MC Cable and Romex

MC cable and Romex are not allowed.

2.2. CONDUIT FITTINGS

Where conduits cross building expansion joints provide O-Z expansion fittings type “AX”, “TE”, “EX”, or “EXE” as required.

Provide grounding bushings where feeder conduit attaches to panelboard backbox. Bond grounding bushing to ground bus.

2.2.1. Rigid Steel Conduit

Couplings shall be steel threaded type and box connectors shall be steel insulated bushings and malleable iron or steel locknuts. Unilets shall be malleable iron with blank cover.

2.2.2. EMT Conduit

Couplings and box connectors shall be die cast setscrew type. Unilets shall be malleable iron with blank cover.

2.2.3. Flexible Conduit

Connectors shall be threaded type iron with insulated throat.

2.3. PLASTIC CONDUIT

Provide rigid polyvinyl chloride (PVC) type EPC 40 heavy wall plastic conduit meeting current NEMA Standard TC-2. Conduit shall be listed UL 651 for underground and exposed use.

Plastic conduit may only be used for exterior underground applications or circuits beneath slabs on grade. Provide galvanized rigid steel (GRS) radius bends and risers as conduits rise above grade or above floor slab.

Provide exterior underground conduit with metal detection strip.

Provide matching plastic fittings. Fittings shall meet the same standards and specifications as the conduit on which it is installed.

Joining and bending of conduit and installation of fittings shall be done only by methods recommended.

Provide conduit support spacing as recommended for the highest ambient temperature expected.

Provide interlocking conduit spacers for multiple runs of underground conduits installed in same trench.

Provide expansion couplings on long runs regardless of ambient temperatures. Determine amount of conduit expansion and contraction from published charts or tables.

Plastic conduit and fittings shall be by a Products Division of Continental Oil Company.

2.4. INSERTS, HANGERS

Support vertical and horizontal conduit runs at intervals not greater than 10 feet, within 3 feet of any bend and at every outlet or junction box.

Install multiple runs of conduits as follows:

- Where a number of conduits are to be run exposed and parallel, group and support with trapeze hangers.
- Fasten hanger rods to structural steel members with suitable beam clamps and to concrete structures with inserts set flush with surface. Install concrete inserts with reinforced rod through opening provided in inserts.
- Inserts shall be Grinnell figure 279, 281, 282, or 285 or equivalent as required by load and concrete thickness.
- Provide beam clamps suitable for structural members and conditions.
- Provide 3/8" minimum diameter steel hangers rods galvanized or cadmium plated finish.
- Trapeze hangers shall be Kindorf Series 900 channels with fittings and accessories as required.
- Attach each conduit to trapeze hanger with Steel City No. C-105 clamps for rigid conduit and Steel City No. C-106 clamps for electrical metallic tubing. (EMT).

Install clamps for single conduit runs as follows:

- Support individual runs by approved pipe straps, secured by toggle bolts on hollow masonry; expansion shields and machine screws or standard preset inserts on concrete or solid

masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction. Use of perforated strap not permitted.

- Install exposed conduits in damp locations with clamp backs under each conduit clamp to prevent accumulation of moisture around conduits.

Provide inserts, hangers and accessories with finish as follows:

- Galvanized: Concrete inserts and pipe straps.
- Galvanized or Cadmium Plated: Steel bolts, nuts, washers and screws.
- Painted with Prime Coat: Individual hangers, trapeze hangers and rods.

Equivalent hangers and support systems by Binkley, Fee and Mason, Kin-Line or Unistrut.

2.5. BUSHINGS AND LOCKNUTS

Enter outlet boxes squarely and securely clamp conduit to outlet box with bushing on inside and locknut on outside.

2.6. SLEEVES

Provide proper type and size sleeves to General Contractor for electrical ducts, busses, conduits, etc. passing through building construction. Supervise installation to insure proper sleeve location. Unless indicated or approved install no sleeves in structural members.

Provide cast iron sleeves extending 1 inch above finished floor where sleeves pass through floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchen. Seal opening between pipe and sleeve with Thunderline Corp. Link Seal.

Unless specified otherwise provide 18 gauge galvanized sheet metal sleeves through floors and non-bearing walls. Where piping passes through exterior walls, equipment room walls, air plenum walls and walls between areas that must be isolated from occupied areas, seal space between sleeves and piping, air or water tight are required with Thunderline Corp. Link Seal.

Provide O-Z Electrical Manufacturing Co., Inc. Type "FSK" or "WSK" or equivalent thruwall and floor seals where conduits pass through concrete foundation walls below grade.

Provide Zurn Z-195 or equivalent flashing sleeve through walls and floors with waterproof membrane. Seal annular space between conduit and sleeve with Thunderline Link Seal or O-Z type CSM sealing bushing.

All holes or voids created by the electrical contractor to extend pipe through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

2.7. CONDUCTORS

Provide conductors by Encore, Southwire, Senator, Cerro, or approved equivalent.

Unless noted otherwise conductors referred to are wires and cable. Provide code grade soft annealed copper conductors with specified insulation type in proper colors to conform with color coding specified. Provide conductors No. 8 gauge and larger stranded and conductors No. 10 gauge and smaller shall be solid.

Use no conductors smaller than No. 12 gauge unless specifically called for or approved by Engineer. Size wire for volt branch circuits for 3% maximum voltage drop. Size feeder circuits for

2% maximum voltage drop. Combined voltage drop of feeders and branch circuits shall not exceed 5% maximum.

Provide conductors for listed applications as follows:

2.7.1. Lighting and Receptacle Circuits

Type THWN, or THWN/THHN 600 volt, 75 degrees C (167°F) thermoplastic insulated building conductor or better.

2.7.2. Lighting and Receptacles Circuits with No. 8 or larger conductors, motor circuits, power and feeder circuits and building service feeders

Type THHN/THWN 600 volts, 75 degrees C (167°F) thermoplastic insulated building conductor.

2.8. FIRE BARRIER

Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.

Equivalent by Dow, Chemelex, 3M.

3. PART 3 - EXECUTION

3.1. CONDUIT INSTALLATION

Align conduit terminations at panelboards, switchboards, motor control equipment, junction boxes, etc. and install true and plumb. Provide supports or templates to hold conduit alignment during rough-in stage of work.

Install conduit continuous between outlet boxes, cabinets and equipment. Make bends smooth and even without flattening or flaking conduit. Radius of bends shall not be shorter than radius listed table 346-10 (b) of NEC. Long radius elbows may be used where necessary.

Ream and clean conduit before installation and plug or cover openings and boxes to keep conduit clean during construction.

Install no conduits or other raceways sized smaller than permitted in applicable NEC Tables. Where conduit sizes shown on drawings are smaller than permitted by code, Contractor shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of Architect-Engineer. Fasten conduit securely in place with approved straps, hangers, and steel supports. Provide O-Z cable support to support conductors in vertical raceways as required by NEC Table 300-19 (a) of NEC.

PVC conduit installation: Make square saw cut with fine tooth saw. Debur and round inside edge of the cut end. Clean socket ID and spigot OD of dirt and moisture. Apply a uniform coat of cement to spigot end and push into socket bottom, rotating ¼ turn. Allow time to set before disturbing, this will vary with ambient temperature. Test workmanship by conducting a low-pressure air (3.0-5.0 psi) test after system is installed and cemented joints are set. Plug and block ends to prevent movement prior to pressurization. Check for leaks at all joints with a soap solution. Even low-pressure air can cause high thrust loads and caution must be observed. The test shall be observed by the architect, engineer or owner's representative, prior to backfill. All below grade conduit must be watertight.

Low voltage wiring including fire alarm, telephone, television, computer cabling and other low voltage wiring shall be installed in conduit unless noted otherwise.

3.2. CONDUCTOR INSTALLATION

Run conductors in conduit continuous between outlets and junction boxes with no splices or taps pulled into conduits.

Neatly route, tie and support conductors terminating at switchboards, motor control centers, panelboards, sound equipment, etc., with Thomas & Betts Ty-Rap cable ties and clamps or equivalent by Electrovert or Panduit.

Make circuit conductor splices with Buchanan B series finger ease wire nuts or equivalent. Make fixture and device taps with Scotchlok self-stripping electrical tap connectors.

Terminate solid conductors at equipment terminal strips and other similar terminal points with insulated solderless terminal connectors. Terminate all stranded conductor terminal points with insulated solderless terminal connectors. Provide Thomas & Betts Sta-Kon insulated terminals and connectors or equivalent by API/AMP, Blackburn, Buchanan or Scotchlok "Wire Nuts".

One (common) neutral may be used for three (3) circuits from different phases occurring in one (1) conduit run. When additional circuits occur in conduit run, additional neutrals shall be installed.

Where a total of six or more control and feeder conductors terminate in a multiple device panel or enclosure that has no built-in terminal blocks provide Buchanan 600 volt heavy duty Type HO sectional terminal blocks with mounting channel and No. 23 see-thru covers. Equivalent terminal blocks by General Electric, Square D or Westinghouse.

Wrap conductor taps and connections requiring additional insulation with a minimum of three overlapped layers of 3M scotch vinyl plastic electrical type No. 88 or equivalent.

Install no conduits or wiring in air ducts, except that required to power devices that directly perform work upon air in the ductwork. No wiring shall be installed in any portion of grease ducts or airstreams of kitchen exhaust.

END OF SECTION 262000

SECTION 265000 - ELECTRICAL EQUIPMENT**1. PART 1 - GENERAL****1.1. RELATED DOCUMENTS**

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

2. PART 2 – PRODUCTS**2.1. DISCONNECT SWITCHES**

Provide heavy-duty horsepower rated Safety Switches rated in accordance with NEMA enclosed Switch Standard KS 1-1969 and L98 Standard.

Equivalents by: G.E., Cutler Hammer, or I.T.E. Siemens, or Square D.

Enclosure shall be NEMA type required by switch location and environment. Enclosure door shall latch with means for padlocking and cover interlock with defeater to prevent opening door when switch is energized or closing switch with door open. Switch shall have an embossed nameplate permanently attached to door front with switch rating, short circuit interrupting capacity and application information.

Line terminals shall be permanently marked and shielded. Contact shall be tin plated, equipped with arch chutes and have movable contacts visible in off position with door open. Wiring terminals shall be pressure type suitable for copper or aluminum wire. Switching mechanism shall be quick-make, quick-break spring driven anti-tease mechanism and shall be integral part of box. All current carrying parts shall be plated.

Fuse holders shall be high pressure suitable for use with dual element fuses or rejection type current limiting fuses where required. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.

All fuse holders shall have rejection clips installed.

All disconnect switches as specified shall be installed in strict accordance with rules set forth by NEC.

3. PART 3 - EXECUTION

All Electrical equipment shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers directions.

END OF SECTION 265000