SECTION 16000 – BASIC ELECTRICAL REQUIREMENTS

Project Number 14-5006-39

Project Title Kansas City Area Transportation Authority
Service Line Reversal (FOR INFORMATION ONLY)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions, Instructions to Bidders, and Division 1 shall apply to Work of this Section.

B. This Section is a Division 16 Basic Electrical Requirements Section, and is a part of each Division 16 section making reference to mechanical related Work specified herein.

1.2 DESCRIPTION OF WORK:

A. The work covered by Division 16 consists of furnishing all labor, equipment, supplies, and materials (except as otherwise specified or shown on the drawings) required to perform all operations necessary for the installation of complete electrical systems. All work shall be in strict accordance with the specifications and drawings.

B. The omission of an expressed reference to any parts necessary for or reasonably incidental to a complete installation shall not be construed as releasing the Contractor from furnishing such parts.

C. By the act of submitting a bid, the contractor represents that his bid is based solely upon the materials and equipment described in the bid documents (including addendums if any) and that he contemplates no substitutions.

1.3 WORK SPECIFIED IN OTHER SECTIONS:

A. Painting of panelboards, terminal cabinets, pull boxes, front covers, exposed conduit and boxes in all finished areas by others.

B. Division 15 is responsible for all wiring associated with the HVAC control system.

1.4 COORDINATION OF WORK:

A. Coordinate all work with other trades and existing conditions to prevent conflicts causing unnecessary expense or delays in the installation of Work. When conflicts arise, remove and relocate items causing such conflicts at no additional cost to the Owner.

B. Provide a job site representative whenever necessary to coordinate work with others.

C. Refer to other discipline's drawings, relevant equipment drawings, and shop drawings to determine available clearances and possible obstructions. Make any necessary offsets or transitions as required to clear structural members, existing equipment, etc. to facilitate installation of the work in the manner indicated.

D. Division 16 shall be responsible for any resultant costs incurred for changes required to accommodate actual equipment furnished when the equipment has characteristics differing from that shown on the drawings.

1.5 QUALITY ASSURANCE:

A. All Work shall be performed by craftsman normally engaged in the respective craft required for each installation.

1.6 FEES, PERMITS, AND INSPECTION:

A. Provide all fees and permits that are required in connection with this Work.

B. Secure all inspections as required by the authorities having jurisdiction.

C. Where applications are required for procuring of services to the building, prepare and file such applications. Furnish all information required in connection with the application in the form required by the utility company and/or municipal department.

1.7 APPLICABLE CODES AND STANDARDS:

A. All work shall comply with the latest edition of the National Electrical Code (NFPA No. 70) and all applicable laws, codes, recommendations, regulations, and interim amendments, of the governmental bodies having jurisdiction.

B. All Electrical work shall be performed in compliance with all applicable governing safety regulations, including OSHA regulations. All safety lights, guards and signs required for the performance of the electrical work shall be provided by and operated by the Electrical Contractor.

C. A reference to technical society, organization, or body in the Specification is in accordance with the following abbreviations, and all Work shall be performed, as a minimum, in accordance with the latest editions of their publication:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. ASME American Society of Mechanical Engineers
4. ETL Environmental Testing Labs
5. NECA National Electrical Contractors Association
6. FM Factory Mutual Laboratories
7. IEEE Institute of Electrical and Electronics Engineers, Inc.
8. NEMA National Electrical Manufacturer's Association
9. NFPA National Fire Protection Association
10. OSHA Occupational Safety & Health Administration
11. UL Underwriter's Laboratories, Inc.
12. LSC Life Safety Code
13. NEC National Electrical Code
14. IBC International Building Code

D. All Work shall comply with rules and regulations of utilities and/or municipal departments affected by connection of services.

E. Should these specifications and drawings conflict with any of the building codes, standards, laws, ordinances, utility company rules and regulations, etc. the more stringent requirements shall take precedence. The Architect shall be immediately notified of any conflicts.

F. Include all items of labor and material required to comply with such standards and codes in accordance with the specification. Where quantities, sizes, or other requirements indicated on the drawings or herein specified are in excess of the standard or code requirements, the specifications and/or drawings shall govern.

1.8 GLOSSARY OF TERMS

A. Terms:

Contractor - The particular sub-contractor who is directly responsible for the work specified herein.

Shall - Action that is required without option or qualification.

May - Action that is desirable or is at the Contractors choice or option.

Should - Recommendation for the Contractor to follow as an aid in performing the required work.

Provide - Contractor shall furnish and install specified item(s).

Furnish - Contractor shall be responsible for obtaining specified items.

Install - Contractor shall be responsible for all labor and construction equipment necessary to set in place, connect, calibrate and/or test the specified items furnished by him or others.

1.9 SUBSTITUTIONS:

A. The materials, products, and equipment described in the specifications or on the drawings establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

B. Reference to any article, device, product, material, fixture, or type of construction by name, make, or catalog number shall be interpreted as having established a standard of quality and shall not be construed as limiting competition. Articles, fixtures, etc. of equal quality by manufacturers listed in this Specification for the applicable use, shall be acceptable to bid as outlined below, subject to spatial, structural, and electrical constraints of the project design.

C. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts sheets, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's approval or disapproval of a proposed substitution shall be final. Approval of a proposed substitution prior to receipt of Bids shall be set forth in an Addendum. Approvals made in any other manner, shall not be considered binding.

D. Refer to Division 1 requirements for substitution procedures.

E. Wherever substitutions alter the design or space requirements indicated on the plans, the Contractor shall include all items of cost of the revised design and construction, including cost of all trades involved.

1.10 SHOP DRAWINGS AND PRODUCT DATA:

A. Shop drawings shall be submitted as specified in Division 1. Submit sufficient quantities of shop drawing literature for all parties concerned, but not less than six (6) copies. Engineer shall retain one copy of each submittal.

B. Each shop drawing shall include a letter indicating all deviations from the drawings and/or specifications.

C. Before submitting a shop drawing or any related material to Engineer for review, Contractor shall:

1. Review each submission for conformance with the means, methods, techniques, sequences and operations of construction, safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor.
2. Approve each such submission before submitting it to the Engineer; and so stamp each such submission before submitting it. Engineer shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises Engineer otherwise via a written instrument, which is acknowledged by Engineer in writing.

3. Any shop drawing being resubmitted shall be flagged and clouded where changed.

D. Checking of shop drawings is a gratuitous assistance by the Engineer and shall not relieve any responsibility for deviations, errors, or omissions which may exist in the shop drawings. Shop drawings submitted and rejected more than two times due to incomplete data or unacceptable material shall be reviewed by the Engineer at an additional cost to Division 16 at $75.00 per hour, two hour minimum. Contractor submitting shop drawing will be responsible for any additional cost.

E. A letter listing the manufacturer's name and model number shall be sufficient for conduit, outlet boxes and rings, junction boxes and pull boxes.

F. Shop drawing submittals shall include the following for each piece of equipment and material, as applicable:

1. Product data indicating manufacturer, model number, materials, and miscellaneous data as required describing the equipment.
2. Dimensional drawings showing layout, connection points and sizes, weights, etc.
3. Accessories
4. Wiring diagrams, including power and control wiring, distinguish between factory and field wiring.
5. Parts list.
6. Installation and maintenance manuals.
7. Warranty statement.

G. Refer to each individual section in Division 16 for additional requirements.

H. The following information shall be submitted in accordance with this Section.

1. Detailed drawings of fabrication and installation for metal fabrications, supports and anchorage for electrical materials and equipment.
2. Schedules indicating proposed methods and sequence of operations for remodeling prior to commencement of work. Include coordination for shut-off of electrical service, and details for dust and noise control.//

I. Contractor shall be responsible for all quantities and dimensions to be confirmed and correlated at the jobsite.

J. The Contractor shall submit copies of his material list and each shop drawing within thirty days after award of the Contract. If any shop drawings cannot be obtained within thirty days, he shall notify the Architect/Engineer immediately upon receiving notice of that fact.

1.11 WARRANTIES:

A. Contractor shall warrant all work performed and material & labor provided under the contract against defects in material and workmanship for one year from date of substantial completion. Provide all services as required to immediately repair or replace, at no additional cost, any defective part of the installation resulting from the supply of faulty workmanship or material. Lack of maintenance, accidents, or carelessness on the part of the Owner shall not be included in this warranty.

B. The only exception to the above warranty is Light Fixture "LAMPS". All Lamps are to be warranted according to lamp manufacturer, which is also based on average life data for each specific type of lamp. Provide labor to replace all defective lamps that are within lamp manufacturer's warranty period.

C. All equipment, apparatus and appliances which are specified and/or come with warranties longer than one year; shall be registered with the manufacturer in the Owner's name.

1.12 RECORD DRAWINGS:

A. Record drawings shall be kept and prepared in accordance with Division 1 and as specified herein.

1. A complete "Record" set of prints, shall be kept at the project site and shall be corrected daily to show all changes in layout from the original drawings and specifications. This "Record" set shall be used for this purpose only.
2. On completion of the project, two new sets of blueline prints shall be obtained and all changes noted on the field record set shall be neatly transferred (in red pencil) to the two new sets of prints.
3. Two dimensions and the depth below grade shall locate all capped conduits. Changes in conduit routing, sizes and number of wires, additional pull or junction boxes shall be clearly noted. The original routing and layout shall be clearly marked out.

B. Final payment will not be authorized until these Record drawings are received and checked for completeness by the Architect/Engineer.

1.13 OPERATIONS AND MAINTENANCE MANUALS:

A. During the course of construction, collect and compile three (3) sets of operating instructions, wiring diagrams, catalog cuts, parts lists, lubrication and preventive maintenance instructions, etc. for all equipment furnished under this contract. All literature including warranties shall be originals, not copies, included in the operation and maintenance manuals.

B. All literature and instructions shipped with the equipment shall be saved for inclusion in the Operational and Maintenance Manuals.

C. At completion or work, and prior to request for final inspection, submit Manuals to Architect in accordance with Division 1 and as specified herein. Manuals shall be bound in heavy duty, three ring, vinyl covered, hard-backed binder, with clear plastic pocket on spine. Spine of each binder shall have following typewritten lettering inserted:

OPERATION AND MAINTENANCE MANUAL
FOR ELECTRICAL SYSTEMS OF
“KANSAS CITY AREA TRANSPORTATION AUTHORITY
SERVICE LINE REVERSAL”

D. Manuals shall include the following:

1. A master index at beginning of Manual listing all items included. Use plastic tab indexes for each section of Manual.
2. A directory, listing the name, address, and phone number of Architect, Mechanical and Electrical Engineers, General Contractor, and all Subcontractors.
3. A directory, listing all equipment installed, and indicating the name, address, and phone number of each supplier.
4. A section for each system, which shall include the following:

    a. General description of each system.
    b. Control wiring diagram for each system. Each diagram shall include locations of controls, relays, etc.

5. A section for each piece of equipment which shall include the following:

    a. Manufacturer's catalog data indicating capacity, size, etc. by underlining the applicable data.
    b. Manufacturer's installation and maintenance manuals.
    c. Recommended list of spare parts to be stocked for preventive maintenance.
    d. Equipment parts identification list for repair and replacement purposes.
    e. Wiring diagram for the specific piece of equipment. Generalized diagrams are not acceptable.

6. A copy of each approved shop drawing.
7. A copy of the fire alarm certification.

1.14 SYSTEM DEMONSTRATIONS:

A. After systems have been tested and placed in proper working order, but before final acceptance of the electrical systems, demonstrate the systems to the Owner. All features and functions of all systems shall be explained and the Owner shall be instructed in proper operation and maintenance of the equipment and systems. Times to be allowed for those instructions are as follows:

1. Power 4 hours

B. Furnish the necessary trained personnel to perform the demonstrations and instructions. The manufacturer's representatives for the equipment shall be present to assist with the demonstrations.

C. Coordinate the dates and times for performing the demonstrations with the Owner.

D. See individual sections for special requirement of systems.

1.15 MAINTENANCE MATERIALS:

A. All special tools provided by the manufacturer for installation or maintenance of the equipment shall be delivered to the Architect before final acceptance.

1.16 TEMPORARY ELECTRICAL SERVICE:

A. Provide temporary electrical service for power and lighting during construction. Maintain during construction and remove service after construction is completed.

B. As a minimum, the temporary system shall consist of an electrical service, distribution system, load-center panel, grounding, 15 amp and/or 20 amp branch circuits, grounded type receptacles and lighting fixtures.

C. Receptacles shall be installed as required to provide temporary power to all locations of the construction site. No extension cord or combination of cords used on the site should exceed 100 feet in total length. All receptacle circuits shall be protected with ground-fault type circuit breakers or individual receptacles must have ground-fault circuit interrupters built-in. Receptacles on the construction site shall not be installed on branch circuits which supply temporary lighting.

D. Provide sufficient number of temporary light fixtures for a safe installation for all trades throughout the building. All lamps for general illumination shall be protected from accidental contact or breakage by suitable fixture or lampholder with a guard. (No Exceptions.)

E. Electrical service, distribution equipment, receptacles, etc., shall be installed in a weatherproof installation.

F. Special power requirements by other trades shall be provided for at the expense of the other trade.

G. When the permanent wiring for lighting and power is installed the Electrical Contractor may, with approval of the Architect, use the permanent system, provided he assumes full responsibility for all Electrical materials, equipment, and devices contained in the systems and provided that roof drainage system and roofing is completed.

1.17 GRAPHIC REPRESENTATION AND JOB CONDITIONS:

A. The drawings shall serve as working drawings for the general layout of the various items of equipment. However, layout of equipment, accessories, specialties, and conduit systems are diagrammatic unless specifically dimensioned; and do not necessarily indicate every required junction box, pull-box or other similar items required for a complete installation.

B. All scale dimensions are approximate. Before proceeding with any work, the contractor shall carefully check and verify all dimensions, and take full responsibility for fitting the equipment which he intends to install into the spaces provided.

C. The architectural drawings take precedence over the electrical drawings in the representation of the general construction work, and the drawings of the various trades take precedence in the representation of the work of those trades. The Contractor shall refer to the architectural drawings and the drawings of other trades to coordinate the electrical work with the other work on the premises.

D. The drawings indicate the required sizes and points of termination of conduit and wiring and suggest proper routes to conform to the structure. Avoid obstructions and preserve clearances; however, it is not the intention of the drawings to show exact routing, all necessary offsets, etc. It shall be the responsibility of the Contractor to install all of his work to best suit actual conditions.

E. All changes from the drawings necessary to make the work conform to the building, as constructed and to fit the work of other trades or to conform to laws and ordinances; and any reasonable changes and adjustments in location of fixtures, equipment, etc., prior to the installation, shall be made as required for a complete installation without incurring any additional expense to the Owner and shall be noted by the Contractor on the Record Drawings.

F. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with maximum overhead clearance, notwithstanding the fact that the locations indicated by drawings may be distorted for clarity in presentation. Coordinate work with other trades involved.

G. Locate operating and control equipment properly to provide easy access, and arrange electrical work with adequate access for operation and maintenance.

H. Give right-of-way to piping, which must slope for drainage.

I. Notify the Architect/Engineer immediately in writing of any differences between drawings, specifications, and conditions of the work, prior to commencing work

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Deliver all materials to the project properly identified with names, model numbers, types, grades, compliance labels and other information needed for identification.

B. Unless otherwise approved in writing, all materials furnished under this Specification shall be new and shall be standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest design. In addition, all equipment shall be listed by Underwriters Laboratories or other independent testing laboratories and bear their label in prominent sight.

C. Equipment of any one type shall be by one manufacturer unless specifically indicated otherwise.

D. Provide materials and equipment specified under this Division, and incidental materials and equipment not specifically mentioned but essential to make the installation complete, in accordance with the intent and requirements of the drawings and specifications.

E. Where others furnish materials for installation under this Division, the Contractor shall notify the supplier of dates he will be ready for delivery as specified in the General Conditions. The Contractor shall receive, unload, handle, store, protect, and insure the material until ready for actual installation. Upon receipt of material furnished by others, the Contractor shall spot-check or check the entire shipment and promptly advise the Architect/Engineer in writing of any damage and/or missing components. Any material which is subsequently lost or damaged due to negligence on the part of the Contractor shall be promptly replaced (or repaired to the satisfaction of the Owner) at the Contractor's expense.

2.2 MISCELLANEOUS METALS:

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Fasteners: Zinc-coated, type, grade, and class as required.

2.3 CONCRETE:

A. Portland Cement shall conform to ASTM C-150, Type I or II as specified in Division 3.

B. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout, recommended for interior and exterior applications, and as specified in Division 3.

2.4 ACCESS DOORS:

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

1. J.L. Industries.
2. Karp Associates, Inc.
3. Milcor Div. Inryco, Inc.

B. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams to be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

C. Frames: 14-gage steel, with suitable means of anchoring frame to wall construction. Provide a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, cast-in-place concrete, ceramic tile, or wood paneling. Units shall be provided with perforated flanges with wallboard bead for installation in gypsum wallboard or plaster.

D. Doors: Flush panel, 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Provide Locking device, which shall be a screwdriver-operated cam lock. Finish shall be factory applied prime coat.

E. Fire-Rated Units: Self-closing mechanism and UL rated for the installation encountered. Provide UL label on each fire-rated access door.

2.5 OPENINGS, CHASES, AND SLEEVES

A. The Contractor shall be responsible for the proper location and sizes of all openings, chases, sleeves, etc. required in the structure to accommodate his work, and shall sufficiently, in anticipation of his needs and in advance of construction, provide sleeves, block-outs, etc., as required.

B. Where cutting is necessary to provide work under this section, it shall be done by methods which will not damage the structure, and shall be subject to prior written approval of the Architect. Any damage to structure or finished surfaces shall be repaired to the satisfaction of the Architect at the expense of the Contractor.

C. The Contractor shall pay all costs associated with obtaining approval of cutting or core drilling of existing structure from building Owner’s engineer.

2.6 FIRE STOP MATERIAL:

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

1. International Protective Coatings Corp.
2. Specified Technologies, Inc.
3. 3M Company, Inc.
4. Rector Seal
5. Hilti, Inc.

B. Fire-Resistant Sealants: One-part elastomeric sealant or a two-part, foamed-in-place, silicone sealant, which are formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire resistance ratings as required for the installation. Fire ratings for the sealants shall be as established by testing identical assemblies in accordance with ASTM E814, by Underwriters' Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

C. Fire Safing: Mineral wool or ceramic fiber material manufactured for the specific purpose of fire safing.

D. Cast-in place firestop devices equivalent to Hilti CP680 may be used for vertical penetrations for conduit and sleeves.

PART 3 - EXECUTION

3.1 WORKMANSHIP:

A. All work shall be performed by experienced tradesmen in accordance with first class practice and the work shall be neat in appearance and complete to perform the intended function.

3.2 LOCAL CONDITIONS:

A. The Contractor shall carefully examine the local conditions and existing installations, and shall thoroughly familiarize himself with all existing conditions which may affect his work.

B. By the act of submitting a bid, the Contractor will be deemed to have made such examination, to have accepted such conditions, to have made allowance therefor, and included all costs in his proposal. Failure to determine existing conditions will not be considered a basis for the granting of additional compensation.

3.3 COOPERATION WITH OTHER TRADES:

A. Examine areas and conditions under which the electrical systems and equipment are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Contractor shall examine all drawings and specifications for Plumbing, Mechanical, Structural and Architectural work. He shall familiarize himself with any and all conditions related to other divisions which might affect the cost of his own work, and make proper allowances in his work schedule.

C. Contractor shall cooperate with all other contractors doing work on this project in such a manner that all required services, facilities and equipment will be installed in the proper sequence of the work, and will result in a pleasing and harmonious finished appearance. The Contractor shall make any changes necessary to accomplish this.

D. Differences between plans, specifications and conditions of the work shall be reported to the General Contractor and Architect in writing, together with a request that the difference be resolved before that portion of the work is started.

3.4 ROUGH-IN:

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.5 SAFETY:

A. Provide warning lights, signs, and guards for safety as required.

B. Safety of personnel on the project site shall be the responsibility of all divisions. Comply with all local, state, and federal regulations for safety.

3.6 HOUSEKEEPING:

A. The premises shall be kept broom clean at all times.

B. Stocks of material and equipment stored on the premises shall be stored in a neat and orderly manner in their shipping containers. Material and equipment shall be protected as recommended by the manufacturer.

C. Remove from the premises all waste material present as a result of electrical Work.

D. Exposed surfaces of fixtures, panels, and equipment shall be cleaned of all dirt, plaster, etc. before final acceptance of the Work.

E. Finish and cleaning: At the completion of the Work, the following shall be completed:

1. All temporary labels, stickers, etc., shall be removed from all fixtures and equipment. (Permanent nameplates, equipment model numbers, ratings, etc. shall not be removed).

2. Clean all material and equipment installed. Dirt, dust, plaster, stains, and foreign matter shall be removed from all surfaces. Damaged finishes shall be touched-up and restored to their original condition.

3.7 SCAFFOLDING AND HOISTING:

A. Provide all scaffolding and hoisting required for the work of Division 16.

3.8 CUTTING AND PATCHING:

A. Cutting and patching shall be performed in accordance with Division 1 and as specified herein.

B. No structural members shall be cut, drilled, or penetrated without prior approval from the Architect.

C. Coordinate the placing of the openings in the new structure as required for the installation of electrical Work.

D. Furnish accurate locations and sizes of required openings for the electrical systems to the appropriate personnel. This shall not relieve Division 16 of the responsibility of checking to assure that proper size openings are provided. When additional patching is required due to failure to inspect this work, the Contractor shall be responsible for the patching required to properly close the openings.

E. When cutting and patching of the structures made necessary due to failure to install sleeves or equipment on schedule, or due to the failure to furnish, on schedule, the information required for the leaving of openings, then the Contractor shall be responsible for the cutting and patching required.

F. All roofing work in the new structure shall be performed by Division 7. Coordinate as required.

G. Provide cutting, patching, and painting in existing structures, as required for the installation of Work of this section. Extent of cutting shall be minimized. Use core drills, power saws, and other machines which will provide neat, minimum openings. Refer to structural drawings for lintels and supports to be furnished by others for the electrical work. All other lintels and supports required for the electrical work shall be furnished by Contractor. Patching shall match and equal adjacent materials and surfaces and shall be performed by craftsman skilled in the respective craft required. Patched finishes shall be approved by the Architect.

H. All public and private property damaged as a result of work performed under this Contract shall be repaired and replaced by this Contractor to the satisfaction of the authorities having regulatory jurisdiction and building Owner.

3.9 PROTECTION OF WORK:

A. All conduit openings shall be kept closed by means of plugs or caps to prevent the entrance of foreign matter.

B. Special care shall be taken for the protection of equipment furnished. All equipment and material shall be completely protected from weather elements, moisture, painting, etc. until the project is completed. Damage from rust, paint, scratches, etc. shall be repaired as required to restore equipment to original condition.

C. Protection of equipment during the painting of the building shall be the responsibility of others, but this shall not relieve Contractor from the responsibility of checking to assure that adequate protection is provided.

D. Where the installation or connection of equipment requires work in other areas previously finished Contractor shall be responsible that such areas are protected and are not marred, soiled, or otherwise damaged. Repairing and refinishing damaged areas shall be the responsibility of Contractor and shall be approved by the Architect.

E. Any such fixtures, equipment or apparatus damaged prior to final acceptance of the work shall be restored to its original condition or replaced by the Contractor at the Contractor's expense. At completion, fixtures and equipment shall be thoroughly cleaned.

F. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent finished areas, when required.

G. All trenches and pits shall be maintained on a continuous basis, free of water for protection of work.

3.10 ERECTION OF SUPPORTS AND ANCHORAGE:

A. Metal: Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation as required to support and anchor electrical materials and equipment.

1. Field Welding: Comply with AWS "Structural Welding Code."
2. Select fastener sizes that will not penetrate members where opposite side will be exposed to view, will receive finish materials, or may damage other surfaces, such as roofing. Make tight connections between members.
3. Attach anchors and fasteners to building structure as required to support applied loads.

3.11 APPLICATION OF SEALANTS:

A. Provide sealant as required by manufacturers' printed application instructions applicable to products and applications indicated.

B. Installation of Fire-Stopping Sealant: Provide sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.12 INSTALLATION OF ACCESS DOORS:

A. Provide access doors as required for access to concealed equipment, controls, etc. Equipment above lay in ceilings shall not require an access door in the ceiling. Access doors shall be furnished by Contractor and installed by Division 9.

3.13 PAINTING:

A. Painting, except as specified, shall be performed by Division 9.

B. Equipment, which has damaged finish, shall be repainted to match the original factory finish.

C. All exposed ferrous metal furnished by this Division, such as hangers, struts, structural steel, etc., shall be primed as specified in Section "PAINTING".

3.14 ELECTRICAL INSTALLATION:

A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves 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. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services.
8. Install systems, materials, and equipment to conform with approved shop drawings, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.15 ADJUSTING AND TESTING:

A. All electrical equipment furnished by Contractor and electrical equipment furnished by others shall be adjusted, aligned, and tested for proper operation.

B. Contractor shall be responsible for the installation of the proper size heaters in all manual and magnetic starters supplied by this Division. This Division shall be responsible for the operation, service, and maintenance of all new electrical equipment during construction and of all new electrical equipment during construction and prior to acceptance by the Owner of the completed project. The trade supplying equipment shall be responsible for maintaining proper lubrication.

3.16 WIRING AND CONNECTION OF EQUIPMENT BY OTHERS:

A. Equipment, which is to be provided by others for connection and/or installation by this Contractor, will be delivered to him at the building in proper condition and complete with all accessories and instructions for the proper installation and connection.

B. Outlets and wiring shown are diagrammatic only, and the correct location, type of outlet, wiring and connection shall be as required for the equipment installed. Equipment connections may be with flexible metal conduit with maximum length of 6'-0" except where indicated otherwise.

3.17 OPERATION DURING CONSTRUCTION:

A. This Contractor is responsible for the installation and operation, service and maintenance of all new electrical equipment during construction and prior to acceptance by the Owner of the completed project. The trade supplying equipment shall be responsible for maintaining proper lubrication. The services of trained factory personnel shall be obtained where required by this specification, and where required for successful startup of equipment. Warranty periods shall not commence until final acceptance by the Owner.

3.18 UTILITY SERVICES:

A. Provide the main electrical service from secondary side of utility pad-mounted transformer underground to the main switchboard. The cables shall be of sufficient length for connection by Power Company to the transformer. Provide PVC conduits from transformer to property line for primary service cables. Primary cables, transformer, metering facilities and station ground will be provided by the Power Company.

B. Telephone service shall be PVC conduits, underground from backboard, to the property line and terminated 24" below grade or as directed. Obtain from the Southwestern Bell Telephone Company the exact location of termination.

C. The end of all power and telephone service conduits shall be sealed watertight after installation of the cables, and this location shall be documented as specified for the Record Documents.

D. The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact locations of all existing utilities and services before commencing work, and agrees to be fully responsible for any and all damages which might be caused by the Contractor's failure to exactly locate and preserve any and all underground utilities and services.

E. This Contractor to reimburse the Power Company and Bell Telephone Company all cost chargeable to the Owner for these permanent services.

3.19 PHASED CONSTRUCTION:

A. Construction phasing and sequencing requirements are indicated on the drawings and Division 1. All work shall be performed in accordance with these requirements.//

3.20 OCCUPANCY ADJUSTMENT:

A. After eleven months from date of substantial completion, provide a Master Electrician at the job site, to tighten all connectors, terminals, bus bar connections and set screws relating to electrical equipment connections. Items that are to be checked, but not limited to, are as follows:

1. Panelboards
2. Switchboards
3. Motor starters or controllers
4. Disconnect Switches
5. Fused Switches
6. Building Grounding Systems

B. All connections shall be in accordance with equipment manufacturers published torque tightening values for equipment installed. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in U.L.'s 4B6A.

END OF SECTION 16000