

## MEA No.: 171001

## SECTION 16000 – ELECTRICAL - GENERAL

## 1.1 GENERAL

- A. Applicable requirements of the Contract Documents, preceding the Technical Specifications, apply to this Section. In the event of conflict between the Specifications, the most stringent shall apply.
- B. Separation of these Specifications into Divisions and Sections is for convenience only and is not intended to establish limits of work.
- C. Consult index to be certain that set of Documents and Specifications is complete. Report omissions or discrepancies to the Owner's Representative.
- D. The Contractor shall employ high standards of good workmanship and shall pay special attention to the safety of personnel and equipment. The installation of material and equipment shall be in conformance with the latest edition of all codes and standards, as adopted by the local authority having jurisdiction, including those listed in Paragraph: STANDARDS. The agency having the most stringent requirements shall be adhered to.
- E. The Contractor shall make a thorough examination of the site and shall make due allowances for difficulties and contingencies to be encountered. All dimensions shall be checked and verified by the Contractor at the site.
- F. The Contractor and all Sub-Contractors shall have a minimum of three years proven experience on projects with similar levels of complexity and magnitude. Experience shall be based on the experience as a company and not on the experience as individuals.
- G. The Drawings and Specifications are intended to function as a common set of documents. Anything shown on the Drawings but not mentioned in the Specifications, or mentioned in the Specifications and not shown on the Drawings, shall be equally binding as if both noted on the Drawings and called for in the Specifications.
- H. The Owner's Representative is the person appointed by the Owner. The Owner's Representative will advise and consult with the Owner during construction and until final payment is due. The Owner's instructions to the Contractor shall be forwarded through the Owner's Representative.

## 1.2 SCOPE

- A. The work covered by and included in these Specifications consists of the furnishing of all materials, all equipment, labor, tools and supervision and performing all operations necessary for the proper and complete execution of the Electrical work in strict accordance with the Specifications and the Drawings and subject to the terms and conditions of the Contract.
- B. Unless noted otherwise, this Contractor shall furnish and install all control devices together with control wiring, conduit and all appurtenances and accessories necessary to perform the operating functions as specified. Control devices shall include, but not be limited to, thermostats, switching relays, control relays and transformers. Control wiring shall include but is not limited to, 120 volt control wiring, as well as, low voltage wiring for dimming, occupancy sensor wiring and other wiring. Wiring materials and installation shall conform to the National Electric Code. All control system wiring except low voltage wiring, shall be 14 AWG minimum installed in 1/2 inch diameter minimum conduit.

- C. It is the intent of these Drawings and Specifications to provide complete and fully functional systems unless otherwise indicated. The Contractor shall provide all incidental components (locknuts, screws, washers, etc.) required to accomplish this intent. This shall include furnishing devices which are obviously required by the design intent such as the second three-way switch where one such switch is shown, fuses for fused disconnect switches, etc.

### 1.3 DEFINITIONS

- A. The term "Contractor" or "Electrical Contractor" when used in this Specification refers to the Contractor responsible for all work under this Section.
- B. The term "Provide" refers to this Contractor purchasing, delivering and installing as a part of this Contract.

### 1.4 STANDARDS

- A. NFPA 70 National Electrical Code (NEC)
- B. NFPA 72 National Fire Alarm Code
- C. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures
- D. Pennsylvania Act 45, Uniform Construction Code (UCC)
- E. Underwriters Laboratories Electrical Construction Materials Directory
- F. International Building Code (IBC)
- G. Public Law 101-336, The Americans with Disabilities Act of 1990
- H. ASTM B-8 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft
- I. ASTM B-496 Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
- J. NETA ATS acceptance testing specifications for electrical power distribution equipment and systems

### 1.5 NOTIFICATION

- A. Trades that have work connected with the Electrical work and trades that do preparatory work for electrical equipment shall be notified for installation requirements and scheduling.
- B. The Owner's Representative shall be informed of the installation schedule to allow sufficient time for inspection without any work delay.
- C. All work shall be coordinated to avoid cutting of work in place and interfering with other operations.
- D. In compliance with state law, contact individual companies to have utility locations marked in the field and to otherwise locate underground objects as may be necessary prior to the start of construction. Pennsylvania law requires three working days notice for the construction phase and ten working days in design stage. Call Pennsylvania One Call System, Inc. (1-800-242-1776, as of this writing).

## 1.6 CONTRACT DRAWINGS

- A. The Contract Drawings are diagrammatic and indicate relation of conduits, connections and equipment. Vendor catalog numbers do not necessarily indicate trim and fitting requirements. Drawings do not indicate all boxes and fittings that may be required. Therefore, the Contractor shall carefully investigate structural and finish conditions affecting work. The Contractor shall furnish all boxes, fittings, hangers and accessories as may be required to meet these conditions at no additional cost to the Owner.
- B. Do not scale the Drawings. The Contractor shall check conditions at the site for dimensions and sizes pertaining to the structure.
- C. Do not deviate from the Drawings without prior written approval.

## 1.7 LINES, GRADES AND SURVEYS

- A. All necessary surveys, lines, grades and measurements are the responsibility of the Contractor desiring the information for the proper installation of his work. The Contractor is responsible for the proper installation of the work with respect to other Contractors.
- B. Grades, elevations and locations shown on the Drawings are approximate and the Contractor shall check all such information on the site before proceeding with the work.

## 1.8 WORKMANSHIP

- A. All equipment, conduit, fixtures, etc. shall be installed in a workmanlike manner meeting the accepted standards of the representative industry.
- B. All work to be performed shall be done by qualified mechanics. All mechanics in the employ of this Contractor on this project shall be skilled in the phases of the work to which they are used. The mechanic's affiliation with labor organizations shall be acceptable to all trades employed on the project.

## 1.9 BRAND NAME OR EQUAL

- A. If an item in this solicitation is identified as "brand name or equal," the purchase description reflects the characteristics and level of quality that will satisfy the Government's needs. The salient physical, functional, or performance characteristics that "equal" products must meet are specified in the solicitation.
- B. To be considered for award, offers of "equal" products, including "equal" products of the brand name manufacturer, must:
  - 1. Meet the salient physical, functional, or performance characteristic specified in this solicitation.
  - 2. Clearly identify the item by:
    - a. Brand name, if any

- b. Make or model number.
  - 3. Include descriptive literature such as illustrations, drawings, or a clear reference to previously furnished descriptive data or information available to the Contracting Officer.
  - 4. Clearly describe any modifications the offeror plans to make in a product to make it conform to the solicitation requirements. Mark any descriptive material to clearly show the modifications.
- C. The Contracting Officer will evaluate "equal" products on the basis of information furnished by the offeror or identified in the offer and reasonably available to the Contracting Officer.
  - D. Unless the offeror clearly indicates in its offer that the product being offered is an "equal" product, the offeror shall provide the brand name product referenced in the solicitation.

#### 1.10 SUBMITTAL PROCEDURES

- A. Transmit each submittal with an Engineer accepted form. Include one copy each for the Owner and the Owner's Representative in addition to copies required by the Contractor.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- C. Identify Project, Contractor, Sub-Contractor or Supplier; pertinent drawing sheet and detail number and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and Contract Documents.
- E. Incomplete submittals shall not relieve the Contractor of providing a complete and functional system.
- F. Schedule submittals to expedite the Project. Coordinate submission of related items.
- G. Submittals by the Contractor must be in complete compliance with the Contract Documents unless exceptions are identified. Exceptions to the Contract Documents may only be made to improve the project. Exceptions cannot be taken which would provide an incomplete and/or nonfunctional system.
  - 1. Exceptions must be included in/on the submittal in a separate paragraph or drawing block located below the Contractor's stamp identified by the title "Exception to Contract Documents." Exceptions cannot be part of the standard Contractor's stamp.
- H. Provide space for Contractor and Owner's Representative review stamps.
- I. The Engineer will return shop drawings with the following designations:
  - 1. Reviewed: Further submission not required.
  - 2. Reviewed as Noted: Corrections must be incorporated in final installation. Further submission not required unless specifically noted.
  - 3. Review Not Required: Placed in project files for information only.

4. Revise and Resubmit: Make necessary changes and resubmit prior to fabrication or purchase.
5. Rejected: Does not meet project requirements. Resubmit in accordance with Contract Documents.

- J. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

#### 1.11 SHOP DRAWINGS/PRODUCT DATA

- A. Submit shop drawings and/or catalog cuts for all specified materials and equipment.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in a single submittal.
- C. Mark dimensions and values in units to match those specified.
- D. Show equipment sizes and dimensions.
- E. Include wiring diagrams, hole location and sizes, and other data that could affect work by other trades.
- F. Show manufacturer's names, trade names, catalog numbers, accessories, special features and rating data.
- G. Indicate required clearances for operating parts, for removal and for servicing.
- H. Show all applicable performance data.
- I. Show sound power levels of all rotating equipment.

#### 1.12 CUTTING AND PATCHING

- A. In new construction, the Contractor shall give the General Contractor complete information as to size of openings required in floors and walls, etc., so that such openings may be provided as the project progresses. In existing construction, the Contractor shall do his own cutting and patching required for the installation of his work.
- B. If openings are omitted or are incorrect through failure of the Contractor to follow these instructions, the Contractor shall, at his own expense, engage the trade, which originally installed the work, to cut and patch to the satisfaction of the Owner's Representative.
- C. All cutting and patching of every nature required in connection with this Contract shall be done by the Contractor with mechanics experienced in their respective lines of work. All patching shall match adjacent finishes.
- D. All cutting in building shall be done with great care so as not to leave an unsightly surface, which may not be concealed by plates, escutcheons, or other normal concealing construction. If such unsightly conditions occur the Contractor shall be required at his own expense, to engage the General Contractor to replace the damaged materials with new materials.

- E. Any penetrations of a roof shall be done in accordance with the roof manufacturer's recommended details for that type of roof and per industry recognized good practices. The penetration methods shall not invalidate any existing warranties.

#### 1.13 SUBSTITUTIONS

- A. Any bidder wishing to substitute "or equal" equipment may request a substitution. Manufacturer's which are submitted as substitutions for approved equal status are considered to have equipment of similar quality, however, the Contractor shall not assume that a piece of equipment by a manufacturer submitted as a "substitution" will be automatically accepted. Compliance with the Drawings and Specifications is still required. If the substituted material is considered to be unacceptable, the Contractor shall provide the equipment as originally specified.
- B. Substitutions are encouraged when there is significant cost savings or improvement to the project. Submit reasons for changes with any requests for substitution. All requests for substitutions must be made within 30 days of contract award unless stated otherwise in the General Conditions.
- C. Bid alternates shall be clearly defined in order to be evaluated during the bidding process.
- D. By submitting an alternate or substitution, the Contractor automatically agrees to the following:
  - 1. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative to review the substituted materials, in accordance with the then current Owner's Representative's hourly rate.
  - 2. The Owner shall be reimbursed by the Contractor for any additional costs incurred by the Owner's Representative field or office conferences caused by the substituted materials in accordance with the then current Owner's Representative's hourly rate.
  - 3. The consideration of alternates/substitutions does not obligate the Owner's Representative to accept same.
  - 4. In the event a brand is approved and substituted, it is the responsibility of the Contractor to so coordinate his substituted material into the original work at no extra cost to the Owner or any other Contractor.

#### 1.14 CONCRETE AND MASONRY WORK

- A. Unless otherwise noted, all concrete bases, reinforcing, etc. and masonry work required to install the respective Contract Work shall be furnished and installed by the respective Contractor.
- B. Provide a 3-1/2 inch high housekeeping pad for all substations, switchboards, motor control centers, transformers, power converters, and other floor mounted equipment. Pads shall extend one inch in all directions beyond the edge of the equipment.
- C. The Contractor shall furnish all materials, labor, equipment and tools necessary to complete concrete and cement work.
- D. All concrete work shall comply with the requirements of the ACI Building Code (ACI 318), the ACI Detailing Manual (ACI 315) and the Specifications for Structural Concrete for Buildings (ACI 301).

- E. If cold weather construction is required, freeze protection must be provided for all concrete. The subgrade cannot be frozen. The concrete must be treated and blankets must be used during curing. All the requirements of ACI 306R must be followed. Any contractor not experienced in cold weather concrete construction shall obtain a copy of the most recent version of ACI 306R and take all precautions prescribed therein.
- F. All reinforcing steel shall be manufactured from high strength billet steel conforming to ASTM Designation A-615 Grade 60. Welded-wire fabric shall comply with ASTM A-185.

#### 1.15 MATERIALS

- A. All materials and equipment provided by this Contractor shall be new, without imperfections and blemishes and shall be protected from the elements prior to installation in building.
- B. All equipment shall meet the requirements of NFPA 70 and, in addition, shall be tested, listed and labeled by an approved authority (UL) and shall be installed in accordance with its listing. The Owner's Representative shall have full authority to reject any equipment, material or installation of same, showing defects of manufacture or workmanship.
- C. All equipment subject to specific requirements of the Owner's insurance company (fire alarm system, security system, etc.) shall meet the insurance company's requirements.

#### 1.16 METHODS

- A. The Electrical Contractor shall confer with all other Contractors and shall apply for detailed and specific information regarding the location of all equipment as the final location may differ from that indicated on the Drawings. Outlets, equipment or wiring improperly placed because of the Electrical Contractor's failure to obtain this information shall be relocated and reinstalled by the Electrical Contractor without additional expense to the Owner.
- B. Each Contractor, upon request of the Owner's Representative, shall expedite the work of a specific area, section or part of the project to permit the installation of another part of the work.
- C. All conduits, wire, cable, wiring devices and equipment shall be installed in such a manner as to preserve access with sufficient space provided for proper operation and maintenance to any existing equipment or to any new equipment installed under this Specification or under other Specifications or Contracts for this building.
- D. This Contractor shall coordinate his work with that of other trades so that all work may be installed in the most direct manner and so that interference between piping, ducts, equipment, architectural or structural features will be avoided. If an interference results, the Owner's Representative shall decide which work is to be relocated, regardless of which was first installed. Such relocation shall be at no additional cost to the Owner.
- E. All materials and equipment installed by the Contractor shall be firmly supported and secured to the building construction where required.
- F. All items of labor, material and equipment not specified in detail or shown on the Drawings but incidental to, or necessary for, the complete and proper installation and proper operation of the work described herein or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Specifications or Drawings.
- G. All equipment shall be installed in accordance with the manufacturer's recommendations and installation instructions. The manufacturer's installation recommendations and instructions shall be considered part of the Contract.

- H. The equipment installation shall also adhere to the installation recommendations and instructions of other building components such as wall and roof materials which the installation impacts.
- I. Any questions regarding means or methods of construction shall be addressed during the bidding phase of the project.

#### 1.17 SCHEDULING OF WORK

- A. The Contractor shall attend all planning meetings, provide scheduling information and work with all trades to obtain a workable project schedule that meets the Owner's requirements.

#### 1.18 PROTECTION

- A. Each Contractor shall effectively protect his work and materials with tarpaulins or heavy plastic material against dirt, water, chemicals, plaster, or damage during the entire period of installation or until he is directed to remove the coverings by the Owner's Representative. Any damaged material must be removed and replaced by the Contractor without additional cost regardless of the cause of the damage. All openings in conduit, fittings, etc., must be effectively sealed to exclude dirt, sand and other foreign substances.

#### 1.19 PROTECTION OF OWNER'S EQUIPMENT

- A. The Contractor shall provide any temporary work required to protect the Owner's equipment and to contain the dust generated during construction. Any measures taken by the Contractor for the protection of equipment shall be installed to the satisfaction of the Owner or Owner's Representative, which may include any and all provisions listed in DIVISION-1 General Requirements and/or in accordance with the appropriate technical specifications for wood and plastics in DIVISION-6. An approved protection material is nylon reinforced flame retardant and anti-static Griffolyn T-55 ASFR 6 mil film (1-800-231-6074 - as of this writing).

#### 1.20 WORK IN THE EXISTING BUILDING

- A. The Electrical Contractor shall be responsible for thoroughly surveying the existing building to determine the extent and cost of installing new equipment and materials in the existing building.
- B. All new equipment and materials shall be installed in existing building as herein specified.
- C. All Contractors before starting any cutting in the existing building must first obtain approval from the Owner's Representative on the site before cutting at each location. This Contractor shall provide any temporary work required to retain the dust generated by his work as may be directed by the Owner's Representative. All dust found, which has escaped the area of cutting shall be properly removed by the Contractor without additional cost to the Owner.
- D. All openings cut into the exterior of the existing structure must be completely sealed and waterproofed before leaving the job site each day. This shall be done by the Contractor responsible for the cutting.
- E. Contractor should not assume utilities can be installed as shown. Drawings are diagrammatic and utilities may need to shift to accommodate existing conditions. It is believed that in general the project can be constructed with utilities in approximately the locations as shown.

#### 1.21 INTERRUPTION OF SERVICES



- A. The Contractor shall schedule his work to avoid any interruption of any utility services to the operating areas of the building during normal working hours. Interruption of services shall be done during off hours at no additional cost to the Owner.
- B. The Contractor shall notify the Owner and the Owner's Representative at least three days prior to any interruption of services. The scheduling of all interruptions shall be approved by the Owner.

#### 1.22 RUBBISH REMOVAL AND CLEAN-UP

- A. Each Contractor is responsible for periodic removal of all rubbish resulting from his work. All surplus material, refuse, rubbish, etc., shall be removed from the job site at the completion of the Contract. The Owner's Representative must be satisfied with the removal and clean up.
- B. All rubbish shall be legally disposed of by the Contractor. Rubbish removed from the site shall become the responsibility of the Contractor.
- C. Any hazardous materials discovered which are not included in the contract shall be brought to the Owner's attention prior to removal from the site.

#### 1.23 DELIVERING AND STORAGE OF MATERIALS AND EQUIPMENT

- A. Deliver accessories, small unmarked parts, adhesives, sealants and incidental items to site in manufacturer's original, unopened, labeled containers.
- B. Store materials and equipment to prevent damage and injury. Store ferrous materials to prevent rusting. Store equipment and lighting fixtures to prevent staining and discoloring.

#### 1.24 AS-BUILT DRAWINGS

- A. During construction, the Contractor shall maintain a record set of "red-lined" installation prints. He shall record on these prints, all deviations from the Contract Drawings in conduit and electrical conductor sizing, equipment sizing, location and details.
- B. At the completion of the work, the Contractor shall transfer this information neatly onto sepias and forward these sepias and the as-built prints to the Owner's Representative.
- C. At the completion of the work, the Contractor shall transfer this information onto one set of prints and onto computer generated construction documents and forward the as-built prints and an electronic copy to the Owner's Representative. Electronic copies of the most recent drawings without title blocks will be made available to the Contractor in AutoCAD versions 2011

#### 1.25 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Prior to completion of this project, the Contractor shall deliver to the Owner's Representative for approval three copies of an Operating and Maintenance Manual consisting of items outlined hereinafter.
- B. The purpose of this manual is to assist the Owner in routine operation, maintenance, servicing, troubleshooting and procurement of replacement parts. All information in the manual shall be as-built and only material pertinent to the project shall be included.
- C. The manual shall include the following:

1. Manuals shall be bound, 8-1/2 x 11 inch text pages and set in three-ring binders with durable covers.
  - a. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of project and subject matter of binder when multiple binders are required. All subject matter shall be in typewritten format.
2. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab labeling clearly printed under reinforced laminated plastic tabs.
  - a. Contents: Prepare a Table of Contents for each volume with product or system description identified, type on white paper.
  - b. Part 1: Directory, listing names, addresses and telephone numbers of Owner's Representative, Contractor, Sub-Contractors and major equipment suppliers.
  - c. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses and telephone numbers of Sub-Contractors and suppliers. Operating and start-up instructions shall be written in a concise step-by-step manner. Maintenance instructions shall include maintenance schedules, procedures, adjustments and trouble-shooting techniques. Identify the following:
    - 1) List of equipment
    - 2) Parts list for each component
    - 3) Operating instructions
    - 4) Maintenance instructions for equipment and systems
  - d. Part 3: Project documents and certificates, including the following:
    - 1) Shop drawings and product data
    - 2) Control wiring diagrams
    - 3) Certificates
    - 4) Photocopies of warranties
    - 5) Electrical inspection certificate
    - 6) Copy of panelboard directory
  - e. Submit one copy of completed volumes in final form 30 days prior to final inspection. This copy will be returned after final inspection, with the Owner's Representative comments. Revise content of documents as required prior to final submittal.
  - f. Submit final volumes revised, within ten days after the Owner's review.

#### 1.26 IDENTIFICATION OF MATERIALS AND EQUIPMENT

- A. All panels, combination motor starters, safety switches, motor operated time switches, junction and pull boxes, in-panel sub-feeders and similar items installed under this project shall be identified by name, function and/or control. Included on nameplates shall be the voltage of the involved circuits. Nameplates shall be at least one by three inch with characters not less than 1/4-inch high. They shall be made up of two laminated black plastic sheets bonded with a middle sheet of white plastic and characters engraved in one black sheet to the depth of the white plastic. Provide warning labels on the front of enclosures warning of potential electric arc flash hazard in accordance with the National Electric Code.
- B. The Contractor shall provide a typewritten indexed directory in each panelboard indicating the item or items controlled by each circuit.
- C. Directories in any existing panelboards shall be updated in typewritten format showing all circuit changes.
- D. All circuits shall be identified in outlet boxes as to the specific circuit connection. All circuit conductors shall also be identified as to the voltage of the circuit.
- E. Color coding shall be as listed in Section "WIRING" of these Specifications.
- F. A typewritten list of nameplates shall be submitted to the Owner's Representative for approval before ordering.

#### 1.27 PAINTING

- A. Where factory finishes are provided and no additional field painting is specified; all marred or damaged surfaces shall be touched up or refinished to a smooth and uniform finish. Provide one-pint quantity of factory finish touch-up paint to the Owner.
- B. All exposed ferrous metalwork, pipe, supports, hangers, insulation and other surfaces not factory painted shall be painted with one prime and two finish coats. Paint, surface preparation and application shall be as specified in the Architectural Section: PAINTING. Colors shall match existing work or shall be as selected by the Owner's Representative.
- C. A quantity of touch-up paint (minimum size - one pint) shall be provided for each color used by the Contractor. Touch-up paint shall be delivered to the Owner.

#### 1.28 LAWS, ORDINANCES, AND REGULATIONS

- A. All systems in all and/or part shall conform to all pertinent laws, ordinances, and regulations of ALL bodies having jurisdiction, at all governing levels. In case of conflict between governing levels, the more stringent law shall apply. As a minimum, all work shall comply with IBC, NFPA, OSHA and USBC requirements.
- B. The Contractor shall pay all fees and prepare and submit all utility applications and obtain and pay for all permits, inspections, and certifications required with his work.
- C. All electrical work shall be inspected and certified by the local authorities; if no local authority inspection is available an independent inspection agency such as the Middle Department Inspection Agency (MDIA) shall be hired by the Contractor.
- D. The Contractor shall make the Owner's Representative aware of any and all code variances that may apply to the electrical equipment/systems. Application for said variances shall be the responsibility of the Owner's Representative.

1.29 BUILDING EXPANSION JOINTS

- A. Provide expansion joints in conduits where they cross building expansion joints.

1.30 FASTENINGS, SUPPORTS, AND HANGERS

- A. Fastenings, supports, hangers, miscellaneous steel, clamps, and anchors shall be made for purpose for which they are to be used. Toggle bolts or machine bolt fastenings shall be used for hollow tile, terra cotta or lath construction; machine screws for structural steel fastenings; lead expansion shields, and machine screws or lag screws for solid masonry fastening; lag screws for wood fastening. All equipment and conduit shall be rigidly and firmly installed to prevent swaying, vibrating or sagging by malleable or wrought steel hangers of standard design, pipe clamps or fabricated steel supports of approved design. Hangers of horizontal conduit runs shall be adjustable clevis type. Perforated strap iron hangers and caddy clips are not permissible.

1.31 SOUND PARTITIONS

- A. Contractor shall be responsible to identify all sound partitions indicated on the architectural plans. Contractor shall seal all penetrations through the wall to maintain the sound absorption integrity of the partition.

1.32 CONCRETE INSERTS

- A. The Electrical Contractor shall provide concrete inserts of an approved carbon steel wedge type for all hangers. Where two or more parallel conduits are installed continuous inserts may be used. Where required to distribute the load on the inserts, a piece of reinforcing steel of sufficient length shall be passed through the insert. Each insert shall include a knockout piece. Concrete inserts shall have a minimum safety factor of five.

1.33 SLEEVES

- A. The Electrical Contractor shall provide and install sleeves where required to protect equipment or facilities in the installation. Each sleeve shall extend through its respective floor, wall, or partition and shall be cut flush with each surface unless otherwise required.
- B. Sleeves in bearing and masonry walls, floors and partitions shall be of standard weight steel pipe finished with smooth edges. For other masonry partitions, through suspended ceilings and for concealed vertical piping, sleeves shall be No. 22 U.S.G. galvanized iron.
- C. All sleeves shall be properly installed and securely cemented in place.
- D. Floor sleeves shall extend one inch above the finished floor. Space between floor sleeves and passing conduit shall be caulked with an approved graphite packing and/or waterproof caulking compound.
- E. Where conduits pass through waterproofed floors or walls, design of sleeves shall be such that waterproofing can be flashed into and around the sleeves.
- F. Where sleeves pass through fire-rated walls or floors, a fire barrier protection system shall be used.
- G. See architectural drawings for fire ratings of building components.

1.34 FIRE STOPPING

- A. Where cables or conduits pass through fire rated portion of the structure, the annular space between them and the structure shall be filled with an approved fireproof material.
- B. The contractor shall be responsible to provide and install fire-stopping materials and/or systems where his work penetrates fire and/or smoke rated portions of the building and non-fire resistance-rated assemblies. Contractor shall engage the services of a fire protection contractor to review the drawings and install fire protection products to maintain the integrity of all pipe, wire, conduit, etc. penetrations through any and all fire rated walls, floors, barriers, and assemblies or, after providing documentation that proper training has been provided by a qualified fire-stopping vendor, he may provide the fire-stopping work with his own staff. All materials used shall be manufactured such that they are intended to resist the spread of fire and the passage of smoke. This includes but is not limited to rated walls, floors, shafts, ceilings, and non-fire resistance-rated horizontal assemblies. All fire stopping materials used shall have a fire resistance rating equal to or greater than the rated assembly for which they are installed.
- C. For locations where the installed fire stopping material is exposed to normal view, the contractor shall conceal the material with chrome-plated escutcheon plates or other materials that have a flame-spread value of 25 or less and a smoke developed rating of 50 or less, as determined per ASTM E 84. The concealing device shall be approved by the owner's representative prior to installation. Provide shop drawings for each device.
- D. The contractor shall provide components/accessories for each fire-stopping system that are needed to install fill materials and to comply with all system performance requirements as recommended by the fire stopping material manufacturer. Accessories include but are not limited to: mineral wool insulation, ceramic fiber, sealants used to aid in the formation of the fire stopping materials, fire-rated formboard, joint fillers and sealers, collars and steel sleeves.
- E. Fire stopping materials and systems shall include, but are not limited to, the following: fire barrier caulk and sealants, intumescent caulk, intumescent putty, intumescent wrap strips, silicone foams and sealants, fire barrier composite sheets and cast-in-place fire barrier systems.
- F. Fire stopping materials and systems shall be as manufactured by 3M Fire Protection Products, Hilti Corporation, or ProSet Systems Inc.
- G. Meet all requirements of Underwriter's Laboratories and all applicable codes for maintaining the integrity of all fire rated assemblies.

#### 1.35 ANCHOR BOLTS

- A. The Contractor shall provide and set in place, at the time of pouring of concrete foundations, all necessary anchor bolts as required for the equipment called for in these specifications. Anchor bolts shall be of the hook type, of proper size and length to suit the equipment. Anchor bolts shall be set in pipe sleeves of approximately twice the bolt diameter and one half the embedded length of the bolt. The Contractor shall assume full responsibility for proper coordination and placement of the bolts. Upon completion of equipment installation, pipe sleeves shall be caulked in accordance with Section, "SLEEVES" of these Specifications.

#### 1.36 HOODS AND SHIELDS

- A. Hoods and shields shall be installed to protect important electrical equipment from sprinkler system discharge. Hoods and shields shall be constructed of non-combustible material and shall be sized to prevent direct contact of the discharging water and the important electrical equipment. The local authority having jurisdiction shall determine what electrical equipment will be classified "important electrical equipment."

### 1.37 DEMOLITION

- A. The Contractor shall perform all demolition work as indicated on the Drawings as part of this Contract.
- B. The Contractor shall cut and patch as required to perform the demolition work. All openings created must be repaired to match existing conditions.
- C. All cutting and patching shall be performed by mechanics experienced in their respective line of work. If the Owner's Representative is not satisfied with the quality of work, the Contractor shall be required, at his own expense, to engage the General Contractor to replace the damaged materials with new materials.
- D. Contractor shall re-establish circuit continuity to wiring devices that may be affected by the demolition process.
- E. Demolition shall be accomplished in accordance with the construction phasing schedule. Where necessary the Contractor shall provide temporary circuits, supports, equipment, etc. as needed to keep equipment, building area, etc. operational or to allow relocation of the same during demolition of adjacent areas.
- F. Abandoned wire, conduit, devices, and circuits in the area of demolition or individually identified shall be removed in their entirety.
- G. The Owner shall be given the opportunity to retain ownership of all removed materials and equipment. All such items shall be carefully handled and protected and shall be stored by this Contractor on site as directed by the Owner. Any such materials and equipment not desired by the Owner shall become the property of the Contractor and shall be removed promptly from the project site. Disposal shall be in accordance with the regulations of the authorities at the disposal site.
- H. Discovery of any equipment and/or material which is scheduled for removal and which is suspected of containing asbestos shall require termination of demolition until the Owner is informed and proper testing can be conducted to ensure the material does not contain asbestos. Equipment and/or material found to contain asbestos shall undergo asbestos remediation by others at the cost of the Owner prior to completion of demolition.
- I. Any equipment scheduled for removal found to contain PCB's shall be disposed of in accordance with the Environmental Protection Agency requirements. All disposal documentation shall be delivered to the Owner. Costs of said services shall be the responsibility of the Owner.
- J. Fluorescent lamps shall be recycled and/or legally disposed of in accordance with EPA rules. Contractor shall provide documentation of legal disposal when requested. The cost of disposal shall be the responsibility of the Contractor.

### 1.38 WARRANTY

- A. The systems specified herein shall be guaranteed to be free from defects in workmanship and material under normal use and service for a period of one year from acceptance by the Owner or Owner's Representative.
- B. If, within the aforementioned warranty period, any of the materials specified herein is proven to be defective in any way, it shall be replaced or repaired at no additional cost to the Owner. The warranty shall include the providing of all labor and materials necessary for repair or

replacement of any defective components. The Contractor is responsible for the costs of any services required by equipment suppliers that are not included in the suppliers' warranties.

- C. The Contractor shall, after acceptance of the installation by the Owner or the Owner's Representative, provide any service incidental to the proper performance of the system under the warranties outlined above for the time periods listed above.
- D. The Contractor shall be responsible to ensure that his work does not invalidate either wholly or partially any existing warranties or the warranties of material or work performed by others. The Contractor is responsible for the costs to repair damaged work and to re-establish the warranty.

#### 1.39 TEMPORARY ELECTRICAL POWER

- A. Electrical power from the Owner's existing system shall be used without metering and without payment of use charges.
- B. The Contractor must make arrangements with the Owner for power and provide installation of equipment, wiring, switches and outlets necessary to provide adequate supply for lighting and power for construction purposes as well as power for construction site offices and other temporary storage and construction buildings.
- C. The Contractor must provide and maintain lights and signs to prevent damage or injury and must illuminate all hazardous areas. Safety lights must be illuminated during all periods of occupancy.
- D. Materials used for temporary electrical power may be new or used but must be adequate in capacity for the purpose intended and must not create unsafe conditions or violate the requirements of applicable codes.
- E. The Contractor shall install all work to have a neat and orderly appearance and to make it structurally sound throughout. The Contractor must maintain all temporary electrical systems to give continuous service and provide safe working conditions.
- F. The Contractor must modify the service as required by the progress of this job.
- G. The Contractor shall remove all temporary equipment and materials upon completion of construction, repair all damage caused by the installation and restore the area to satisfactory construction.

END OF SECTION 16000