ITEM L-100 GENERAL PROVISIONS AND REQUIREMENTS FOR ELECTRICAL WORK

DESCRIPTION

100-1.1 SPECIAL REQUIREMENTS FOR ELECTRICAL WORK. These special requirements shall apply for the electrical work. Where the contract special conditions or general provisions also apply, the stricter of the documents shall apply.

100-1.2 AUXILIARIES AND ACCESSORIES. Include all auxiliaries and accessories for a complete and properly operating system, to the satisfaction of the Owner and Engineer.

Provide and install all electrical systems and any necessary appurtenances as per FAA Advisory Circulars, NEC and local codes whether specified or shown on drawings or not. The content of these specifications and contract documents in general only refers to work required above and beyond the requirements of the NEC and applicable local codes.

100-1.3 PROJECT PAY ITEMS. The project pay items are provided to be inclusive of all work to be performed as shown in the contract documents. All work not identified with a specific pay item is to be considered work to complete the project and is to be subsidiary to the cost of project pay items provided.

100-1.4 REFERENCES

a. ANSI/NFPA 70 - National Electrical Code
b. NECA - National Electrical Contractors' Association
c. NEMA - National Electrical Manufacturers' Association
d. UL - Underwriters' Laboratories, Inc.
e. FS - Federal Specifications.
f. NESC - National Electrical Safety Code.
g. ANSI - American National Standards Institute.
h. IES - Illuminating Engineering Society.
i. IEEE - The Institute of Electrical and Electronic Engineers
j. ICEA - Insulated Cable Engineers Association
k. National Bureau of Standards
l. NFPA - National Fire Protection Association
m. OSHA - Occupational Safety and Health Administration
n. EPA - U.S. Environmental Protection Agency
o. International Electrical Testing Association.
p. AWS – American Welding Society
q. Other standards as referenced in individual sections

SUMMARY OF WORK

100-2.1 SUPERVISION AND ATTENDANCE. The Contractor shall provide a resident field superintendent who has had a minimum of four years previous successful experience on projects of comparable sizes and complexity. The Superintendent shall be present at all times that work under this division is being installed or affected.

100-2.2 RECORD DOCUMENTS. The Contractor shall maintain the contract documents, shop drawings and samples at the site, in good order and annotated daily to show all changes made during the construction process, per Section L-106, Submittals, Record Documents and Maintenance Manuals. These shall be available to the Engineer for examination.

100-2.3 SAFETY AND PROTECTION. The Contractor shall be solely and completely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

a. All employees on the work and other persons (including but not limited to the general public) who may be affected thereby,

b. All the work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and

c. Other property at the site, adjacent thereto, or utilized by the Contractor including but not limited to trees, shrubs, lawns, walks, pavements, structures, underground facilities, and other utilities not designated for removal, relocation or replacement in the course of construction regardless of whether or not such other property is indicated in the Contract Documents.

d. Existing underground utilities and systems both shown on the plans and those not shown. The Contractor shall have all utilities and systems field located by the FAA or appropriate authorities having jurisdiction and shall take whatever measures necessary to protect the utilities and systems from damage.

The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss.

All hoisting machinery shall be inspected by a competent person or by a government or private agency recognized by the U.S. Department of Labor. A copy of the written inspection report shall be submitted to the Engineer prior to the start of work requiring the use of this equipment.

The installation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow work schedules established in the plans and specifications or as directed by the Engineer. The system shall be installed in accordance with the National Electrical Code and/or local code requirements.

The Contractor shall provide temporary wiring as required to reconnect existing circuits to provide guidance for aircraft to pass through the construction areas on those taxiways/runways, which must remain open. The Contractor shall check all temporary circuits before dark each day to assure that they are operational. In the event of failure, the Contractor shall immediately take steps to restore operation.

The Contractor shall provide all safety rails as required in the performance of the work at building perimeters, at perimeters of floor and/or roof openings and on scaffold systems or platforms in accordance with the above regulations. Maintain safety rails during the duration of the work for this Contract. This Contractor shall be responsible for the removal and replacement of any safety rail necessary for the installation of equipment or materials provided in this work.

Powder-actuated fasteners will not be allowed without express written approval of the Engineer. No fasteners shall pierce the structure until approved by the Engineer.

Clean up of scrap materials and waste of the Contractor to be completed daily or more frequently as needed.

100-2.4 ENGINEERING INSPECTIONS. Items noted by the Engineer, Owner, or their authorized representative during construction and before final acceptance, which do not comply with the contract, documents will be listed in accordance with the specifications. These items will be sent to the Contractor

for action. The Contractor shall have these items corrected.

Items noted after acceptance during the warranty period shall be checked and corrected by the Contractor in a timely manner acceptable to the Owner.

100-2.5 EXISTING CONDITIONS. Investigate the construction site thoroughly and reroute all conduit and wiring in area of new construction in order to maintain continuity of existing circuitry. Existing conduit shown on plans show approximate locations only. The Contractor must verify and coordinate existing site utilities, conduits and piping. The specifications include hand digging within five (5) feet of all existing utilities and all required rerouting in areas of existing utilities, conduits and/or pipes.

The Contractor shall check the construction site and existing conditions thoroughly before bidding. The Contractor shall advise the Engineer of discrepancies or questions noted.

Special attention is called to the fact that work involved in this project is in connection with existing systems/facilities, which must remain in operation while work is being performed. Work must be done in accordance with the schedule specified in the contract documents. Schedule work for a minimum outage to the Owner. Request written permission and receive written approval from the Owner a minimum of 72 hours in advance of any shut-down of existing systems. Perform work required at other than standard working hours where outages cannot be approved during regular working hours. Protect existing buildings and equipment during construction as required.

Special attention is called to the fact that there may be piping, fixtures or other items in the existing systems, which must be removed or relocated in order to perform the alteration work. All conduit, wiring, boxes, etc. that do not comply with these specifications shall be removed or corrected to comply with these specifications. All unused conduit not removed shall be identified and a pull line shall be installed. Bid shall include all removal and relocation required for completion of the alterations and the new construction.

If any difference is discovered between the existing conditions and the drawings or specifications, the Engineer shall be notified in writing immediately.

100-2.6 WORK SEQUENCE

a. Install Work to accommodate Airport's present occupancy requirements during the construction period. Coordinate electrical schedule and operations with Owner, Contractors working on site and other requirements of the specifications. The Airport will remain in operation during construction.

b. Shutdown of existing electrical facilities shall be kept to an absolute minimum and coordinated with the Engineer. Shutdown shall be made at hours convenient to the Airport. This includes evening and weekend hours.

c. The cost of any anticipated overtime work shall be included in the Contractor's base bid. Requests for additional compensation for this work after award of contract will be refused.

d. Coordinate all work with all other contractors and subcontractors.

100-2.7 SYSTEMS GUARANTEE. The work required under this specification shall include a one (1) year warranty unless required otherwise by these specifications. This warranty shall be by the Contractor to the Owner for any defective workmanship or material, which has been furnished under this contract for a period of one year (1) from the date of final acceptance of the system. This warranty shall not include light bulbs in service after one (1) month from date of final acceptance of the system. Explain the provisions of the warranty to the Owner at the "Demonstration of Completed System."

100-2.8 SUBSTANTIAL COMPLETION. All specified work shall be complete prior to final inspection of the work, and all forms and other information requested, including maintenance manuals, shall be submitted to the Engineer for approval one (1) week before the request for substantial completion of the work.

The Contractor shall demonstrate the function of any equipment and system as requested. In the event that any equipment or system does not function correctly, the Contractor shall perform any tests and provide test equipment required to ascertain the cause.

100-2.9 FINAL ACCEPTANCE. All work specified shall be complete after the substantial completion observation, all repairs made, and all required information approved at which time the Owner shall formally accept the project and take possession of all work on a permanent basis.

100-2.10 CONTRACTORS RESPONSIBILITIES. Provide necessary layout, labor, material, equipment, tools, transportation, full time supervision and services required for the satisfactory and timely completion of the work in accordance with the drawings and specifications and contract documents.

Unload, store, protect and re-handle the materials required for this contract until such time that material is in place. Provide protection of materials required of this contract after installation.

Provide all required transportation, erection, maintenance, dismantling and removal of temporary facilities and equipment required by this contract.

Provide all transportation, unloading, distribution, hoisting, rigging, material handling and scaffolding required to install the work of this contract.

Provide all engineering and layout required to perform the work.

Provide temporary electrical power and temporary water and sanitary sewer for the Contractor's field office, Engineer's field office and on-site testing laboratory. Pay all utility company charges. Provide temporary power required for the Contractor's work.

Prior to start of his work the Contractor is to inspect work performed by others on which this work is to be placed on or adjacent to, and report in writing to the Engineer, any condition found to be unacceptable. Failure to make said report shall constitute acceptance of the conditions found and any claims made thereafter due to the unacceptable conditions will not be considered by the Engineer.

Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this work. Work required under other sections, specifications or drawings to be performed by this section shall be coordinated with the respective contractor, and such work performed at no additional cost to the Owner including but not limited to electrical work in support of the mechanical division of the specifications and drawings.

It is the responsibility of the Contractor to coordinate the exact required location of any electrical or electronic equipment, system, or cabinets to be installed in or relocated inside an existing electrical or electronic equipment space. No existing equipment may be relocated in any existing electrical or electronic equipment room without prior coordination and with written approval of the Owner.

Provide and pay for all permits, licenses, fees and inspections required for the performance of the work. The Contractor shall pay all sales, consumer, use and other taxes required to be paid in accordance with the laws of the place of the project.

Provide all tests as required, per the drawings and specifications and submit all test reports to the Engineer.

Provide all excavation, backfill, compaction, shoring and dewatering required for performance of the work.

Provide sleeves for all conduit required as specified.

Protect all work of this contract from damage and intrusion of dirt and foreign objects. Close off open ends of conduit and sleeves on work, which is to be completed at a later date. Remove closure material prior to continuance of work.

Prior to Final Inspection, submit to the Engineer, all Record Drawings and Operation and Maintenance Manuals as specified. Instruct Owner's maintenance personnel in the operation and maintenance of the systems as required by the Specifications.

The above is not all inclusive of the work described by the drawings and Specifications, which form the basis for this contract, but is presented for the Contractor's convenience.

100-2.11 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS. Should anything necessary for the clear understanding of the electrical work be omitted from the contract documents, or should the requirements appear to be in conflict, the Contractor shall secure written instructions from the Engineer before proceeding with the work affected thereby; otherwise the Contractor will be deemed to be proceeding at his own risk and expense. It is understood and agreed that the work shall be performed according to the true intent of the contract documents. Refer to Appendix A Figure 1 for a "Request For Information" (RFI) form.

BASIC MATERIAL & METHODS

100-3.1 REQUIREMENTS OF BASIC MATERIALS AND METHODS. The work shall include the furnishing of the systems, equipment and material specified in these specifications and as called for on the drawings, to include: supervision, operations, methods and labor for the fabrication, installation, start-up and tests for the complete electrical installation. Provide the necessary intertrade/Contractor coordination for the installation to be in a neat and workman like manner.

Drawings for the work are diagrammatic, intended to convey the scope of the work and to indicate the general arrangement and locations of the work. The drawings shall not be scaled for exact sizes or locations. Because of the scale of the drawings, certain basic items such as: conduit fittings, access panels, sleeves, pull and junction boxes may not be shown. Where such items are required by Code or by other sections or where they are required for proper installation of the work, such items shall be included. Coordinate final equipment locations with governing architectural and structural drawings. Layout equipment before installation so that all trades may install equipment in the space available.

Equipment Specifications may not deal with minute items such as components, parts, controls and devices, which may be required to produce the equipment performance specified, or as required to meet the equipment warranties. Where such items are required, they shall be included by the Contractor or the supplier of the equipment, whether or not specifically called for.

Conduit routed through any buildings that interferes with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in the building; do not introduce these into the building at such times or in such manner as to cause damage to the structure. Equipment that requires servicing shall be readily accessible.

Locate all openings required for work performed under this section. Provide sleeves, guards or other approved methods to allow passage of items installed under this section.

Keep cutting and patching to a minimum. Insofar as possible, determine in advance the proper chase

size and openings necessary for the work.

Where cutting and patching are required due to an error of the Contractor, or where the Contractor has not given enough advance notice of the need for holes, recesses, and chases, patching shall be performed by those trades skilled in the use of the materials involved and shall be done at the Contractor's expense.

Any cutting of work in place shall be patched and decorated by such mechanics and in such a manner that the quality of workmanship and finish shall be compatible with that of adjacent construction.

The approximate location of building fixtures, wall switches, etc., is indicated on the drawings. Exact locations shall be determined by the Engineer as building work progresses. The indicated locations may be changed by ten (10) feet in any direction without additional cost before the items are installed.

The drawings and specifications describe specific sizes of switches, breakers, fuses, conduits, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters), lights, motors for fans, compressors, pumps, etc.) Wherever the Contractor provides power consuming equipment, which differs from drawings and specifications, the wiring and associated circuit components for such equipment shall be changed to proper sizes to match at no additional expense to the Owner.

The basis for new design requires that electrical services, switchgear, panelboard and transformers total calculated connected load not be more than 60% of the service size. The total calculated load requirements for alterations shall not be more than 80%.

Furnish to roofer all pitch pans required for electrical items, which pierce roof whether or not shown on drawings. Roof penetrations are to be waterproofed in such a manner that roofing guarantees are fully in force. Floor penetrations shall be sealed with fire proof sealant to prevent water from leaking to floor below and to provide a 3 hour fire and smoke barrier. Wall penetrations shall be sealed to provide a 3 hour rated fire seal.

Surface mounted fixtures, outlets, cabinets, conduit, panels, etc., shall have finish or shall be painted as directed by the Engineer. Paint shall be in accordance with other applicable sections of these specifications.

All materials utilized shall be suitable for the environment encountered. No combination of materials shall be used that forms an electrolytic coupling of such nature that in the presence of moisture corrosion is accelerated.

In general, all relays, contactors, starters, motor control centers, switchboards, panelboards, dry type transformers, disconnect switches, circuit breakers, and manual motor starter switches are to be supplied and manufactured by the same manufacturer and shall be submitted and approved as equal to that specified.

Make electrical connections to constant current regulators, transformers, motors, instruments, mechanical equipment, controls and at other locations as required with approximately 3 feet (12" minimum) of Sealtight flexible conduit. The sealtight electrical conduit shall utilize strain relief type connectors by adding a T&B wire mesh grip, WMG-LT series, or approval equal to each sealtight connector. Determine the requirements from drawings, these specifications, and the approved manufacturer drawings.

Provide inserts, hangers, supports, braces, and anchor bolts as necessary for all work called for under these specifications.

All conduits shall contain one copper grounding conductor, in accordance with NFPA 70, NEC Article 250.

#6 AWG and smaller shall have green insulation. #4 AWG and larger shall be bare. The only exception is the 5KV airfield lighting conduits and ductbanks.

All galvanized materials shall be hot-dip galvanized after fabrication, conforming to ASTM A 123 and/or A 153, unless noted otherwise.

Unless noted otherwise, all panelboards, motor starters, junction boxes, wireways, etc., shall be spaced off the concrete structure by using a Unistrut P-1060 series square washer or approved equivalent between the mounting surface and the equipment at each mounting point. Equipment as listed above, mounted on Unistrut or approved equivalent shall have Unistrut P-1060 series square washer or approved equivalent installed between the Unistrut channel or approved equivalent and the equipment at each mounting point. All bolted connections and equipment mountings shall utilize a flat washer, lock washer and hex head A-325 bolting hardware.

Unless noted otherwise, all wire sizes are based on a 135 degrees F (75 degrees C), XHHW THWN-2 600 volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit sizes are based on the use of XHHW THWN-2 600 volt insulated conductors. The Contractor shall make the necessary increase in conduit sizes for other types of wire insulation. In no case shall the conduit size be reduced. The minimum wire size shall be #12 AWG.

All electrical conductors, windings, busbars, etc. shall be high conductivity (98% conductivity) copper.

The Contractor shall furnish and install all required motor overcurrent protection required by the NEC and these drawings and specifications. The overcurrent protection shall be sized according to the motor nameplate data.

100-3.2 ELECTRICAL REFERENCE SYMBOLS. Symbols used on the plans are defined in the Electrical Legend on the Drawings. Not necessarily will all symbols scheduled be applicable to the project.

100-3.3 ACTIVE SERVICES. Existing active services i.e., water, gas, sewer, electric, communications, etc. when encountered, shall be protected against damage. Do not prevent or disturb operation of active services, which are to remain. If active services are encountered which require relocation, the Contractor shall make a written request to the Owner for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the Utility or Municipality or Authority having jurisdiction.

100-3.4 ELECTRIC SERVICE INTERRUPTIONS

a. Electrical service is defined as any electrical, communication, data, fire alarm and any other electrical transmission system. Other services include but are not limited to water, sanitary, gas, HVAC and storm water systems.

b. The Contractor shall notify the Owner and the Engineer of the intent to perform any Work requiring service interruptions and shall proceed with such work only after receiving a time schedule approved by the Owner and the Engineer. The Owner and the Engineer shall have the right to cancel or delay the time of any service interruption. The Contractor shall provide personnel and equipment to assist in the proper coordination of service interruptions. The Contractor shall not leave the job site until resumption of normal service is satisfactory to the Engineer.

c. Coordinate required facility shutdowns through the Engineer.

d. When service interruptions are required to perform the contract work on transformers, circuit breakers or feeder cables, the Contractor shall arrange the distribution system from dual service to

single service. In the event that service interruptions cannot be accomplished by supplying single line utility service, the Contractor shall provide reliable and adequate capacity generators including all temporary connections, secondary distribution equipment, disconnections, cables, safety devices and fuel unless otherwise noted. The use of temporary transformers and substation equipment will be considered by the Engineer.

e. Shutdown times must be minimized where entire building or sections of buildings are to be shut down. Shut down periods shall occur between 0100 and 0500 hours. On site generators will be necessary in areas where facilities are out of service for more than ½ hour. All switching and change-overs will be performed by the Contractor and witnessed by the Engineer. Coordination of all service interruptions will be performed by the Engineer.

f. Contractor shall perform all work involving service interruptions at times designated by the Engineer or at night and/or Saturday or Sunday. No allowances will be made by the Owner for overtime labor costs.

g. Where Contractor interrupts any electrical or other service due to damaging equipment or cable through their negligence, they shall be required to repair or replace the equipment or cable immediately, working continuously to restore service until satisfactory to the Engineer. Repair, replacement or both shall be at the discretion of the Engineer and at the expense of the Contractor.

h. Contractor shall note that the Airport shall be occupied and in use during the construction period. Contractor shall not disturb continuity of service to any area without the written approval and agreement as to time and duration of such interruption. Contractor shall perform any of this work at any time without extra cost to owner.

i. Contractor shall fully examine all areas of demolition in this contract. Contractor shall identify all services related to its trades. Contractor shall provide protection of such service to prevent disruption of service. Contractor shall reroute all services to remain as required to approved locations without extra cost to the Owner.

100-3.5 TEMPORARY SERVICES. Contractor shall provide temporary electrical services throughout the entire work area where required whether indicated or not. Existing roadway lighting circuit integrity shall remain until new traffic patterns are established. Coordinate with all Contractors and Subcontractors. Contractor shall revise temporary services as many times as necessary for all Contractors and Subcontractors work to occur through the completion of the project.

100-3.6 CODES AND FEES. Install in accordance with latest edition of FAA Advisory Circulars, the National Electrical Code and the regulations of governing Federal, State, County, local and other applicable codes, including the Utilities Company. Where a conflict in code requirements occurs the most stringent requirement shall govern. The Contractor shall be responsible and pay all required permits, licenses, services, fees and inspections including meter installation fee. The cost for such shall be included in the bid price.

Deliver to the Owner and Engineer, prior to the start of construction, a copy of all permits and licenses required for the work. At the completion of the work, secure and deliver to the Owner and Engineer all certificates of compliance of local authorities.

The work shall meet the requirements and recommendations of applicable portions of the latest editions of these standards:

a. National Electrical Code (NFPA 70)

b. Life Safety Code (NFPA 101)

c. National Electrical Safety Code (ANSI C2)

d. NEMA Standards (NEMA)

e. Underwriter's Laboratories (UL)

f. Institute of Electrical and Electronics Engineers (IEEE)

g. Lightning Protection Code (NFPA) 780 and UL 96A)

h. AWS D1.1

i. ANSI

j. NFPA

k. Federal Aviation Administration Advisory Circulars (AC)

l. Applicable Local Building Code

m. Certified Ballast Manufacturers (CBM)

The above is not all inclusive of applicable codes and standards, but is presented for the Contractors convenience.

100-3.7 STANDARDS. All materials shall be new and free of defects and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available for certain types of equipment, test data shall be submitted to prove to the Engineer that equipment meets or exceeds available standards. All listed, labeled or approved material shall be used only for the intended purpose.

100-3.8 UTILITY COMPANY FEES, CHARGES, COSTS. It is the Contractor's responsibility to contact the applicable Utility Company(s) to determine if any fees, charges or costs will be due the Utility Company(s) as required by the Utility Company(s) for temporary power, installations, hook-ups, etc. The associated fee, charge or cost for each utility shall be included in the Contractor's bid price.

100-3.9 TESTS. Systems shall be tested by the Contractor and placed in proper working order prior to demonstrating systems to the Owner. Refer to the requirements in each section for other applicable standards.

After work is completed a load balance test shall be made, as required, to demonstrate that with full lighting and mechanical load the balance between phases is within 5%. Unbalance beyond this limit shall be corrected.

System ground and lightning protection system ground shall be tested, as required, to demonstrate that the ground resistance does not exceed twenty-five (25) ohms per ground rod. All testing shall be done by methods approved by the Engineer and prior to the connection of the grounding conductors.

Perform such tests as required by any Authorities having jurisdiction over the site. Refer to specification L-131, Demonstrations, Tests and Performance Verification.

Testing methods shall be acceptable to the Engineer and shall be submitted to the Engineer for review, a minimum of thirty (30) days prior to the scheduled test.

The Contractor shall supply all labor, materials, instruments and miscellaneous equipment for any examination of work or tests as required. All test results shall be recorded and submitted to the Engineer.

100-3.10 LAMINATED PHENOLIC PLASTIC NAMEPLATES. The Contractor shall provide nameplates for wiring systems and equipment as called for herein. All nameplates shall have beveled edges and one-half inch (1/2") lettering. If equipment is smaller than ten inches by six inches (10"x 6"), one-quarter inch (1/4") lettering may be used. Smaller lettering may be used with permission of the Engineer.

Nameplates shall be laminated phenolic plastic, black front and back with white core, with lettering etched through the outer covering. White engraved letters on black background. Emergency systems shall use red front and back with white core for nameplates. Attach nameplates with 4-40 stainless steel self tapping screws. Where conditions do not warrant piercing the enclosure "LOCTITE" brand adhesive or approved equivalent may be used with permission of the Engineer.

The following items shall be equipped with nameplates: all constant current regulators, pushbutton stations, control panels, system cabinets, terminal cabinets, disconnect switches, panelboards, circuit breakers, contactors or relays in separate enclosures, high voltage boxes and cabinets whether existing or planned by these specifications. Special electrical systems shall be identified at junction and pull boxes, terminal cabinets and equipment racks. Junction boxes shall comply with paragraph 100-3.10, Junction/Pull Box Color Code.

Nameplates shall adequately describe the function of the particular equipment involved. Where nameplates are detailed on the drawings, inscription and size of letters shall be as shown and shop drawing submitted for approval. Nameplates for panelboards and switchboards shall include the panel designation, panel name, circuit designation source of power and voltage and phase of the supply. For example, "Equip YY, Panel A, CKT XX fed from Panel XYZ, 480/277V, 3-phase, 4-wire." The name of the machine on the nameplates for a particular machine shall be the same as the one used on all motor starters, disconnects and pull box station nameplates for that machine. Nameplates shall include as a minimum the following:

a. Equipment Number

b. Equipment Name

c. Power Source with Circuit Designation

d. Voltage Level and number of phases

All major pull and junction boxes in service areas, tunnels, above accessible ceilings and in accessible chases shall have nameplates identifying the feeder or system.

Systems with conductors exceeding 100 volts to ground shall have voltage identification nameplates with one-half inch (1/2") high letters on all panels, switches, pull boxes and junction boxes.

100-3.11 ADHESIVE BACKED CLOTH MARKERS. All raceways containing conductors exceeding 150 volts to ground shall have adhesive backed cloth/vinyl markers installed at each end and every thirty feet (30') in between identifying the voltage level (Example: "480 VOLTS"). If the conduit is less than ten feet (10') in length one marker is acceptable. The markers shall be installed so they are visible from floors and walkways. Normal power system shall use black letters, emergency systems shall use red letters.

The markers shall be "Brady" brand or approved equivalent with one-half inch (1/2") letters.

The markers shall be suitable for the environmental conditions encountered.

100-3.12 JUNCTION/PULL BOX COLOR CODE. Circuit numbers and circuit identification shall be printed on junction box and pull box covers using ink markers and shall be plainly visible after paint is applied. The entire box and cover shall be color coded as listed below:

Color Code for Junction Boxes	Krylon Color & Paint # Or Approved equivalent	
Normal Power 480/277 Volt	Brown	2501-6
Normal Power 208/120 Volt	Black	1601-6

100-3.13 CONCRETE WORK. Concrete bases and pads for all equipment furnished by the Contractor shall be the responsibility of the Contractor unless noted otherwise.

The Contractor shall furnish all equipment anchor bolts and shall be responsible for their proper installation and accurate location.

100-3.14 EXCAVATING, TRENCHING AND BACKFILLING. The Contractor shall do excavating necessary for light bases, underground wiring, conduit and ductbanks and shall backfill trenches and excavations after work has been inspected. Care shall be taken in excavating that walls and footings and adjacent load bearing soils are not disturbed in any way, except where lines must cross under a wall footing. Where a line must pass under a footing, the crossing shall be made by the smallest possible trench to accommodate the conduit. Excavations shall be kept free from water. No greater length of trench shall be left open in advance of conduit laying than that, which is authorized or directed by the Engineer.

Roots shall be removed to a level of eighteen (18") below furnished grades and deeper as required for duct runs, manholes and light pole bases. No roots shall be allowed to remain under the work.

Backfill about the structures shall be placed, where practical, as the work of construction progresses. Backfilling on or against concrete work shall be done only when directed. Backfilling of duct lines shall progress as rapidly as the testing and acceptance of the finished sections of the work will permit and shall be carried to a crown approximately six inches (6") above the existing grades. In backfilling around duct lines, selected material shall be compacted firmly around the duct. Fill and backfill shall be clean and free from vegetable matter and refuse.

All trenches and other excavation left open by necessity shall be barricaded and guarded as required by OSHA or applicable codes and regulations.

100-3.15 WELDING. All welding and weld procedures shall be in accordance with AWS D1.1, Latest Edition. Qualifications of welders and welding operators shall be in accordance with AWS D1.1, Latest Edition. The welder qualification test shall be performed on a 1" A-36 Test Coupon in the 3G and 4G positions. The welder qualification shall be current within 12 months of the work being performed. Weld inspections shall be per the criteria set forth in AWS D1.1 for visual weld inspection.

DESIGNATION OF MATERIALS

100-4.1 CRITERION DESIGNATION OF MATERIALS AND EQUIPMENT. Where a criterion specification is designated for any material or equipment to be installed by the name or catalog number of one specific manufacturer, such designation is intended only for the purpose of establishing the style, quality, performance characteristics, etc., and is not intended to limit acceptability of competitive products. Products of other manufacturers which are approved by the Engineer as similar and equal will be equally acceptable unless specifically otherwise stated.

Where equipment or materials are specified by the use of the name and catalog number of more than one

manufacturer, that equipment or material shall be one of those specified. No alternative will be acceptable.

Where no brand name is specified, the source and quality shall be subject to the Engineer's review and acceptance.

When a product is specified to be in accordance with a trade association or government standard, at the request of the Engineer, the Contractor shall furnish a certificate that the product complies with the referenced standard. Upon request of the Engineer, the Contractor shall submit supporting test data to substantiate compliance.

The Engineer shall be the sole judge of whether the proposed "or equal" is suitable for use in the work.

Each Bidder represents their bid is based upon the materials and equipment described in these specifications. Substitutions will not be considered unless a written request has been submitted to the Engineer in accordance with Item L-106, Submittals, Record Documents and Maintenance Manuals.

If the Contractor desires to use a method or type of equipment other than specified in the contract documents, a written request therefore shall be made to the Engineer. If approval is given, the Contractor will not be excused from producing work in conformity with contract requirements. If a trial use establishes that work does not meet the contract requirements, the Contractor shall take such action as the Engineer determines necessary to correct any deficiency in the work. No change in contract time will be made as a result of changes made under this Subparagraph. By making a request for substitution, the Contractor:

a. Represents that it has personally investigated the proposed substitution and determined the proposed substitution equal or superior in all respects to the specified method or equipment;

b. Represents that it will provide a warranty for the substitution identical in all respects to the warranty for the specified method or equipment;

c. Represents that it will coordinate the installation of the accepted substitute, making changes as may be required for the work to be complete in all respects at no additional cost to the Owner.

PROTECTION OF MATERIALS, EQUIPMENT AND WORK

100-5.1 REQUIREMENT FOR THE PROTECTION OF MATERIALS, EQUIPMENT AND WORK. Materials shall be stored so as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall be subject to reinspection prior to their use in the work. The Contractor shall coordinate the storage of all materials with the Owner and the Engineer.

Owner-furnished materials, if any, shall be made available to the Contractor at the location specified herein. All costs of handling, transportation from the specified location to the site of the work, storage and installation of Owner-furnished materials shall be included in the Total Contract Price. All risk of loss or damage to Owner-furnished materials shall pass to the Contractor after delivery of said material to the site of the work. The Owner shall be entitled to deduct from any monies due or to become due to the Contractor any cost incurred by the Owner resulting directly or indirectly from a loss caused in whole or in part by the Contractor's handling, storage or use of Owner-furnished materials.

The Contractor shall protect electrical raceway, cables of any sort, lighting fixtures and associated support systems against damage from movement of equipment and material, welding, flame cutting, and other construction damage. Raceways and supporting structures for raceway and lighting fixtures shall not be used as access scaffolding at any time. Whenever welding or flame cutting operations occur

above or near raceways, cables or lighting fixtures not shielded from such operations by concrete floor or other protective covers, the Contractor shall protect the raceways, cables, and lighting fixtures from damage by means of fireproof boards or blankets. Damaged materials shall be repaired or replaced, by and at the Contractor's expense, subject to the Engineer's direction and acceptance.

Surfaces of most equipment, such as panels, switchgear, transformers, constant current regulators and circuit breakers, are finished at the factory. Great care shall be exercised to prevent damage to this original finish during installation of the equipment and during construction work.

If the factory finish is damaged during the course of construction, the entire surface of the damaged component shall be refinished or replaced by and at the expense of the Contractor.

The refinished surface shall be equivalent in every respect to the original surface, including color, texture and smoothness. Refinishing paint, if furnished with the equipment, may be used; otherwise, the paint shall be obtained from the equipment manufacturer.

All cut edges of galvanized materials and marred or scratched galvanized surfaces shall be repaired using LPS-1G cold galvanizing compound or approved equivalent.

All threaded conduit joints shall use T&B Kopr-shield or Aluma-Shield or approved equivalent for galvanized and aluminum conduits respectively, as joint compound.

GENERAL CONSTRUCTION REQUIREMENTS

100-6.1 ADDITIONAL REQUIREMENTS. Provide the bracing, shoring, rails, guards, and covers necessary to prevent damage or injury. Do not leave energized electrical items unnecessarily exposed or unprotected. Protect personnel from exposure to contact with electricity. Deliver equipment and materials to the job site in their original, unopened, labeled containers. Store ferrous materials so as to prevent rusting. Store finished materials and equipment so as to prevent staining and discoloring.

All materials stored prior to installation, shall be stored in a bonded and secured facility.

All sheeting, shoring, dewatering and cleaning necessary to keep trenches and their grades in proper condition for the work to be carried on, including the removal of water by mechanical means, shall be the Contractor's responsibility.

METHOD OF MEASUREMENT

100-7.1 The items described in this section are incidental to other sections and shall not be measured for payment.

BASIS OF PAYMENT

100-8.1 No direct payment shall be made for the work described in this specification. The work described in this specification is incidental to other items and shall be paid for in the respective bid item of which it is a component part.

Request for Information
Supplemental Instruction

Reynolds, Smith and Hills, Inc.
Architectural, Engineering, Planning and Environmental Services

To: _____ **RFI - 000**

From: _____ Date: _____

Project: _____ AEP File No: 000-0000-000

_____

Reference:

Contract Drawing: _____

Shop Drawing: _____

Specification: _____

Other: _____

Subject:

Description:

By: _____

Reply:

Answered By: _____ 00/00/00
Date

Project Manager

Cc:

APPENDIX A
FIGURE 1

END OF ITEM L-100