

READ THIS FIRST

Notice to the Design Engineer, this document is part of Facilities and Infrastructure standards for Electrical Systems. Designers are advised to NOT use this template (*.doc) document as part of any project contract documents. Designers shall use the Port of Seattle MasterSpec specifications from the following link:

<https://www.portseattle.org/page/guide-specifications> Designers shall edit the corresponding Port's MasterSpec specification to meet the F&I Electrical Standard outlined in this specification. Note that Port's MasterSpec specifications contain specifications and languages for both Aviation and Maritime Divisions. F&I Standards are strictly for Aviation Division, and any Maritime related specs or languages should be removed from the project specifications.

PART 1 - GENERAL

1.01 SUMMARY AND NOTES TO DESIGNER

- A. Show full pathway from new work to panel for all new homeruns.
- B. This Section includes general requirements for accomplishing electrical work as specified herein and indicated on the Drawings.
- C. Related Documents: The provisions and intent of the Contract, the General and Supplementary Conditions, and Division 1 Specification Sections, apply to the Work as if specified in this Section.
- D. All or a portion of the work covered by this Section may be conducted within the Air Operations Area (AOA) at Sea-Tac International Airport. Restrictions and conditions necessary to maintain airfield and aircraft safety as required by FAA regulations, and as required to maintain efficient airport operations, may impose limitations upon the Contractor's methods and procedures.
- E. The airport is a 24-hour, 365-day operational facility. Electrical hot work will be required to be performed on portions of the electrical power distribution and utilization equipment. The Contractor and its subcontractors shall provide personal protection equipment (PPE), training, authority having jurisdiction (AHJ) safety compliance and all necessary tools for the execution of such work.
- F. Liquid-carrying pipes are prohibited inside electrical and communication rooms without approval from F&I. Designers and contractors shall notify F&I during designs and before construction if non-electrical/communication pipes are discovered in the design or as part of the existing conditions.

1.02 SUBMITTALS

- A. Submittals shall include the following:

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1. Review of Shop Drawings and Brochures shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from Contract Document requirements. It shall be clearly understood that the noting of some errors, but the overlooking of others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the review of the Shop Drawings and Brochures.
 2. Manufacturer Approval Drawings: Equipment that is laid out, configured, or designed by manufacturer based on performance specifications only shall be submitted to the Engineer for approval prior to release of drawings for manufacturing.
- B. Ordering Materials: Order materials within two (2) weeks of receiving reviewed submittals from the Engineer. Provide proof of order placement upon request. Failure to comply will be considered non-performance and progress payments will be suspended

1.03 DRAWINGS

- A. The electrical drawings are diagrammatic and are not intended to show all raceway, wiring, exact locations of equipment, terminations or number or types of fittings required by the electrical system. Provide all related electrical work which is specified herein, diagrammed or scheduled on the electrical drawings, required by code enforcing agencies and as indicated on other details or elevations for complete and operating electrical systems. Since the drawings of floor, wall and ceiling installation are made at a small scale, outlets, devices, equipment, etc are indicated only in their approximate location unless dimensioned or otherwise indicated. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinate such locations with the work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings. Refer to Architectural and Mechanical shop drawings and project drawings for dimensions as applicable.

1.04 PRODUCTS

- A. All material used for electrical distribution, lighting and communication equipment must be capable of being recycled. Use of water based coatings, recyclable plastics, ceramics and metals are required. (Due to liability, it is not allowed that such material be reused by third parties.) All wiring must now use lead free jacketing. This will apply to communication equipment printed circuit boards, monitors and PLC based control systems.
- B. Manufacturers:
1. Provide only equipment specified in the Contract Documents or approved by addendum. Manufacturer's catalog numbers and descriptions establish the quality of product required.
 2. Substitutions allowed only with approval of Facilities and Infrastructure and engineer of record.

1.05 QUALITY ASSURANCE

- A. All materials shall be new, unless noted otherwise. Properly store all materials and equipment for protection from physical damage or damage due to corrosion.
- B. Review accessibility of equipment for operation, maintenance and repair prior to installation. Proceed with installation only after unsatisfactory conditions have been corrected
- C. Equipment Manufacturer Qualifications: Equipment manufacturers shall have at least 10 years' experience in manufacturing products and accessories similar to those for this Project, with a record of successful in-service performance.
- D. Electrical Work shall be performed by a licensed electrical contractor in accordance with Washington State Chapter 19.28 RCW.
- E. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- F. General: Products are specified by manufacturer name, description, and/or catalog number to show intended function and quality. Report discrepancies, such as discontinued equipment or catalog numbers, to the Engineer prior to bidding. If the Contractor is unable to interpret any part of the plans and/or specifications, he shall notify the Engineer, who will issue interpretation and/or additional clarifications to Bidders before the project is bid.
- G. Manufacturers: Provide only equipment specified in the Contract Documents or approved by addendum. Manufacturers' catalog numbers and descriptions establish the quality of product required.
- H. Warranty: Comply with Specification Section 017836 - Warranties and Bonds. Warranty shall be manufacturer's standard or a minimum of one year unless noted otherwise in Division 260000 Sections.

1.06 COORDINATION AND SCHEDULING

- A. Comply with Specification Section 01 32 16 - Bar Chart Schedule.
- B. The Port of Seattle Construction Manager shall be the focal point for coordination with the Port.
- C. Coordinate and schedule electrical work with the work of other trades. Every reasonable effort shall be made to prevent conflicts as to space requirements, dimensions, locations, code required working spaces, access openings, drawout and removal spaces or other matters tending to obstruct or delay the work of other trades. All changes caused by failure to coordinate shall be made at the Contractor's expense.
- D. Work in adjacent areas of this project to be scheduled and approved fourteen (14) working days in advance with POS Electrical Maintenance Shop (206-787-5311).

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Conflicts to be resolved with other ongoing POS projects in the same work area. Comply with State requirements for highway signage, flagging and re-routing traffic.

- E. Work in the non-taxiway AOA to be coordinated with Airport Operations and the Electrical Maintenance Shop fourteen (14) days in advance.
- F. No overshift/ overnight storage of equipment, materials or tools permitted on the job site. All items must be removed prior to the end of the work shift and placed in approved storage area.
- G. All work areas are to be kept clean and clear to permit access and egress of personnel and equipment at all times. Infractions considered safety violations and handled in accord.
- H. This project is concurrent with other on-going Port of Seattle projects. Contractor is to coordinate their activities with these other contracts.

1.07 SAFETY AND PROTECTION

- A. Safety Measures To Be Taken: The Engineer has not been retained or compensated to provide design and construction review services relating to the Contractor's safety precautions or to the means, methods, techniques, sequences or procedures required for the Contractor to perform his work. The Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Engineer to conduct construction observations of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site. It shall be the Contractor's responsibility to comply with applicable safety and health regulations for construction. The Contractor shall consult with the state or federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist or whether he is or is not in compliance with state or federal regulations.
- B. Protection: The Contractor shall take whatever measures are required to ensure that electrical safety and protection are maintained, including the proper covering, signage, and securing of "live" circuits.
- C. Comply with Specification Section 01 35 13.13- Operational Safety on Airports During Construction, Port of Seattle Construction Health & Safety Manuals and with applicable State of Washington safety rules and health standards, including WAC 296-44, WAC-294-45, and the Port of Seattle "Electrical Safety Rules." Any violation shall result in a warning citation.
- D. The Port of Seattle "Electrical Safety Rules" are as follows:
 - 1. Work on Electrical circuits operating at over 50 volts, phase to ground, or greater shall be conducted in accordance with Port of Seattle Construction Health & Safety Manual Energized Electrical Work plan.

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- E. Power Outages: Any essential outages required in the course of construction, whether for temporary services, cutovers, or testing, shall be closely coordinated with the Port Resident Engineer and shall occur at times approved by the Port by means of shutdown notification request.
- F. Electrical circuits shall be considered de-energized only after compliance with the Port of Seattle Construction Health & Safety Manual Lock-out Tag-out Policy and under the following conditions:
 - 1. Switches connecting subject circuit to the energy supply are observed in the "open" position, with an air break, and locked and tagged out in accordance with Port of Seattle Construction Health & Safety Manual Lock-out Tag-out Policy.
 - 2. Electrically operated switches are visibly "open", blocked or racked in the "open" position, and locked and tagged out "open".
 - 3. If the supply circuit break is not visible and clearly identified, the circuit shall be grounded. If the ground connection is not within sight of the work area, the ground connection shall be locked and tagged out before proceeding with the Work.
 - 4. Oil switches are observed "open" in a sight window and locked and tagged out "open," or fuse carrier is removed in oil fuse cutouts and locked and tagged out "open."
- G. Use of Red Safety Tags
 - 1. For protection of personnel working on circuits, safety tags shall be filled out and attached to any opened switch or equipment.
 - 2. Safety tags shall be removed only by the Port of Seattle employee who placed the tag, or by another Port of Seattle employee who has been authorized to remove the tag in writing by the employee who placed the tag. The Port of Seattle Maintenance Electrical Systems Manager or his designated representative may authorize removal of a safety tag placed by an employee who is not available to remove the tag at the time of need only after carefully checking that the circuit is ready to be energized.
 - 3. Equipment with a safety tag attached shall not be operated, and connections with a safety tag attached shall not be changed.
- H. Insulated cables, operated at over 250 volts to ground, shall be handled when energized only with rubber gloves tested to 22,000 volts by a Washington State approved testing laboratory.
- I. Insulated cables that have been in operation shall be cut only with grounded cable shears, or shall be grounded by driving a grounded sharp tool through the shielding and the conductors before cutting.
- J. All personnel working around energized electrical equipment operating at over 600 volts or more shall wear standard insulated, non-conducting hard hats and shall wear fire retardant garments with no metallic zipper fasteners.
- K. Ladders used in any electrical work shall be of wood or fiberglass construction.
- L. All panelboards, junction boxes, electrical devices and other similar equipment which is being worked on and which have exposed live wires, bus bars, or terminals operating

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above 50 volts shall be covered adequately for the voltage with an electrical insulating material and labeled with a "Danger" sign when Contractor personnel are not present. The Danger sign shall advise that exposed electrical parts are behind the temporary protective cover.

- M. Contractors engaged on Port of Seattle projects or working on Port of Seattle property shall be governed by Port of Seattle rules. The Contractor shall place their lock and tag only after Port of Seattle Electric Shop or designee has placed a lock and tag. The Contractor shall designate a supervisor for all contract personnel and operations. This supervisor shall be on the job whenever contract operations are in progress.
- N. Before entry is made into energized electrical cable vaults or manholes, an infrared tester shall be used to scan the cables and connector components. If a temperature difference of 10 degrees Fahrenheit is detected between the cable and connector components, or any reading greater than 140 degrees Fahrenheit is detected from the cables or components the entry shall not be made! The Contractor shall notify the Engineer and the POS Electrical Shop.
- O. Comply with the following procedures for medium-voltage manhole access:
 - 1. Contact Port Electrical Shop at 206.787.5311 prior to entering any manhole.
 - 2. All switching of the medium-voltage system must be approved in advance and coordinated through the Electrical Shop.
 - 3. Schedule requests for Electrical Shop assistance a minimum of seven (7) days in advance.
 - 4. Comply with confined space entry procedures, lockout procedures, and all other applicable State safety requirements.
 - 5. Complete a confined space entry permit for each entry. Submit to designated Port Construction Engineering Inspector.
 - 6. Ventilate and monitor the confined space. A top man is required at all times.
 - 7. Complete safety tags once line clearance has been given, and attach tags to any opened switch or equipment. Submit tags to Electrical Shop upon completion of the Work.
 - 8. Provide effective barriers to prevent others from falling into the open vault. Close and secure vaults when not attended.
 - 9. Comply with State requirements for highway signage, flagging, and re-routing traffic

1.08 ELECTRICAL SERVICE

- A. Temporary Electrical Construction Service: Comply with Specification Section - Temporary Facilities and Controls.
- B. Continuity of Service: Provide temporary service to existing systems as required to maintain continuous operation without reducing equipment efficiency. Coordinate the extent of temporary services with the Resident Engineer.
- C. Power Outages: Outages shall be kept to an absolute minimum. Any essential outages required in the course of construction, whether for temporary services, cutovers, or

testing, shall be closely coordinated with the Port Resident Engineer and shall occur at times approved by the Port.

1.09 DEMOLITION

- A. General: De-energize circuits in demolition areas to ensure a safe condition.
- B. Existing material that is not to be reused or is not requested by the Port to be retained shall be removed from the site and shall become the property of the Contractor for salvage. All materials removed from the site shall be disposed of at facilities licensed for the material.
- C. In areas of where alterations are to be done, existing conduits may be reused in their original location, unless noted otherwise.
 - 1. Wiring that is discovered with damaged or deteriorating insulation shall be replaced with new.
 - 2. No existing conduit or wiring once removed may be reused, unless noted otherwise.
- D. Remove all unused exposed conduit except where located in or above existing construction which is not being altered and would require removal and replacement of the existing construction.
- E. Remove all abandoned conductors and raceways unless marked/labeled for future uses.
- F. Recycle demolished materials where feasible. When available, provide weight slips or receipts to Port Project Manager. This standard requires that material taken from the site, be sent to a certified recycler (county or state).

1.10 ELECTRICAL EQUIPMENT INSTALLATION

- A. Comply with POS Standards for environmental regulatory requirements, quality control, construction facilities and temporary controls, traffic control, access control, and signage requirements.
- B. National Electrical Code Compliance: Comply with applicable portions of National Electrical Code as to the type of products used and provisions for electrical power connections.
- C. Underwriters Laboratories acceptance: All material and equipment within the scope of the UL Re-examination service shall be approved by Underwriters Laboratories, Inc. for the purpose for which they are used and shall bear their label. Any variation to this requirement must be approved by the authority having jurisdiction..
- D. Provide electrical connection of all equipment having electrical requirements. Make final connections for all Owner-furnished equipment.

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1. Make electrical connections in accordance with manufacturer's written instructions, with recognized industry practices, and complying with requirements of the National Electrical Code.
 2. Verify all electrical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit capacity, etc.) for equipment furnished under other divisions of this specification by reviewing respective shop drawings furnished under each division.
 3. Meet with each subcontractor furnishing equipment requiring electrical service to review electrical characteristics for each equipment item before rough-in begins. Report any variances from electrical characteristics noted on the electrical drawings to the Engineer before proceeding with rough-in work.
- E. Cutting and Patching: Coordinate the locations of all openings required in the building construction for installation of the Work.
1. Drill penetrations required through existing concrete slabs or walls with a diamond core drill. In no case shall any structural member be cut.
 2. Provide approved sleeves as required for electrical penetrations through floors and walls. Seal all openings around conduits in sleeves with a material of equal fire rating as the surface penetrated.
 3. Obtain written approval from a licensed Structural Engineer prior to cutting any reinforcing bars.
- F. Equipment Bases and Fastening: Comply with seismic zone 3 anchorage and bracing requirements of Section 260529 – Hangars and Supports for Electrical Systems.
- G. Equipment Accessibility: Comply with applicable codes and install equipment to be accessible for operation, maintenance or repair. Equipment deemed inaccessible shall be relocated as directed.
- H. Electrical Work Exposed to Weather:
1. Provide weatherproof enclosures and corrosion protection for all ferrous metal portions of electrical work exposed to weather, including conduit, clamps, supports, and hardware.
 2. All galvanized electrical equipment exposed to the weather shall be painted to prevent leaching of zinc into the stormwater system. Paint coating shall be a minimum of 3 mils thick, and application as part of the manufacturing process is preferred over painting in the field.

1.11 EARTHWORK

- A. Existing Underground Utilities: Verify, before any excavation, the location of all existing utilities in the area of new construction. Exercise extreme care with all work adjacent to these utilities. A designated representative of the Contractor shall advise the Port of Seattle Maintenance Electrical Systems Manager and Power Company where he can be contacted in any emergency.
- B. Review drawings and notify the Engineer of any deviations in duct runs to avoid conflicts with existing utilities. Any changes in the work resulting in the same quantities

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of trenching material shall not entitle the Contractor to any claim for an addition to this Contract.

- C. The Contractor is responsible for any damage done to existing utility installations during the course of the work. All damaged installations shall be replaced to the satisfaction of the utility or agency involved at the expense of the Contractor.
- D. Comply with the Division 1 and 2 requirements for site work, including excavation, bracing and shoring, erosion control, requirements for temporary pumping equipment, backfilling, patching and paving, sod replacement, removal of surplus material, and requirements for traffic control during construction.

1.12 PROJECT FINALIZATION

- A. Fully test and adjust all equipment installed under this specification and demonstrate its proper operation.
 - 1. Testing that involves use of instruments other than meggers and volt-ohm meters shall be performed by an independent testing agency according to the requirements of Section 260800 - Acceptance Testing.
- B. Present the Port with Certificate of Inspection from the City of SeaTac upon completion of the Work stating that all work complies with all applicable Codes and Ordinances.
- C. Where circuits have been added, removed or relocated on panelboards and switchboards, the contractor shall provide as-built panel and switchboard schedules in Port standard excel format. Post hard copies in panelboards and provide electronic excel copies to Port of Seattle Aviation F&I. Coordinate submittal of schedules with Port Construction Manager.
- D. Comply with Division 1 General Requirements for cleaning, closeout procedures, commissioning, training, operations and maintenance manuals, and record drawings.

END OF SECTION 260000