This master should be used by designers working on Port of Portland construction projects and by designers working for PDX tenants (“Tenants”). Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

1. GENERAL
	* + 1. DESCRIPTION

Add to or delete A as appropriate.

* + - * 1. This division includes the electrical requirements of the work including, but not restricted to, the following key elements:
				2. This section includes general electrical requirements which apply to the entire electrical division including, but not necessarily restricted to, the following:

Procedural requirements.

Port standards.

Specifications for general items not specifically covered in other technical sections.

* + - 1. RELATED WORK SPECIFIED ELSEWHERE
				1. Section 019100, General Commissioning Requirements
				2. Section 024119, Selective Interior Demolition
				3. Section 083100, Access Doors and Panels
				4. Section 260533, Raceway and Boxes for Electrical Systems
				5. Section 271000, Structured Cabling
			2. REFERENCES
				1. All equipment and materials shall be in accordance with the applicable standards of the following organizations:

ANSI: American National Standards Institute

FAA: Federal Aviation Administration

IBC: International Building Code

ICEA: Insulated Cable Engineers Association

IEEE: Institute of Electrical and Electronic Engineers

NEC: National Electrical Code

NEMA: National Electrical Manufacturers Association

NFPA: National Fire Protection Association

OAR: Oregon Administrative Rules

OR-OSHA: Oregon Occupational Safety and Health Administration

UL: Underwriters Laboratories

* + - 1. CODES, PERMITS, AND CERTIFICATES

Edit Division 1, Section 011100 for specific operating area, including restricted areas exempt from inspections.

* + - * 1. See Division 1 for specific requirements relating to codes enforced, permits, and inspections.
				2. Provide notification 48 hours prior to covering concealed electrical work to allow for inspection.
				3. Notify the electrical inspector of jurisdiction having authority sufficiently in advance to completely inspect the work in the various stages necessary. Uncover concealed work and provide qualified staff to assist inspectors.
				4. In preparation for final inspection, all electrical equipment shall have wires installed and under terminal posts, and circuit schedule and labeling complete.
				5. Deliver certificates from inspection authorities, certifying work is complete and satisfactory, before acceptance of the work.
			1. ELECTRICAL SAFETY PROGRAM
				1. Contractors doing work on Port property are required to have an electrical safety program that meets or exceeds all OR-OSHA requirements.
				2. Prior to commencement of electrical work, the Contractor shall meet with Port facility safety personnel and inform each other of existing known hazards, personal protective equipment requirements, safe work practice procedures, and emergency/evacuation procedures applicable to the work to be performed. This coordination shall include a meeting and documentation.
			2. DELIVERY, STORAGE, AND HANDLING
				1. Store and handle materials to protect against corrosion or mechanical damage. Remove damaged materials from site immediately after detection.
				2. Deliver materials in manufacturer’s packaging. Deliver conductors and cables in complete coils.

Tenant: In this article, delete all instances of “Port” and replace with name of tenant.

* + - 1. SALVAGED MATERIALS

List specific electrical equipment to be salvaged.

* + - * 1. Unless otherwise specified, the following electrical materials salvaged from this work shall remain the property of the Port and shall be delivered to the airport maintenance facility, as directed. The Contractor shall obtain signed receipts for materials delivered to the maintenance facility. Submit copies to the Port.

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Tenant: In this article, delete all instances of “Port” and replace with name of tenant.

* + - 1. PORT-FURNISHED MATERIALS

List location and equipment to be supplied by the Port. Include dimensions, weights, and anticipated delivery dates.

* + - * 1. The following items will be supplied by the Port and made available to the Contractor at \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:

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* + - * 1. The Contractor shall be responsible for formally acknowledging receipt of materials, for transportation and labor to move the materials from the Port’s storage area, for proper handling and protection from weather and physical damage, and for installation of the equipment.
				2. Quantities supplied to the Contractor are based on estimates. Confirm the quantities required and notify the Port immediately if a shortage is indicated.
				3. After Contractor acceptance, lost or damaged materials shall be replaced by the Contractor at no additional cost to the Port. Defective equipment determined to be a manufacturer’s defect will be replaced by the Port.
				4. At the end of the project, surplus materials, if any, shall be returned to the Port in good condition.
			1. ELECTRICAL DRAWINGS
				1. The drawings are diagrammatic and do not show every detail of installation.
1. PRODUCTS
	* + 1. MATERIALS
				1. Supply all materials to complete and provide the operating system specified, unless it is specifically indicated that materials are being furnished by others, or that existing equipment shall or may be reused.
				2. All materials shall be new and meet the requirements of these specifications. Materials shall be subject to Port approval via the submittal process.
				3. All components and equipment provided and normally tested and labeled by Underwriters Laboratories (UL), or similar recognized third party approval authority, shall be so labeled.
			2. GENERAL SUPPORT AND ANCHORING HARDWARE
				1. All anchors, nuts, washers, and bolts shall be rust resistant, plated type, unless specified otherwise. Anchors, nuts, washers, and bolts for exterior use shall be stainless steel.
				2. Brackets and miscellaneous hardware shall be rust resistant, plated type, unless specified otherwise.
				3. Bolts associated with lighting fixture installation shall be applied with anti-seize lubricant such as Never-Seez, or equal, prior to installation.

Choose type of hardware required by environment.

* + - * 1. Exterior channel-type support or where noted on drawings shall be hot-dipped galvanized. Interior channel-type support shall be hot-dipped galvanized or electro-galvanized plus zinc chromate finish. Kindorf, Superstrut, Unistrut, or equal.
				2. Clamps, brackets, and similar hardware utilized with the channel support system shall be of the same manufacturer and be similarly galvanized.
1. EXECUTION
	* + 1. LAYOUT AND COORDINATION
				1. Layout of the various equipment is very specific with the dimensioning, relative location and/or dimensions shown on the drawings. Call attention to any error, conflict, or discrepancy in the drawings or specifications. Do not proceed with any questionable items of work until clarification has been received.
				2. Work under this division shall be conducted in a cooperative manner with work of other divisions employed on the project, for proper installation of all items of equipment.
				3. Verify the physical dimensions of each item of electrical equipment to fit the available space and provide prompt notification prior to roughing‑in if conflicts appear. Coordinate equipment to fit into the available spaces and coordinate access routes through the construction site.
			2. PROTECTION
				1. Electrical work, wire and cable, materials, and other equipment specified in this division shall be protected against damage by other construction activities, weather conditions, or any other causes as a part of this work. Equipment found damaged or in other than new condition shall be rejected as defective.
				2. Keep light fixtures and electrical equipment covered or closed to exclude moisture, dust, dirt, cement, or paint and shall be free of all contamination before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches or other finish defects. Properly refinish to new condition if damaged.
				3. Keep conduit and raceways closed during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Raceways shall be clean and dry before installation of wire and shall be so at the time of final acceptance.
				4. Comply with the requirements of Section 017000, Execution Requirements, for investigation prior to penetration of floor slabs.
			3. GENERAL INSTALLATION METHODS
				1. Install all material and equipment in accordance with the manufacturer’s recommendations, instructions, and/or installation drawings, and in accordance with NEC and specifications.
				2. Unless otherwise noted on the drawings, conceal all wiring in finished spaces. Exposed conduit is acceptable only when and where prior specific authorization is obtained from Port. If exposed conduit is installed, it shall be parallel to structural lines.
				3. Unless otherwise noted on the drawings, all wiring devices, recessed light fixtures, etc., in finished spaces shall be flush-mounted.
				4. Provide necessary rigid conduit sleeves, openings, and chases where conduits or cables are required to pass through floors, ceilings, or walls. Seal all openings around conduits against leaks and in a manner to maintain the fire rating of the structure penetrated. Prevent unnecessary cutting in connection with the finished work. Make all repairs and seals in a manner acceptable to the Port.
				5. Cutting or notching shall be kept to a minimum and shall only be done in a Port-approved method. Structural members shall not be disturbed or cut in any way without specific written approval from the Port on a case‑by‑case basis. Patch and correct finished surfaces damaged by electrical work.
				6. The extent of the branch circuiting and control wirings shown shall not be changed.
				7. Provide all backing and mounting hardware required to complete the electrical systems in a safe, working condition as part of the contract work.
				8. Comply with code requirements and methods.
				9. In general, mounting heights shall be as noted on the drawings. Where no heights are indicated, request clarification. All device dimensions are to the center above finish floor unless specified otherwise. Lighting dimensions are to the bottom of suspended fixtures.

Modify the following as required for this project.

* + - 1. POWER SERVICE OR UTILITY COORDINATION
				1. Power Service:

Obtain service from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ located \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ where shown on the drawings.

Submit for approval, arrangement layouts and installation details for the service equipment. Install the equipment in accordance with the approved drawings.

* + - * 1. Utility Coordination:

Coordinate all aspects of incoming electrical service indicated with the appropriate provider. Requirements of the utility company exceeding the provisions made on the drawings or covered in these specifications shall take precedence. Provisions made on the drawings or specifications in excess of the utility company requirements shall take precedence. The utility representative is:

Mr./Ms. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
(Pacific Power)

or

(Portland General Electric)
(503) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + - 1. EXISTING ELECTRICAL SYSTEMS

Edit A, according to project requirements.

* + - * 1. Existing electrical services shall be maintained operational at all times unless specified, scheduled, and/or approved otherwise.
				2. All switching of the existing electrical distribution systems, when required and scheduled as specified, will be performed by Port maintenance staff unless specifically approved otherwise.

Always include the following (including all subparagraphs) for airfield work. Edit subparagraph 3 according to location.

* + - * 1. Notify Port inspectors prior to de‑energizing or energizing any circuit.

Work requiring de-energizing 600V or less feeder circuits to transformers, panelboards, bus ducts, and motor control centers, and critical equipment (HVAC equipment, baggage conveyor systems, passenger loading bridges, etc.) shall require a minimum of 72 hours’ advance notification.

Work requiring de-energizing 5kV and 15kV feeders shall require a minimum of 7  days’ advance notification.

Work requiring de-energizing select branch circuits shall require 24 hours’ advance notification to Port inspectors. Prior to de‑energizing any branch circuit, notify the Port inspectors and PDX maintenance trouble line (503‑460‑4683), identifying panel, circuit location, and estimated duration.

Work requiring de-energizing airfield lighting circuits shall require 24 hours’ advance notification. All extended outages (8 hours or more) shall be scheduled a minimum of 72 hours in advance. Notify Port inspectors prior to energizing any airfield lighting circuit.

* + - * 1. The Contractor shall be responsible for ensuring the safety of Contractor’s personnel when working on Port electrical systems. Those responsibilities include:

Compliance with Oregon Administrative Rules, Chapter 437, when working on or near exposed de-energized or energized parts.

Confirming that the equipment has, in fact, been de-energized by testing and installing grounds to the system being worked on.

Providing the spider and locking device necessary to lock out the disconnect switch.

Providing a circuit breaker locking device or disconnecting the branch circuit conductor from the circuit breaker and tagging the conductor.

Providing the personnel responsible for attaching tags and locks with a mobile telephone.

Always include for PDX static vault and airfield work.

Identifying which regulators are locked out and who the responsible contractor and electrician is in the static vault log.

* + - * 1. An example of an approved lockout tag will be provided to be used by the electrician responsible for the work being performed and for installing and removing the lock and tag. The electrician shall attach the tag to the lockout device using a tie string or wire indicating the following: The electrician’s name, company, time of lockout, mobile telephone number, estimated time the circuit can be energized, and who authorized the outage.
				2. The individual responsible for signing the tag shall be required to remove the lock and, unless the circuit has been approved for an extended outage, that person shall remain on site until all related work is completed and the tags and locks are removed. No one else shall be allowed to remove them even if told to do so. Where shift work is in progress, he can remove his tag and the responsible individual on the next shift shall immediately install his tag.

Always include the following two paragraphs for airfield work.

* + - * 1. Prior to disconnecting any device on an airfield lighting circuit: de-energize the airfield circuit at the regulator vault by first switching the regulator local control switch off; opening the respective regulator’s disconnect switch and attaching a locking device to prevent persons from operating the disconnect switch; and field-verifying the circuit condition. Under no circumstances will airfield lighting circuits be switched off from the control tower to allow work on an airfield circuit.
				2. Circuits shall not be tested by requesting the control tower to turn on airfield circuits. Test airfield lighting circuit(s) by activating the regulator’s local control switch at the regulator vault.
			1. EXISTING SIGNAL AND COMMUNICATION SYSTEMS
				1. Signal and communication systems and equipment shall be kept in operation wherever these serve occupied or functional portions of the building. Outages of these facilities shall be kept to a minimum and be prearranged with the Port. The Contractor shall be liable for any damages resulting from unscheduled outages or for outages not confined to the prearranged times.
				2. Telephone services where required during the construction work shall be maintained operational by the Contractor. Coordinate this work with Port IT Communications personnel in such a manner that service, as required by the building occupants, can be readily installed and maintained.

Choose one of the following two paragraphs. The first is for Port-contracted projects, the second it for Tenant-contracted projects

* + - * 1. The Port will perform cross-connections at termination blocks and/or patch panels within the Port’s IT network and communication rooms. Provide materials and installation in accordance with Section 271000. Notify the Port one week in advance for associated cross-connection work.
				2. The Port will perform cross-connections at termination blocks and/or patch panels within the network rooms identified as being part of the common communication infrastructure. Notify the Port one week in advance for associated cross-connection work. All other cross-connections, including the MPOP (Room T1196), are the responsibility of the vendor/tenant. Vendor/tenant should contact the Port’s communication services department to verify cross-connect locations. Provide materials and installation in accordance with Section 271000.

Delete the following article if not applicable.

* + - 1. DEMOLITION
				1. Remove or relocate electrical wiring, equipment, luminaires, etc., as encountered in existing area affected by this work. Wiring which serves usable existing outlets shall be restored and routed clear of the construction or demolition. Cable and conduit to be demolished shall be removed back to the source.
				2. Protect equipment identified to be salvaged. Remove salvaged equipment prior to demolition of adjacent services. Arrange with the Port for storage and return of salvaged equipment.
				3. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations. Prior to demolition, verify that demolished services will not affect the operation of existing systems that are to remain and notify the Port.
				4. Demolition Service/System Requirements:

Locate, identify, disconnect, and seal or cap off indicated utility services and electrical systems serving areas to be selectively demolished.

Demolish all service back to nearest active main or point of future connection as indicated. Verify with Port extent of demolition prior to proceeding if extent is not clear.

The Port will arrange to shut off indicated services/systems when requested by the Contractor.

If services/systems are required to be removed, relocated, or abandoned: Before proceeding with selective demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

Remove all accessories associated with removed utilities including supports, hangers, braces, clips, etc., in their entirety.

Patch penetrations of walls and floors related to demolished services restoring existing fire separations, assembly ratings, and waterproofing membranes.

* + - 1. CUTTING AND PATCHING
				1. Include cutting, patching, and restoration of finishes necessary for the work. Surfaces damaged by the work and spaces around conduits passing through floors and walls shall be neatly patched and finished to match the adjacent construction, including painting or other finishes. Patch, clean, and remove all dirt and debris.
				2. Where equipment installations or connections require the installation of an access panel, coordinate and provide a properly sized and installed access panel, as approved by the Port. See Section 083100 for additional requirements.

Delete second sentence if firestopping section is not included in the project manual or delete article entirely if not applicable.

* + - 1. FIRESTOPPING
				1. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7.
			2. EQUIPMENT CONNECTIONS
				1. For each electrical equipment connection indicated, provide incidental wiring, devices, labor, and all materials and accessories as needed to complete splices and terminations of the equipment.
				2. Verify the location and method for connecting to each item of equipment prior to roughing‑in. Check the voltage and phase of each item of equipment before connecting. Motor connections shall be made for the proper direction of rotation. Pump motors shall not be test run until liquid is in the system and proper lubrication to all bearings in the unit is checked.
				3. Conduit, wire, and circuit breaker sizes for equipment furnished under other divisions are based on the equipment ratings of one manufacturer. The electrical characteristics of the equipment furnished may differ from the ratings of the specified equipment. Coordinate the electrical requirements of the equipment to be furnished with the equipment supplier prior to purchase or installation of conduit, wire, starts, and circuit protection required for equipment connection.

Edit for type of construction.

* + - 1. NOISE CONTROL
				1. Outlet boxes at opposite sides of partitions shall not be placed back to back, nor shall straight-through boxes be employed, except where specifically permitted on the drawings by note, to minimize transmission of noise between occupied spaces.
				2. Route conduit along corridors or other “noncritical” space to minimize penetrations through sound-rated walls. All penetrations through sound-rated partitions shall be grouted solid and airtight. Conduit and its associated attachment shall not rigidly connect (i.e., bridge) independent wall structures. Flexible connections or attachments are required.
				3. Contactors, transformers, starters, and similar noise-producing devices shall not be placed on walls which are common to occupied spaces unless specifically called for on the drawings. Where such devices must be mounted on walls common to occupied spaces, they shall be shock-mounted or isolated in a manner that effectively prevents the transmission of noise to the occupied space.
				4. Ballasts, contactors, starters, transformers and like equipment which are noticeably noisier than other similar equipment used for the work will be deemed defective and shall be replaced at no additional cost to the Port.
			2. GENERAL EQUIPMENT SUPPORT
				1. Each fastening device and support for electrical equipment, luminaires, panels, outlets, and cabinets shall be capable of supporting no less than four times the ultimate weight of the object or objects fastened to or suspended from the building structure and shall be installed to resist seismic forces as specified in the IBC for the ground motion accelerations corresponding to the work location.
				2. Properly and independently support luminaires installed under this work from the building structure. Supports shall provide proper alignment and leveling of luminaires. Where permitted, flexible connections to exposed luminaires shall be neat and straight, without excess slack, attached to the support device.
				3. Support all junction boxes, pull boxes, or other conduit terminating housings located above the suspended ceiling from the floor above or roof structure to prevent sagging or swaying.
				4. Conduits:

Support suspended conduits from the overhead structural system with metal ring or trapeze hangers and threaded steel rod having a safety factor of 4.

Anchor conduit installed in poured concrete to the steel reinforcing with No. 14 black iron wire.

* + - * 1. Power-actuated fasteners are not allowed except for slack wires where there is no continuous loading in tension for items such as light fixtures. See Section 017000, Execution Requirements.

List installation requirements of Port-furnished equipment.

* + - 1. INSTALLATION OF PORT-FURNISHED EQUIPMENT

Only use when work in the PDX terminal is above the baggage handling system.

* + - 1. INSTALLATION ABOVE BAGGAGE CONVEYOR
				1. Where possible, do not install conduit, equipment, or other electrical items above conveyors or catwalks. If in the opinion of the Contractor a pipe or conduit must be located above a conveyor or catwalk, request permission from the Port and do not proceed unless and until permission is granted. Where such permission is granted, install the item as high as possible above the conveyor or catwalk. Prior to installing items above or within 4 feet of any conveyor or catwalk component, coordinate the location in the field with the Port’s baggage handling system manager. When crossing above a conveyor or catwalk, install pressurized piping tight to the structure and ceiling deck even if the installation creates vertical bends in the piping. If installing above the conveyor, the bottom of any item shall never be less than 34 inches above the conveyor bed. See Section 260533, for installing conduit above conveyors or catwalk requirements.

List testing requirements of equipment, edit for Port-furnished equipment.

Tenant: In this article, delete all instances of “Port” and replace with name of tenant.

* + - 1. TESTING
				1. Upon completion, test systems to show the equipment installed operates as designed and specified, free of faults and unintentional grounds. Submit testing plans per Section 013300, Submittal Procedures, for review prior to testing. The system tests shall be set up for as many at one time as possible to work into construction phasing. Tests shall be done in the presence of the Port, and shall be scheduled 48 hours in advance.
				2. A journeyman electrician with required tools shall be available to conduct all tests, with or without the equipment factory representative present.

Edit for specific project.

* + - * 1. Systems to be tested shall include, but not be limited to the following:

High voltage distribution system.

Low voltage distribution system.

Emergency power system.

Lighting systems.

Public address systems.

Lighting control system.

* + - * 1. A written record of performance tests shall be compiled, dated, witnessed, and submitted along with operating and maintenance data, to the Port prior to substantial completion.
				2. See other sections for possible testing requirements as they apply to those sections. Notify the Port prior to testing.

Delete if Section 019100, General Commissioning Requirements (large scope), is not included in the project manual.

* + - 1. COMMISSIONING
				1. Complete all phases of work so the system, equipment, and components can be checked out, started, calibrated, operationally tested, adjusted, balanced, functionally tested, and otherwise commissioned. Complete systems, including all subsystems, so they are fully functional.
				2. Perform commissioning as specified in Section 019100, the technical sections, and this section. Unless specified otherwise in the technical sections, provide factory startup services for the following items of equipment:

Transformers.

Primary switchgear.

Secondary switchgear.

Emergency power systems.

Electrical distribution systems.

Lighting control systems.

* + - * 1. Participation in Commissioning:

Provide skilled technicians to checkout, startup, calibrate, and test systems, equipment, and components.

The Port reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system.

* + - * 1. Resolution of Deficiencies:

Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process. Experimentation to correct system performance will be permitted.

* + - * 1. Verification and Documentation:

As each test is performed, the Contractor shall have the commissioning manager observe the physical responses of the system and compare them to the specified requirements to verify the test results.

Submit site observation reports for deficiencies in the system.

Record the result of individual checks or tests on the pre-approved checklist, test, and report form from the commissioning plan and submit results for Port review.

END OF SECTION 260500