This master applies to tenant infrastructure installed in Port network rooms/spaces and should only be used by designers working on Port of Portland tenant improvement projects. Designers working on Port of Portland construction projects should use Section 271000, Structured Cabling.

Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

SECTION 271001 –STRUCTURED CABLING FOR TENANT IMPROVEMENT PROJECTS

1. GENERAL
	* + 1. DESCRIPTION
				1. This section describes copper and fiber communications infrastructure for connection in PDX network rooms by Port tenants.
			2. RELATED WORK SPECIFIED ELSEWHERE
				1. Section 260526, Grounding and Bonding for Electrical Systems
				2. Section 260533, Raceway and Boxes for Electrical Systems
				3. Section 270553, Identification for Telecommunication Systems
			3. REFERENCES
				1. Install equipment and materials in accordance with the applicable standards of the following organizations:

ANSI: American National Standards Institute

ANSI/TIA: American National Standards Institute and Telecommunications Industry Association

ANSI/TIA-568-C.1: Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standard

ANSI/TIA-568-C.3: Optical Fiber Cabling Components

ANSI/TIA-607-C: Generic Telecommunications Bonding and Grounding for Customer Premises

BICSI: Building Industry Consulting Service International

EIA: Electronic Industries Alliance

EIA-310: Cabinets, Racks, Panels, and Associated Equipment

IBC: International Building Code

IFC: International Fire Code

NEC: National Electrical Code

NEMA: National Electrical Manufacturers Association

UL: Underwriters Laboratories

* + - 1. SUBMITTALS
				1. Submit product data for the following:

Cable

Connectors

Patch panels

Closet connector housing (CCH)/Fiber optic distribution unit (FODU)

Modular cords

Faceplates

Jacks

* + - * 1. Submit Contractor qualifications, upon request, including:

Contractor’s current certification for the manufacturer’s certified installer program.

Manufacturer’s Category 6 certifications for each technician performing installation on the project.

Manufacturer’s fiber optic cable and connector certifications for each technician performing installation on the project.

* + - * 1. Upon request, submit certified equipment calibration records performed by the equipment manufacturer stating that the equipment that will be used in the testing of copper and fiber optic cables installed as part of the work was calibrated within the past 6 months.
				2. Provide as-constructed documents, including the following information as applicable:

Complete site plans, floor plans, and enlarged plans and site plans indicating placement and routing of as-installed raceways, junction boxes, racks, cabinets, cables, and communications outlet locations and types with labels and cabling facilities installed. Cabling shall include callouts detailing Port cable designation.

Cable termination schedules and details.

* + - * 1. Test Reports: The Contractor shall be responsible for recording all test data. Submit electronic copies of all test results to the Port for review and approval no later than one week after completion of the testing.

Submit test report schedules with the assigned cable designation clearly indicated to confirm that the cabling infrastructure has been tested, labeled, and documented.

* + - * 1. Submit manufacturers’ equipment guarantees or warranties for applicable systems and components.
			1. QUALITY ASSURANCE
				1. The work shall be performed by Oregon Limited Energy Journeyman licensed technician(s).
				2. The structured cabling system shall be installed by a value-added reseller for the manufacturers specified and their respective products. Each of the Contractor’s installing technicians shall have completed the manufacturer’s training and be a certified member in good standing of the manufacturer installer program before, during, and through completion of the system installation.

Within article, replace [Tenant] with name of tenant.

* + - 1. WARRANTY
				1. Provide the following:

Limited Lifetime Berk-Tek/Leviton materials warranty on parts and labor to repair/replace defective telecommunications copper station cabling materials and associated products.

Minimum 25-year Corning Cable Systems warranty on parts and labor to repair/replace defective telecommunications fiber backbone and fiber station cabling materials and associated products.

* + - * 1. Passive components and products (cables, connectors, patch panels, and/or other associated components) shall come from the manufacturers listed above to offer an extended warranty on the structured cabling system being installed. The Contractor or the Contractor’s installer shall be certified by Berk-Tek/Leviton or Corning to provide the materials warranty and shall meet all necessary requirements to make [Tenant] eligible for the extended warranties. Upon completion, submit a certificate from the sponsoring manufacturer stating that the installed system is covered by the manufacturer’s extended warranty for the minimum period applicable.
1. PRODUCTS
	* + 1. MATERIALS
				1. Communications products installed as part of this work shall be listed by a recognized testing laboratory or approved in writing by the inspection authority as required by governing codes and ordinances.
				2. Materials shall be new and of the best quality. The materials shall be manufactured in accordance with NEMA, ANSI, UL, or other applicable standards.
				3. Equipment and materials of the same general type shall be of the same manufacturer throughout the work to provide uniform appearance, operation, and maintenance.
				4. Cable jacket shall be plenum-rated and marked with the CMP designation where appropriate and as required by code for installation in plenum-rated areas.
			2. FIBER OPTIC CABLE
				1. Fiber optic cables shall be single-mode, loose tube, riser/plenum rated for the environment of the installation. Corning FREEDM Cable Series, no substitutions.

Singlemode fiber shall be 8.3um/125um.

Where installed in cable tray, cable shall be armored.

* + - * 1. Cable strand size as indicated on the drawings.
			1. HORIZONTAL CABLE – INTERIOR
				1. Horizontal cables shall be four-pair, twisted pair (UTP), #24 AWG solid copper conductors, paired, flame-retardant PVC jacket.
				2. Cable shall be pliant with no memory.
				3. Manufacturer: Berk-Tek LANmark-6 UTP Plenum cable (Part No. 10136749), no substitutions.
				4. Cable jacket shall be yellow in color.
			2. HORIZONTAL CABLE PATCH PANELS
				1. Design patch panels for installation on standard NEMA 19-inch equipment racks.
				2. Patch panels shall be certified by the manufacturer to ensure optimal channel performance of the structured cable system. Leviton Atlas-X1 Angled Shielded QuickPort 24 Port Patch Panel+ (Part No. 4S256-S24), no substitutions.
			3. FIBER CONNECTORS
				1. In Existing or New FODUs with Fan-Out Kits:

Terminate singlemode fiber ends with LC ceramic ferrule connectors. Corning FuseLite splice on connector, no substitutions.

Bare fibers shall be protected using buffer tube fan-out kits prior to termination. Corning Cable Systems Part No. FAN-BT25-1, no substitutions.

* + - 1. CLOSET CONNECTOR HOUSING (CCH)/FIBER OPTIC DISTRIBUTION UNIT (FODU)
				1. Network, Equipment Rooms:

CCH with LC bulkheads, connector panels, and associated hardware.

Closet connector housings shall be black in color.

CCH housing size as indicated on the drawings.

* + - 1. FACEPLATES
				1. Faceplates shall have a minimum of four communication ports that may be configured for either copper or fiber installations on a per-port basis and shall be flush-mount unless otherwise specified.
				2. Provide angled single gang configuration.
				3. Faceplates shall be stainless steel.
				4. Unused faceplate ports shall have black blank inserts (Part No. 41084-BW).
				5. Leviton, Part No. 43081-1L4, no substitutions.
			2. JACKS
				1. Jacks shall be yellow, Leviton Atlas-X1 CAT6 UTP QuickPort Connector Part No. 61UJK-RY6, no substitutions.
				2. Wall mount jacks (for wall phones) shall be stainless steel Leviton Recessed Wallplate Part No. 4108W-1SP, no substitutions.
1. EXECUTION
	* + 1. GENERAL
				1. Provide services, labor, material, and components necessary for a complete and finished installation.
				2. Install equipment, patch panels, and termination blocks between 1 foot 6 inches AFF and 6 feet 6 inches AFF on equipment racks or backboards as appropriate.
				3. Install firestops and seals at penetrations through building floors, walls, or where required by fire codes.
				4. Field test cables prior to installation. Replace damaged cables.
				5. Inspect cable for sheath defects or other irregularities as it is pulled out. Upon detection of defects, stop pulling and repair or replace the cable section.
				6. Install cables continuously with no splices.
				7. Provide bonding for all equipment within telecom rooms in accordance with manufacturer’s requirements.
			2. GROUNDING
				1. Comply with grounding specifications of EIA/TIA-607-C: Generic Telecommunications Bonding and Grounding for Customer Premises
			3. EQUIPMENT SUPPORT
				1. Each fastening device and support for communications equipment and racks shall be capable of supporting not 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 project location.
				2. Powder-actuated or similar shot-in fastening devices will not be permitted for any communications work except when approved by the Port.
			4. ALIGNMENT
				1. Fit outlets with neat, appropriate trims, plates, or covers, without overhanging edges, protruding corners, or raw edges, to leave a finished appearance.
			5. CUTTING AND PATCHING
				1. Include cutting, patching, and restoration of finishes. Surfaces damaged by this work shall be neatly patched and finished to match the adjacent construction, including paint or other finishes. Clean up and remove dirt and debris.
				2. Where equipment installations or connections require the installation of an access panel, provide a properly sized and installed access panel similar to those used for mechanical equipment access.
				3. Conduit fill shall not exceed NEC fill requirements.
			6. PROTECTION OF WORK
				1. Protect communications work and equipment installed against damage by other trades, weather conditions, or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.
				2. Communications equipment shall be kept covered or closed to exclude dust, dirt and splashes of plaster, cement, or paint, and shall be free of all such contamination on exterior and interior before acceptance. Enclosures and trims shall be in new condition, free of rust, scratches, and other finish defects. Properly refinish to new condition if damaged.
			7. MAINTENANCE OF SERVICE
				1. Communication systems and equipment shall be maintained to functioning portions of the building throughout construction, during normal working hours of the building occupants. Outages to occupied areas shall be kept to a minimum and require pre-approval from the Port. The Contractor will be liable for any damages resulting from unscheduled outages or for outages not confined to the prearranged times.
			8. FIBER OPTIC CABLE
				1. Install fiber optic cable in inner duct, either existing corrugated or new flexible fabric, when using underground conduits. Use no inner duct in cable trays if armored fiber cable is used. Stop inner duct before entering a network room or computer room. Leave 10 feet of maintenance loop at both ends. Coordinate with the Port for location.
				2. For installation of fiber optic cabling in the outside plant raceway system, provide a 15 maintenance loop in every third manhole, vault, or pull box in addition to the maintenance loop indicated above.
				3. Fan-Out of Fiber Optic Cable: Prior to termination, fiber optic cable strands shall be furcated (fanned out) using the specified buffer tube fan-out kits and using the procedure specified by the manufacturer.
			9. HORIZONTAL CABLE
				1. Install cables in cable tray or conduit. Install conduit in accordance with Section 260533.
				2. Dress cables neatly in cable trays and tie down at corners and changes in cable tray elevation using hook and loop fastener, strap or wrap. Install cables in center spine cable tray so that the cable tray is balanced.
				3. Verify cable lengths prior to installation. Provide notification of cables exceeding 290 feet, do not install cables that exceed 290 feet without prior Port approval.
				4. Install pull string in all conduits.
			10. TERMINATIONS
				1. Terminate horizontal cables on modular jacks inserted in patch panels, faceplates, or surface mount boxes.
				2. All four pairs of each horizontal cable shall be terminated in T568B pinout standard order on the jack.
				3. Coordinate with Port IT on cable termination locations in Port network rooms.

Within article, replace [Tenant] with name of tenant.

* + - 1. TESTING
				1. Upon completion, test systems to show that equipment installed operates as designed and specified. Submit testing plans for review prior to testing. Plan system tests for as many at one time as possible to work into construction phasing. The Port and [Tenant] may witness tests at its option and if so, schedule tests 48 hours in advance.
				2. A written record of performance tests shall be compiled, dated, witnessed, and submitted along with operating and maintenance data, prior to substantial completion.
				3. Test reports shall certify that wiring is complete, passes all test criteria, is fully operational, and that the work has been completed as specified.
				4. Provide all forms, instrumentation and test equipment, loads, and other consumables required.
				5. Copper Cat 6 Horizontal Cable Testing:

Test after jacks are inserted and faceplates correctly mounted and labeled.

Following the final inspection tests and certification by the Contractor, post-certification may be performed through an independent field verification program or testing service. The Port, at its discretion, may require the Contractor to return to the site, at no additional cost to the Port, to assist with the determination of any certification discrepancies. If such a determination finds the materials, installation procedures, or final testing procedures to be out of compliance with this contract, the Contractor shall remedy the cause and re-test, at no additional cost to the Port.

Test copper cables with test equipment designed to substantiate compliance with ANSI/TIA568-C.2. If the test equipment permits, program into the tester “Port of Portland” as the name of “Owner” and the correct cable number under “Circuit ID” appearing on each cable report page. Retain test results and submit.

Perform channel tests on horizontal cables and provide test results on the following electrical signal characteristics:

Wire Map

Length

Resistance

Propagation Delay

Delay Skew

Insertion Loss

Return Loss

Near-End Crosstalk (NEXT)

Powersum Near-end Crosstalk (PSNEXT)

Attenuation to Crosstalk Ratio Near-End (ACRN)

Powersum Attenuation to Crosstalk Ratio Near-End (PSACRN)

Attenuation to Crosstalk Ratio Far-End (ACRF)

Powersum Attenuation to Crosstalk Ratio Far-End (PSACRF)

Test cables to meet ANSI/TIA-568-C.2 standards on the permanent link, equipment outlet to patch panel. The cable installation and products will be deemed acceptable if the Contractor provides documentation substantiating compliance with the electrical signal characteristics of the ANSI/TIA-568-C.2 specifications for horizontal cables.

Approved Cat 6 tester is Fluke Versiv with DSX5000 module, or equal.

Correct or replace copper cables and related hardware that fail the acceptance test. Re-test, as outlined in the testing procedures, cables requiring corrective action to meet compliance.

Submit cable test equipment reports on a compact disc using the latest version of the test equipment manufacturer’s software, as well as a printed paper copy, for approval. Provide a copy of the test equipment manufacturer’s most current release of the test equipment software to allow reading of the test data.

* + - * 1. Fiber Optic Cable Testing:

Tier 1 Testing:

Test all fiber strands via the one-jumper reference method.

Fiber test reference cords shall meet ISO/IEC 14763-3 maximum dB loss limits with verifiable maximum loss limits of no more than 0.20dB.

Fiber test reference cords shall be between 2m and 5m in length.

Perform end-to-end, one-directional attenuation test for each fiber strand (connector-to-connector) at 1310 and 1550 wavelengths.

Approved Tier 1 tester is Fluke Versiv with CertiFiber Pro OLTS module, or equal.

Tier 2 Testing:

Install a launch cable between the OTDR and the first link connection.

Install a tail cable after the last link connection.

The launch and tail cables shall remain in place for the measurement in the opposite direction.

Launch and tail cable connectors shall not have more than 0.20dB maximum loss.

Launch and tail cables shall have a minimum length of 130m.

Perform end-to-end, bi-directional attenuation test for each fiber strand (connector-to-connector) at 1310 and 1550 wavelengths.

Approved Tier 2 tester is Fluke Versiv with OptiFiber Pro OTDR module, or equal.

Fluke field-test instrument shall be within the calibration period recommended by the manufacturer and a copy of the calibration certificate shall be made available.

Calculate the fiber optic attenuation loss budget using the manufacturer’s specified attenuation per linear foot of fiber. Calculate singlemode connectors using the manufacturer’s published values of 0.30 dB per connector for the maximum loss.

No singlemode mated pair connector will be accepted if field test result loss is greater than 0.50 dB.

Place terminated fiber connectors in duplex fiber bulkheads and panels sequentially per the fiber color code. Polarity shall be straight through.

Submit a copy of the OLTS and OTDR test reports on a compact disc using the latest version of the test equipment manufacturer’s software, as well as a printed paper copy, for approval. Include a copy of the test equipment manufacturer’s most current release of the test equipment software.

Following the final inspection tests and certification by the Contractor, post-certification may be performed through an independent field verification program or testing service. The Port, at its discretion, may require the Contractor to return to the site, at no additional cost to the Port, to assist with the determination of any certification discrepancies. If such a determination finds the materials, installation procedures, or final testing procedures to be out of compliance with the contract documents, the Contractor shall remedy the cause and re-test, at no additional cost to the Port.

Fiber strands not in compliance with manufacturer’s performance specifications shall be removed, replaced, and re-tested as outlined in the testing procedures.

END OF SECTION 271001