READ THIS FIRST

Notice to the Design Engineer, please refer to the Port of Seattle, Facilities and Infrastructure standards for reference before editing this specification.

This Project Spec Document may need additional modifications to suit your project. It is recommended that you proofread each section, paying attention to any “Notes” boxes such as this one--you should remove these “Notes” sections as you go. Also, do a search for all bracket characters “ [ ] “ as they are used to show you areas containing options or project specific details (you can use Microsoft Word’s Find feature {Ctrl-F} to jump to an open bracket “ [ “ character quickly). Again, these bracket characters should be removed.

It is important that every paragraph be numbered to allow for easy referencing. If you use the document’s built in styles and formatting your outline should be fine (turn on the formatting toolbar by going to View > Toolbars > Formatting). Most paragraphs will use the style “Numbered Material” and can be promoted (Shift) or demoted (Shift-Tab).

You should not have to manually enter extra spaces, carriage returns or outline characters such as A, B, C, or 1.01, 1.02; the formatting will do this for you. The entire document is 11 pt. Arial. If you paste items in, you may need to reapply the “Numbered Material” format.

1. GENERAL
   1. SUMMARY OF WORK
      1. The extent and location of “Cable Trays” Work is shown in the Contract Documents. This section includes requirements for materials, equipment, tests for cable tray systems, including straight sections, bends, tees, elbows, dropouts, supports and accessories.
   2. GOVERNING CODES, STANDARDS AND REFERENCES
      1. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
      2. NEMA FG 1 (National Electrical Manufacturers Association) - Fiberglass Cable Tray Systems
      3. NEMA VE 1 (National Electrical Manufacturers Association) - Metallic Cable Tray Systems
      4. NEMA VE 2 (National Electrical Manufacturers Association) - Metallic Cable Tray Installation Guidelines
      5. NFPA 70 (National Fire Protection Association) - National Electrical Code
   3. SUBMITTALS
      1. Submit materials data in accordance with Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.
      2. Submittals shall include the following:
         1. Product Data: Include data indicating dimensions and finishes for each type of cable tray.
         2. Manufacturer’s Installation Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation.
         3. Shop Drawings: Detail fabrication and installation of cable tray, including plans, elevations, and sections of components, and attachments to other construction elements. Identify components and accessories, including, but not limited to clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, drop-offs, sweeps, and fittings.
         4. Seismic Qualification Certificates: For cable trays, accessories, and components, from manufacturer.
            1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
            2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
            3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
         5. Design Calculations: Verify loading capacities for supports.

Designer shall delete Coordination Drawings paragraph where not required by the Project.

* + - 1. Coordination Drawings: Tray routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
         1. Structural members in paths of conduit groups with common supports.
         2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
      2. Factory-certified test reports of specified products, complying with NEMA VE 1.
      3. Field Test Reports: Provide grounding test locations and results.
      4. Maintenance Data: For cable trays to include in the maintenance manuals specified in Division 1 General Requirements.
  1. QUALITY ASSURANCE
     1. Source Limitations: Obtain cable tray components through one source from a single manufacturer.
     2. Listing and Labeling: Provide cable trays and accessories that are Listed and Labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction, and marked for intended use for the location and environment in which they are installed.
     3. Comply with NEMA VE 1, “Metal Cable Tray Systems,” for materials, sizes, and configurations.
  2. COORDINATION
     1. Coordinate layout and installation of cable tray with other installations.
     2. Coordination Drawings: Include floor plans and sections drawn to scale. Include scaled cable tray layout, support points, and relationships between components and adjacent structural and mechanical elements, vertical and horizontal offset and transitions, clearances for access above and to side of cable trays, and vertical elevation of cable trays above the floor or below bottom of ceiling structure.
     3. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Engineer.

1. PRODUCTS

A. If only one product is acceptable (single or sole source product), obtain an approved Competition Waiver and submit to the CPO Construction, Contract Administrator. The language shall read as: “Manufacturer Name, Product # XXXXX, No Equal.” Refer to CPO-6 Competition Waiver Policy for more information.

B. If a Competition Waiver is not approved or more than one product is acceptable, this section must list a minimum of 2 products plus the language “Or Approved Equal,” along with salient characteristics. Refer to CPO Construction’s Salient Characteristics Guidelines for more information.

* 1. MANUFACTURERS
     1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. Cooper B-Line
        2. MP Husky
        3. Legrand Cablofil.
        4. Or Approved Equal.
     2. Manufacturer: Communication Cable tray systems shall be as manufactured by:
        1. Cooper B-Line
        2. Chatsworth Products, Inc.
        3. Or Approved Equal
  2. GENERAL REQUIREMENTS FOR CABLE TRAYS
     1. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
        1. The term "withstand" means "cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."
     2. Cover: Electrical cable trays shall have no cover
     3. Tray Size:
        1. Width: [6] [9] [12] [18] [24] inches.
        2. Minimum Fitting Radius: [12] [24] inches.

Inside depth does not apply to channel type tray.

* + - 1. Tray Inside Depth: [4] [5] [6] inches.
      2. Standard 12 foot lengths.
  1. LADDER CABLE TRAYS
     1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
     2. Rung Spacing: [6 inches for control cables,] [12 inches for power cables] on center.
     3. Rung cable bearing surface: ¾ inch with radiused edges.
     4. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
     5. No portion of the rungs shall protrude below the bottom plane of side rails.
     6. Structural Performance of Each Rung: Capable of supporting a 200-lb minimum concentrated load, when tested according to NEMA VE 1.
  2. TROUGH CABLE TRAYS
     1. Rung Spacing: Rungs or corrugations shall be spaced a maximum of 6 inches on center and have a minimum flat bearing surface of 2 inches.
     2. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
     3. Structural Performance: Capable of supporting a maximum cable load of 200-lb minimum concentrated load, when tested according to NEMA VE 1.
     4. Class Designation: Comply with NEMA VE 1, Class 12B OR Class 12C OR Class 20B OR Class 20C.
     5. Splicing Assemblies: Bolted type using serrated flange locknuts.
     6. Splicing Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
     7. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
  3. CHANNEL CABLE TRAYS
     1. Configuration: Channel with ventilated flat bottom with holes and slots to facilitate use of cable ties to secure cables. Minimum loading depth of 1-1/4”.
     2. Fitting radius – minimum of 12 inches
     3. Structural Performance: Capable of supporting a maximum cable load of 200lbs per rung or 800lbs per foot.
  4. MATERIALS AND FINISHES
     1. Steel:
        1. Outdoor Installation: Steel conforming to ASTM A1011, grade 33 for 14 gauge and heavier.
        2. Splice Plates: High strength steel splice plates with 4 ribbed neck carriage bolts with serrated flange locknuts each.
        3. Finish: Hot-dip galvanized after fabrication, complying with ASTM A123.
           1. Hardware: To match cable tray construction.
     2. Aluminum:
        1. Indoor Applications: Alloy 6063- according to ANSI H35.1/H 35.1M for extruded components, and Alloy 5052 according to ANSI H35.1/H 35.1M for fabricated parts.
        2. Splice Plates:
           1. Bolted type, Aluminum alloy 6063-T6 with four square neck bolts and serrated flange locknuts each.
        3. Hardware: Chromium-zinc-plated steel, ASTM F 1136.
     3. Fabricate cable tray products with rounded edges and smooth surfaces.
  5. CABLE TRAY ACCESSORIES
     1. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

Delete paragraph below if not used.

* + 1. Barrier Strips: Same materials and finishes as cable tray.
    2. Cable tray supports and connectors, including bonding jumpers, as required to install, support, and protect the cable tray system.

1. EXECUTION
   1. EXAMINATION
      1. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of cable trays. Do not proceed with installation until unsatisfactory conditions have been corrected.
   2. INSTALLATION
      1. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.
      2. Coordinate installation of cable tray with other trades to allow a minimum of 12” above, 18” in front, and 12” below of clearance from piping, conduits, ductwork, etc. Allowance must be provided for access to the tray with reasonable room to work. Obstructions to the tray must be minimized and cannot block more than 6’ of the tray at any point in the run.
      3. Coordinate with the architect the color scheme for the trays and other pathways in the open spaces to match existing aesthetics.
      4. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
      5. Join aluminum cable tray with splice plates; use four square-neck carriage bolts and locknuts.
      6. Install cable tray level and plumb according to manufacturer’s written instructions, Coordination Drawings, original design, and referenced standards.
      7. Remove burrs and sharp edges from cable trays.
      8. Fasten cable tray supports securely to building structure as specified in Section 26 05 29 – Hangers and Supports for Electrical Systems and Section 26 05 48 – Structural Loading Controls for Electrical and Communication Work, unless otherwise indicated.
         1. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.

Delete paragraph below if cable tray does not connect to equipment.

* + 1. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independently of fittings. Do not carry weight of cable tray on equipment enclosure.

Delete paragraph below if expansion fittings are not required.

* + 1. Install expansion connectors where cable tray crosses a building expansion joint and in cable tray runs that exceed 100 feet. Space connectors and set gaps according to NEMA VE 2.
    2. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.
    3. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
    4. Support cable tray to prevent twisting from eccentric loading.
    5. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.
    6. Make cable tray connections and changes in direction or elevation using standard fittings.
    7. Locate cable tray above piping where practical.
    8. Seal penetrations through fire and smoke barriers, including walls, partitions, floors and ceilings, after cables are installed, according to Section 07 84 00 - Firestopping.

If cable trays are sized for future cables, specify provisions for penetrations with sleeves through fire-rated partitions, or use “repairable” firestopping-penetration sealing material.

* + 1. Sleeves for Future Cables: Install capped sleeves for future cables through firestopping-sealed cable tray penetrations of fire and smoke barriers.
    2. Workspace: Install cable trays with sufficient space to permit access for installing cables.

Delete paragraph below if systems are not mixed.

* + 1. Provide separate trays for cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600V, 5kV, and 15kV.
    2. Install barriers to separate cables of different voltage systems or to separate normal and emergency system cables.
    3. When terminating a conduit to cable tray, use appropriate ground bushing to bond the conduit to the tray.
    4. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.
    5. Clamp covers on cable trays installed outdoors with heavy-duty clamps
  1. ADDITIONAL REQUIREMENTS FOR COMMUNICATION CABLE TRAY
     1. Cable Trays: Comply with ANSI/TIA-569.
     2. Cable trays should not extend more than 12“ inside of the TR.
     3. Enclosed cable tray (NOT solid bottom, bendable or thru cable tray) with cover for distribution of backbone and horizontal cabling.
     4. Provide cable runaway radius drop at cable transitions from tray to racks.
     5. Cable tray bottom to conceal cables in the color that has been coordinated previously with architect to match the area color theme.
  2. CABLE TRAY GROUNDING
     1. Ground cable trays according to NFPA 70 and as instructed by manufacturer. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
     2. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.
     3. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer’s published torque tightening values.
     4. Cable trays shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch intervals with approved grounding clamps designed for cable trays. The grounding conductor shall be minimum #2 AWG bare copper stranded cable or larger, sized according to NFPA 70.
     5. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding-bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
     6. When steel or aluminum tray is used as equipment grounding conductor, cable tray sections and fittings shall be marked to show minimum cross-sectional area in accordance with NFPA 70.
     7. Connections to aluminum cable tray shall be made using an anti-oxidant compound.
     8. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70.
     9. Connect cable tray ground conductor to building steel or ground grid.
  3. CONNECTIONS
     1. Remove Paint from all connection points before making connections. Repair paint after the connections are completed.
     2. Connect raceways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.
  4. CABLE INSTALLATION
     1. Install cables only when each cable tray run has been completed and inspected. Cable installation shall be per NFPA 70.
     2. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
     3. Fasten cables on vertical runs to cable trays every 18 inches.
     4. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 48 inches.
     5. In existing construction, remove abandoned and damaged cables from cable trays.
  5. IDENTIFICATION
     1. After installation of cable trays is completed, install warning signs as specified in Section 26 05 53 - Electrical Identification at 25-foot intervals in visible locations on cable trays, both sides of tray if both sides are visible.
  6. TESTING
     1. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the “worst case” loading conditions outlined in this specification and performed in accordance with the latest version of NEMA VE-1.
  7. FIELD QUALITY CONTROL
     1. Grounding: Test cable trays to ensure electrical continuity of bonding and grounding connections. Maximum allowable resistance is 1 ohm.
     2. Perform the following tests and inspections [with the assistance of a factory-authorized service representative]:
        1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
        2. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are installed in separated cable trays from power circuits.
        3. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
        4. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
        5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
        6. Check for improperly sized or installed bonding jumpers.
        7. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
        8. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays.
  8. CLEANING
     1. Upon completion of cable tray installation, including fittings, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

1. MEASUREMENT AND PAYMENT
   1. GENERAL
      1. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items in the [Schedule of Unit Prices] [Lump Sum price bid for the Project].

End of Section

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

10/08/2025 Added information for communication raceways, and general revisions