SECTION 27 11 23

COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

PART 1 – GENERAL

1.01 DESCRIPTION

A. The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:

1. Telecommunications room ladder racks complete with all necessary installation hardware.

1.02 QUALITY ASSURANCE

A. Refer to Section 27 00 00 for general details.

1.03 CODES AND STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations in Section 27 00 00.

1.04 SUBMITTALS

A. Refer to Section 27 00 00 for general details.

B. Shop Drawings:

1. Shop drawings shall show the position of ladder racks in the telecommunications room. Ladder racks shall be dimensioned and the position of the ladder rack shall be dimensioned from (2) walls in each telecommunication room.

2. Shop drawings for ladder racks shall also show the method of attachment to the ceilings.

C. Submit Manufacturer's Cut Sheets for the following:

1. Any products not specifically listed in the PRODUCTS section shall require a submittal of the manufacturer’s cut sheets.

1.05 IDENTIFICATION

A. None Required.

1.06 DEFINITIONS

A. N/A
1.07 WARRANTY

A. Refer to Section 27 00 00 for general details.
PART 2 – PRODUCTS

2.01 PRODUCT CONSISTENCY

A. Product Consistency: Any given item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item will not be permitted.

2.02 LADDER RACK - GENERAL

A. Unless otherwise noted, finish on all metal components shall be epoxy-polyester hybrid powder coat and grey in color, Hardware will be zinc plated with a gold chem. finish.

B. Elements shall be provided from the manufacturer as a complete kit, including all fasteners and required hardware.

2.03 LADDER RACK (UNIVERSAL CABLE RUNWAY)

A. Ladder rack shall be manufactured from 3/8” wide by 1-1/2” high tubular steel with .065” wall thickness.

B. Ladder rack (side stringers) will be 9’-11½” long. Cross members will be welded in between stringers on 12” centers beginning 5-3/4” from one end so that there are 10 cross members per ladder rack. There will be 10-1/2” of open space in between each cross member.

C. Ladder rack will be delivered individually boxed, and available in 15” and 18” widths.

D. Manufacturer/Product: CPI Part# 10250-115 (15” Universal Cable Runway)

E. Manufacturer/Product: CPI Part# 10250-118 (18” Universal Cable Runway)

2.04 VERTICAL-TO-HORIZONTAL 90° TURNS (CABLE RUNWAY OUTSIDE RADIUS BEND)

A. Vertical-to-horizontal 90° turns shall be manufactured from 3/8” wide by 1-1/2” high tubular steel with .065” wall thickness, and shall be available in 15” and 18” widths.

B. Stringers (sides) will be formed in a 90° arc with a 12-1/2” outside radius. Cross members will be welded in between stringers on approximate 23° increments so that there are 3 cross members per turn. The welded assembly will create a smooth 90° vertical-to-horizontal turn.

C. Manufacturer/Product: CPI Part#: 10723-115 (15” Cable Runway Outside Radius Bend)

D. Manufacturer/Product: CPI Part#: 10723-118 (18” Cable Runway Outside Radius Bend)

2.05 HORIZONTAL-TO-VERTICAL 90° TURNS (CABLE RUNWAY INSIDE RADIUS BEND)

A. Horizontal-to-vertical 90° turns shall be manufactured from 3/8” wide by 1-1/2” high tubular steel with .065” wall thickness, and shall be available in 15” and 18” widths.

B. Stringers (sides) will be formed in a 90° arc with a 12-1/2” outside radius. Cross members will be welded in between stringers on approximate 23° increments so that there are 3 cross members per turn. The welded assembly will create a smooth 90° horizontal-to-vertical turn.

C. Manufacturer/Product: CPI Part#: 10724-115 (15” Cable Runway Inside Radius Bend)
D. Manufacturer/Product: CPI Part#: 10724-118 (18" Cable Runway Inside Radius Bend)

2.06 CORNER BRACKETS (CABLE RUNWAY CORNER BRACKET)

A. Corner brackets shall be manufactured from 3/8" wide by 1-1/2" high tubular steel with .065" wall thickness.

B. The inside stringers of the corner bracket will be formed at 90° with a small chamfer at the vertex. The outside stringer of the corner bracket will be formed in a 90° arc with a 15° radius. A single cross member will connect the chamfered portion of the inside stringer to the outside stringer. The welded assembly will create a smooth 90° turn within the L-shaped corner created by two intersecting ladder racks.

C. Corner brackets will be available in the size(s) specified below. Installation hardware will be included with the corner bracket. Corner bracket installation hardware does not include the junction splice kit required to form the L-shaped intersection between two ladder racks.

D. Manufacturer/Product: CPI Part#: 11959-115 (Cable Runway Corner Bracket)

2.07 LADDER RACK SPLICES

A. Splice kits will provide a method of mechanically connecting ladder rack sections and turns together end-to-end to form a continuous pathway for cables.

B. Splices (splice plates) will be manufactured from steel with zinc plating.

C. Manufacturer/Product: CPI Part#: 11301-001 (Cable Runway Splices)

2.08 JUNCTION SPlice KITS

A. Splice kits will provide a method of mechanically connecting ladder rack sections and turns together side-to-end to form a continuous pathway for cables.

B. Splices (splice plates) will be manufactured from steel with zinc plating.

C. Manufacturer/Product: CPI Part#: 11302-001 (Junction Splice Kit)

2.09 LADDER RACK SUPPORTS

A. Ladder Rack Supports for Suspension from an Open Ceiling

1. Supports will be sized to match the width of the ladder rack that is supported. Some supports will work with all widths of ladder rack.

2. Each support will include a means of securing ladder rack to the support.

3. Supports will be manufactured from steel.

4. Support kit shall utilize no less than a 3/8" threaded rod.

5. Manufacturer/Product: CPI Part#: 11310-001 (Cable Runway Supports)

B. Horizontal Ladder Rack Supports for Wall Mounting (Horizontal Wall Angle Support)
1. Supports will be sized to match the width of the ladder rack that is supported.

2. Each support will include a means of securing ladder rack to the support.

3. Supports will be manufactured from steel.

4. Support shall be 2" x 2" x .105" steel angle designed specifically this application.

5. Manufacturer/Product: CPI Part#: 11421-115 (15" Cable Runway Supports)

6. Manufacturer/Product: CPI Part#: 11421-118 (18" Cable Runway Supports)

C. Vertical Ladder Rack Supports for Wall Mounting

1. Supports will be sized to match the size of the ladder rack stringers that are supported.

2. Supports will be manufactured from steel.

3. Manufacturer/Product: CPI Part #: 10608-001 (Cable Runway Supports)

D. Ladder Rack Supports for Top of Rack

1. Supports will be sized to match the width of the ladder rack that is supported. Some supports will work with all widths of ladder rack.

2. Each support will include a means of securing ladder rack to the support, and the support to the rack.

3. Supports will be manufactured from steel.

4. The 3” wide mounting plate shall include a hat shaped mounting bracket to secure the plate to the rack top angles without intruding into the rack mounting spaces.

5. Manufacturer/Product: CPI Part #: 12730-118 (Cable Runway Supports)

2.10 LADDER RACK ACCESSORIES

A. Ladder Rack Radius Drops

1. Supports will be sized to match the width of the ladder rack that is supported.

2. Each radius drop mounts to the cross member or stringer and will be secured with a clevis pin.

3. Radius drop shall provide minimum 3" bend radius, and shall be equipped with three 1½" cable spools.

4. Supports will be manufactured from steel or aluminum.

5. Manufacturer/Product: CPI Part #: 12100-112 (Cable Runway Supports for Cross Members)

6. Manufacturer/Product: CPI Part #: 12101-101 (Cable Runway Supports for Stringers)
B. Ladder Rack Grounding
   1. 8" insulated green #6 AWG stranded copper conductor
   2. Utilizes two-hole, double crimp, compression lugs with 1/4" bolt holes spaced on 5/8" centers.
   3. Shall use all UL Listed components.
   4. Manufacturer/Product: CPI Part #: 40164-001 (Grounding Kit)

C. End Caps
   1. End caps used to cover the ends of ladder rack will be manufactured from a black fire-retardant rubberized material.
   2. Sized to fit stringers 3/8" wide by 1-1/2" high.
   3. Manufacturer/Product: CPI Part #: 10642-001

D. Touch Up Paint
   1. Air dry waterborne paint available in a bottle with applicator.
   2. Manufacturer/Product: CPI Part #: 25401-100

2.11 CABLE MANAGEMENT ACCESSORIES (STRAPS AND TIES)

A. Cable Straps
   1. Construction is to be laminated, as opposed to heat bonded or glued.
   2. Hook side shall be constructed from 100% Polyethylene
   3. Loop Hook side shall be constructed from 100% Nylon
   4. Available in multiple widths and colors, but ½" white shall be used.
   5. Manufacturer/Product: Riptie Part #: W-60-1SP-W (White, ½"

B. Cable Ties (Indoor)
   1. Cable ties for use indoors with OSP, riser, and fiber optic cables.
   2. Low profile head with parallel-entry (180° entry)
   3. Width shall be at minimum 0.3"
   4. Minimum Loop Tensile Strength of 120lbs.
   5. Material shall be nylon and Natural or White in color.
   6. Manufacturer/Product: Panduit Part #: ILT6LH-C
C. Cable Ties (Outdoor)
   1. Cable ties for use outdoors with OSP cables.
   2. Low profile head with parallel-entry (180° entry)
   3. Width shall be at minimum 0.3”
   4. Minimum Loop Tensile Strength of 120lbs.
   5. Material shall be weather resistant nylon and Black in color.
   6. Manufacturer/Product: Panduit Part #: ILT6LH-C0

D. Cable Tie Mount
   1. Cradle design with a recessed #10 screw mounting hole
   2. Material shall be weather resistant nylon and Black in color.
   3. Manufacturer/Product: Panduit Part #: TMEH-S10-C100
PART 3 – EXECUTION

3.01 GENERAL

A. Location and placement ladder rack shall be as shown on the Drawings or defined in these specifications and schedules.

B. Where cable leaves a pathway to transition to a ladder rack, and that transition spans more than 18", continuous support shall be required.

C. Ladder rack and all related accessories shall be assembled and installed as per the manufacturers’ printed instructions.

D. Ladder rack and all cable management accessories shall be installed level, plumb, square, and placed in a workmanship like manner.

E. The installer will provide touch-up paint color-matched to the finish on the ladder rack and will correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process prior to the delivery to the University. If a component is cosmetically damaged to the extent that correction in the field is obvious against the factory finish, the component will be replaced with a new component finished from the factory.

F. If a component is physically damaged or exhibiting rust due to mishandling, improper storage, or modification during the installation process, it shall not be used.

G. Any excess length of bolts or threaded rods shall be trimmed to no more than ½ past the nut.

H. All exposed sharp edges shall be filed smooth.

I. Do not install cabling using the ladder rack until after their installation has been accepted by the campus telecommunications representative.

3.02 QUANTITIES

A. Quantities and sizes of ladder rack and components shown on the Drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of all materials necessary to accommodate the equipment and to terminate, cross connect and patch the volume of cable described in these specifications and schedules and shown on the Drawings.

B. Ladder Rack Radius Drops

1. Cable Runway Radius Drops shall be required in any instance where a cable transitions on or off ladder racking, except where the cable enters from above. Contractor is to supply three extra Cable Runway Radius Drops for Stringers per telecom room.

3.03 INSTALLATION

A. Ladder Rack

1. Ladder rack shall be installed with side stringers facing down so that the ladder forms an inverted U-shape and so that welds between the stringers (sides) and cross members (middle) face away from cables.
2. Ladder rack shall be secured to the structural ceiling, building truss system, wall, floor, or the tops of equipment racks using the manufacturer's recommended supports and appropriate installation hardware and methods as defined by local code or the authority having jurisdiction.

3. Ladder rack splices will be made in mid-span, not over a support, with the manufacturer’s recommended splice hardware.

4. At each splice point or termination cut the ladder rack ¼” short to allow for thermal expansion.

5. Maintain correct cross member spacing when splicing ladder sections.

6. Ladder rack shall be supported every 5’ or less in accordance with TIA-569-B. Where additional support is required for runs over 5’, ladder rack is to be supported from the ceiling.

7. Ladder rack shall be supported within 2’ of every splice and within 2’ on both/all sides of every intersection. Support ladder rack within 2’ on both sides of every change in elevation. Support ladder rack every 2’ when attached vertically to a wall.

8. Ladder rack installed parallel to the wall shall be placed with an 8” offset from the wall.

9. Leave a minimum of 12” in between ladder rack and mechanical systems, lighting fixtures, ceiling or any other obstructions. Multiple tiers of ladder rack shall be installed with a minimum clearance of 12” in between each tier of ladder rack.

10. The quantity of cables within the ladder rack will not exceed the manufacturer's product specifications for each product. Actual cable fill for ladder rack will not exceed 6” in height.

11. The combined weight of cables within the ladder rack will not exceed the stated load capacity of the ladder rack as stated in the manufacturer’s product specifications or load/design tables.

12. When a single ladder rack supports different types of cable media, the cable media will be separated within the pathway. Treat each type of cable media and divided area of the ladder rack separately when determining cable fill limits.

13. Use a radius drop to guide cables wherever cable exits overhead ladder.

14. Cover the exposed ends of cable runway that do not terminate against a wall, the floor, or the ceiling with end caps.

15. **Cable Ties & Straps**

1. Riser, Tie and OSP Cables will be secured at every cross member of ladder rack with cable ties.

2. Station Cables (cable bundles) will be secured to every cross member of ladder rack with reusable straps.

3. Cable Tie Mounts spaced 12” on center shall be used to support cable runs on backboard.

4. Riser, Tie and OSP Cables are to use cable ties in all locations, station cables are to use reusable straps in all locations.

3.04 **GROUNDING & BONDING**
A. Within each telecommunications room, ladder rack shall be bonded together, electrically continuous, and bonded to the TGB/TMGB.

B. Ladder rack and transition elements shall be bonded across each splice with a bonding kit. Ladder rack shall be bonded to the TGB/TMGB using an approved ground lug on the ladder rack and a minimum #6 grounding wire.

C. Remove paint from the ladder rack where bonding/ground lugs contact the ladder rack so that the lug will contact bare metal, or use star washers between the nut and the stringer.

D. Use antioxidant joint compound in all locations where bonding/grounding elements are mechanically attached.

E. Verify continuity through the bonds at splices and intersections between individual ladder rack sections and turns and through the bond to the TGB/TMGB.

F. Install all grounding and bonding components per the manufacturer's written specifications.

A. Refer to Section 27 05 26 for additional details.

3.05 TESTING

A. None Required

3.06 ACCEPTANCE

A. Any deviation from the approved drawings will require submission and approval of a revised shop drawing before the installation begins.

B. Once the installation and testing has been completed and the campus telecommunications representative is satisfied that all work is in accordance with the Contract Documents, the representative will notify the Contractor and/or campus project manager in writing or via email.

3.07 RECORD (ASBUILT) DRAWINGS

A. The Project Record Drawings shall show the types and locations of installed ladder rack.

END OF SECTION
DOCUMENT VERSION CONTROL

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