

SECTION 270000
GENERAL PROVISIONS FOR COMMUNICATIONS WORK

PART 1 INSTALLATION OVERVIEW**1.01 SUMMARY**

- A. This project encompasses the installation of high capacity cabling backbone and associated hardware to support high-bandwidth communications. Also included in the communications scope are Unshielded Twisted Pair Cabling.

1.02 THE COMPONENTS ASSOCIATED WITH THIS PROJECT ARE:

- A. Conduit shall be used to provide a protected pathway for all cables routed or installed in an exposed environment or in inaccessible areas. The pathways for this project are included in the Division 26000 series of specifications.
- B. J-Hooks and/or bridal rings shall be used to provide pathway for all cables routed above accessible finished ceilings.
- C. CAT6 twisted pair cabling (as specified) shall be home run between each network drop location to the nearest telecom closet (MDF/IDF).

1.03 RELATED SECTIONS

- A. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 Specifications sections, apply to work in this section.
- B. Division 26 and 27 Sections apply to work in this section.

PART 2 INSTALLATION PROCESS**2.01 INSTALLATION OF CONDUIT**

- A. Unless otherwise stated on drawings, Contractor under Division 26 of this specification is to provide and install conduit in all situations where cabling exits ceiling cavities. All proposed cable routes and drop locations are approximate and should be verified by the contractor. Cable lengths indicated are approximate. It is the contractor responsibility to verify cable distances prior to cutting and routing of cables. It is the contractor responsibility to verify locations and quantities of drops.
- B. All vertical cable runs between floors shall be routed in conduit unless installed in a designated wiring closet, existing ceiling cavity, or specified differently. Vertical conduit runs shall be floor to ceiling or terminate in drop ceiling cavities. In all locations, penetration into the corridor ceiling cavities shall be continuous and require the replacement of fire stop materials.
- C. All core drills that are required shall be provided by the contractor, unless otherwise noted. It is the responsibility of the contractor to verify locations with school officials prior to drilling and to fire stop in accordance with local and state codes.

PART 3 EXECUTION**3.01 CABLING**

- A. All cables shall be routed in accordance with state and local codes and regulations. All cables installed and terminated shall follow the guidelines set forth by the manufacturer. When routing cables through ceiling cavities all cables shall be supported by bridal rings in a bundled manor and shall not be supported or rest on drop ceiling components. Cables shall be neatly swept and bundled. The maximum allowable cable sag between supports shall be 6 inches as measured vertically. All cable shall be run to deck height while in ceiling cavities and fastened to roof supports or the bottom of the deck. Refer to project drawings for additional details.
- B. Drop locations
 - 1. Drop locations and types are as specified on the associated drawings. All locations are approximate and should be verified with county personnel prior to implementation.

3.02 LABELING

- A. All cables are to be labeled at both the origination and termination locations using as specified a permanent alpha numeric cabling system. Cables shall be labeled at all junction points where

a single continuous cable is not used, such as in a splice panel or Demarcation.

- B. Each faceplate shall have identification, which includes the cable number, and drop number if more than one of the same type of drop is installed in the room.

3.03 TESTING

- A. Cabling shall be tested per manufacturers' criteria, EIA/TIA, and test specifications identified in this design.

PART 4 COMPLETION

4.01 PROJECT COMPLETION

- A. All documentation shall be completed as specified. All cabling shall be neat and secure.
- B. Passing of data from each drop location shall be done as specified, in conjunction with Owner. Refer to testing in the general specification section.
- C. All facilities such as walls, ceilings etc., shall be restored to as found or better condition. All fire barriers breached shall be restored / sealed as to local, state and federal codes.
- D. The removal of any construction or installation debris as a result of this project.
- E. The Owner is to be consulted on any alterations of wiring closets, riser locations, and drop locations as required. Should conflicts between this design and the actual install or should any unforeseen circumstance occur during installation the contractor shall consult immediately with an authorized agent of the Owner.

END OF SECTION 270000

SECTION 270529
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 271000 - Structured Cabling.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- I. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
 - 2. Coordinate work to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
 - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
 - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable supports, channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. TIA-569.
 - b. NFPA 70.
 - c. Requirements of authorities having jurisdiction.
 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
 3. Refer to section 260529 for additional requirements.
 4. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 5. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 6. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
1. Applications:
 - a. Do not exceed 5 feet (1.5 m) between cable supports.
 2. Comply with TIA-569.
 3. Cable Supports Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
 4. J-Hooks: Noncontinuous cabling support with removable top retainer clip.
 - a. Material: Use galvanized steel, factory-painted steel, or stainless steel.
 - b. Provide support surfaces with smooth, beveled edges and radius not less than minimum allowable bend radius of cables supported.
 - c. Provide multitiered J-hooks where required to support multiple cabling systems.
 5. Bridle rings: Noncontinuous circular cabling support.
 - a. Material: Use galvanized steel, painted steel, or stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners in accordance with manufacturer's recommended torque settings.
- I. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 270529

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**SECTION 271000
STRUCTURED CABLING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Communications outlets.
- E. Communications grounding and bonding.
- F. Communications identification.

1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260536 - Cable Trays for Electrical Systems.
- D. Section 260534 - Boxes for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products.
- F. Section 262726 - Wiring Devices.
- G. Section 270529 - Hangers and Supports for Communications Systems.
- H. Section 270533.13 - Conduit for Communications Systems.

1.03 REFERENCE STANDARDS

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment 2005e.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2020.
- E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2018d, with Addenda (2020).
- F. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- G. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- H. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
- I. UL 444 - Communications Cables Current Edition, Including All Revisions.
- J. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
- K. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 2. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Project Record Documents: .
 - 1. Record actual locations of outlet boxes and distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on drawings.
- D. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

- A. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
 - 2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
 - 4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
 - 1. Cabling to Outlets: Copper, quantity as indicated on drawings.
- C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

- A. Conduit: See section 260533.13.
- B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

2.03 COPPER CABLE AND TERMINATIONS

- A. Provide cables with lead content less than 300 parts per million.
- B. Copper Horizontal Cable:
 - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
 - 2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
 - 3. Cable Capacity: 4-pair.
 - 4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
 - 5. Maximum Cable Length: 100m.

- a. If cable length exceeds maximum, provide composite single mode fiber with media converters at ends with 5' of copper cable.
6. Cable Jacket Color:
 - a. Voice/Data: Blue
- C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
 1. Performance: 500 mating cycles.
 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
- E. Copper Patch Cords:
 1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
 2. Patch Cords for Patch Panels:
 - a. Quantity: One for each pair of patch panel ports.
 - b. Length: as required for application.

2.04 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

- A. Copper Cross-Connection Equipment:
 1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
 - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - d. Provide incoming cable strain relief and routing guides on back of panel.
- B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
 1. Do not paint over UL label.

2.05 COMMUNICATIONS OUTLETS

- A. Outlet Boxes: Comply with Section 260534.
 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
 2. Minimum Size, Unless Otherwise Indicated:
 - a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
- B. Wall Plates:
 1. Comply with system design standards and UL 514C.
 2. Accepts modular jacks/inserts.
 3. Capacity: 4 ports.
 4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 262726.

2.06 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.
- B. Comply with Section 260526.

2.07 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606 and as indicated on drawings.

- B. Comply with Section 260553.

2.08 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
- C. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, and uninterruptible power systems.
 - 2. 12 inches (300 mm) from power conduits and cables and panelboards.
 - 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
 - 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.
- C. Outlet Boxes:
 - 1. Coordinate locations of outlet boxes provided under Section 260534 as required for installation of telecommunications outlets provided under this section.
 - a. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
 - b. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
 - c. Locate outlet boxes so that wall plate does not span different building finishes.
 - d. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.
 - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 - 1. At Distribution Frames: 120 inches (3000 mm).
 - 2. At Outlets - Copper: 12 inches (305 mm).
- C. Copper Cabling:
 - 1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
 - 2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
 - 3. Use T568B wiring configuration.
- D. Identification:
 - 1. Use wire and cable markers to identify cables at each end.

2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
 1. Inspect cable jackets for certification markings.
 2. Inspect cable terminations for color coded labels of proper type.
 3. Inspect outlet plates and patch panels for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
 1. Test backbone cables after termination but before cross-connection.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION 271000

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