SECTION 27 00 00

COMMUNICATIONS - TERMINAL 1

This document is intended to note the Owners Design Requirements (ODR) for the titled specification section. Design professional to review and integrate ODR into the project's technical specifications. This ODR document should not be viewed as a standalone technical specification.

PART 1 - GENERAL REQUIREMENTS

- Category 6 cable shall be used in Terminal 1 and it's corresponding areas.
- Warranty
  - The warranty shall cover the following standards-compliant applications:
    - Category 6 cabling permanent link - IEEE 802.3 10GBASE-T up to 295 feet
    - Fiber optic multi-mode cabling permanent link - IEEE 802.3 10GBASE-S/LX4
    - Fiber optic single-mode cabling permanent link - IEEE 802.3
- CONTRACTOR QUALIFICATIONS
  - ABF Cable Installer: The proposing company shall be manufacturer certified in designing and installing the air-blown fiber system selected for this project. The company shall have a minimum of three (3) years' experience and have completed at least three (3) previous installations of similar or greater size than this project.
  - Horizontal Cable Installer: The proposing company shall be manufacturer certified in designing and installing the SYSTIMAX structured cabling system for this project. The company shall have a minimum of three years' experience and have completed at least three previous installations of similar or greater size than this project.
  - Management: Project management and supervisory personnel shall be experienced in overseeing the installation of telecommunications cabling systems of the types and sizes to be provided as part of this work. The CONTRACTOR'S on-site management and supervisory staff shall include a BICSI, Registered Communications Distribution Designer (RCDD).

PART 2 - PRODUCT REQUIREMENTS AND SPECIFICATIONS

- GENERAL
  - All products furnished shall be new, unused, free of defects, undamaged, and free of corrosion.
  - All products shall meet all applicable codes and standards.
  - All applicable products shall be listed and classified by Underwriter's Laboratories, Inc. as suitable for the purpose specified and shown.
  - Any given product shall be the product of one manufacturer throughout the facility. Unless specifically noted otherwise or approved by OWNER, multiple manufacturers of any one item is not permitted.
  - All copper and optical fiber cable shall carry a manufacturer's warranty of twenty years.
  - Any product bid and installed per this Section shall be from a company having a minimum of three (3) years' experience specializing in the manufacturing of that product technology.
  - Delivery, storage, and handling of products:
    - Upon delivery to the project site, all products shall be visually inspected for damage. Damaged goods shall be returned to the supplier and replaced at no additional cost to OWNER.
    - Wire and cable stored at the construction site shall be stored in a clean, dry, covered location, which has been approved by OWNER. Maintenance and security of materials storage space is the responsibility of CONTRACTOR.
    - Prior to installation, each end of each continuous length of cable shall be kept sealed by

suitable means to protect against the entrance of moisture. Each continuous length of cable shall be placed on an individual reel.

- If post-manufacture performance data has been supplied with the product, copies of such data shall be provided to OWNER upon request.

♦ AIR-BLOWN OPTICAL FIBER CABLE BACKBONE

- The Air Blown Fiber (ABF) system installed under this project shall be Sumitomo Electric Lightwave Corp. FutureFlex® Air Blown Fiber System or AFL eABF. The new system will match the existing system, which has the following characteristics:
  - Utilize nitrogen to install multi-strand optical fiber bundles through a tubing system. The tubing system allows for the addition of fibers or the change of the type of fiber without pulling additional inner duct or optical fiber over existing fibers.
  - Allows individual tubes to be routed as required through the use of simple push-fit connectors.
  - The optical fiber has the capability of being removed and re-used without damage to the cable.
  - Each fiber is buffered with color-coded PVC.
- Tube cable and Tube Distribution Units (TDU).
  - Tubing and the ABF distribution boxes supplied for this work shall be compatible with existing tubing and boxes.
  - The tubing material shall conform to all required fire safety codes for the areas within which it will be installed.
  - Tube Distribution Units shall be appropriately sized for the amount of tubing to be used but in no case smaller than "24x20x7" and shall meet with OWNER's approval.
  - Unless otherwise specified, tube cables shall provide at least two times the number of tubes needed to complete the initial fiber bundle installation requirements.
- Indoor tube cables
  - The tube cable shall be suitable for installation in cable tray, or conduit.
  - The tubing material shall conform to all required fire safety codes for the areas within which it will be installed.
- Outdoor tube cables
  - The tube cable shall be suitable for underground, buried, and aerial applications.
  - The tubing cables for buried applications shall be steel armored for rodent protection, and conductive materials shall be bonded and grounded. Conform to all required fire safety codes for the areas within which it will be installed.
- Fiber specifications:
  - Provide multimode OM3 type, 50/125 µm diameter tight-buffered optical fiber, with fiber counts as indicated on drawings, with mechanical and transmission performance specifications that meet or exceed ANSI/TIA/EIA-568-B.3 Note: Listed type OFNP, OFNR, OFCR, and/or OFCP (as required in the NEC).
  - Provide single-mode inside plant optical fiber,OS1 type, with fiber counts as indicated on drawings, with mechanical and transmission performance specifications that meet or exceed ANSI/TIA/EIA-568-B.3

- Listed type OFNP, OFNR, OFCR, and/or OFCP (as required in the NEC).

- Refer to drawing for tubing configuration.
- Acceptable manufacturer:
  - Sumitomo Electric Lightwave
  - AFL eABF Enterprise Air-Jetted Fiber Optic Cable
  - Approved Equal
- Conventional Fiber Manufactures:
  - Commscope Systimax
  - Corning

♦ OPTICAL FIBER CONNECTORS

- Description: Field-installable or Pre-terminated (single-mode, multimode) optical fiber connectors
- Specifications:
  - The attenuation per mated pair shall not exceed 0.75 dB (individual) and 0.5 dB (average).
  - Connectors shall sustain a minimum of 200 mating cycles per EIA/TIA-455-21without violating specifications.
  - Connectors shall meet the following performance criteria:

Test	Procedure	Maximum Attenuation Change
Cable Retention	FOTP-6	0.2 dB
Durability	FOTP-21	0.2 dB
Impact	FOTP-2	0.2 dB
Thermal Shock	FOTP-3	0.2 dB
Humidity	FOTP-5	0.2 dB

- LC connectors shall be provided with multimode/single-mode identification compliant with TIA/EIA 568-B.3
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ OPTICAL FIBER TERMINATION PANELS

- CommScope high density fiber optic patch panels is the standard adopted by the Department of Aviation.
- CommScope Systimax HD-xx-SP series Fiber Optic Splicing Shelf.
- Similar to existing panel installations, complete with termination inserts and connectors, cable manager (wire minders) placed below each patch panel. Provide enough panels to accommodate the fiber in all the tubes installed; provide termination inserts and connectors for the installed fiber plus 100% growth each panel.
- For Telecom Enclosures provide a 48-position, 1 RU optical fiber patch panel. HD-1U-SP series Fiber Optic Splicing Shefl.
- Acceptable manufacture

- Systimax Solutions (CommScope)
- Approved Equal

♦ OPTICAL FIBER PATCH CORDS

- Owner will install and connect equipment in the racks. Contractor shall include (1) 3-meter, multimode fiber patch cords for 30% of number of multimode strands installed in each room. Contractor shall provide a unit price for additional single-mode and multimode patch cords and additional lengths (10', and 15') in base bid. Per unit price shall be clearly identified separate from the remainder of the bid.
- Optical fiber patch cords for use with patch panels.
- Specifications:
  - Fiber type: Multimode 50/125 µm and Single-mode, tight buffer construction.
  - Patch cord outside diameter: 3.0mm
  - Patch cord minimum length: 3m
  - Cords shall meet or exceed the minimum mechanical and optical characteristics for optical fiber patch cords as specified in ANSI/TIA/EIA-568-B.3.
- 2-strand, Duplex construction; LazrSpeed for MM and TeraSpeed for SM.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ PRE-TERMINATED FIBER OPTIC CABLE ASSEMBLIES

- 24-Strand multimode (MM) and 24-Strand single-mode (SM) optical fiber modular cable assemblies, factory terminated and tested for use in the CR and CUTE rooms, as shown on T Series drawings.
- Specifications:
  - Fiber strand: Multimode 50/125 µm optical fiber; single-mode 8.3/125 µm optical fiber.
  - Fiber count: 24-strand MM; 24- strand SM.
  - Submit to OWNER for approval quantities and lengths of pre terminated cable
  - Fiber connector: 24 LC multimode/ single-mode module.
  - Fiber shelf: 1U, 2U or 4 U modular shelves.
- 12 LC MM/ 12LC SM connector modules mounted in 1U/4U modular shelves at the server cabinet side and 2U or 4RU panel at the termination rack side.
  - Mount the MM module on the left side of the shelf and SM on the right side, leaving a blank adapter module in between at the cabinet side.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ COPPER TERMINATION PANELS - VOICE APPLICATIONS

- Separate UTP termination panels shall be used for voice and data applications, mounted in separate racks. The voice rack will have a backbone cross-connect field panel in top position.
- Description: 19-inch rack-mountable 8-pin modular connector patch panel used for UTP voice applications.

- Specifications:
  - Connecting hardware shall meet or exceed the minimum mechanical and electrical characteristics for Category 6 as specified by EIA/TIA 568-B.2-10 Draft or latest approved standard.
- Configuration: Capable of housing (48) 8-pin modular connector terminations in a 48 port arrangement. Note: The TIA T568B wiring configuration will be used for all modular connectors. The backbone cross-connect panel will be used to terminate 100 UTP on the back (two pair per jack).
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ COPPER TERMINATION BLOCKS – VOICE BACKBONE

- Backbone cables shall be terminated on 110 blocks on the wall field and get cross-connected to a 110 cross-connect field connecting to the voice rack. The voice rack will have a backbone cross-connect field panel in top position.
- Voice Backbone field: 110 blocks wall-mountable used for UTP voice applications.
- Voice Cross-connect field (wall): 110 blocks wall-mountable used for UTP voice applications.
- Specifications:
  - Connecting hardware shall meet or exceed the minimum mechanical and electrical characteristics for Category 5e as specified by EIA/TIA 568-B.
  - Provide 5 pair connecting blocks for the backbones field and 4 pair connecting blocks for the cross-connect field.
- Configuration: Capable of terminating 100 UTP using 5pair and 4-pair connecting bocks.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ COPPER TERMINATION PANELS - DATA APPLICATIONS

- Separate UTP termination panels shall be used for voice and data applications.
- 19-inch rack-mountable 8-pin modular connector patch panel used for UTP data applications.
- Specifications:
  - Connecting hardware shall meet or exceed the minimum mechanical and electrical characteristics for Category-6 modular connectors as specified by TIA.
  - Connectors shall be backward compatible with Cat 5/5e components.
  - TIA T568B wiring configuration.
- Configuration: 48-position patch panel.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Owner Approved Equivalent
- Modular connector selection: As part of the modular connector selection process, connector manufacturer/vendors shall submit, in writing, their minimum guaranteed specifications for attenuation and NEXT.

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- ♦ BUILDING ENTRANCE PROTECTORS (BEP)
  - Description: used for protection of incoming copper and outdoor station cables.
  - Specifications:
    - Manufacturer recommended BEP for optimal performance with approved cable type or standard 110 connectors.
    - Provide 110 blocks as shown on drawings to allow for service provider's terminations of the incoming copper cables.
    - Provide category 6 compliant protectors for the outdoor station cables.
  - Configuration of incoming copper cable protectors:
    - Suitable for pair-count as shown on drawings and for mounting on plywood backboard. .
    - Provide space for labeling of each individual connector pairs.
    - Shall allow any individual cable to be terminated or otherwise handled without disturbing other cables.
  - Configuration of outdoor station cable protectors:
    - One 4-Pair UTP Category 6 solid-state protector.
    - Shall comply with TIA/EIA standards for Category 6 performance.
    - Shall be UL listed.
  - Acceptable manufacturers:
    - Systimax Solutions (CommScope) for incoming copper cables protectors.
    - ITW Linx for outdoor station cable protectors.
    - Approved Equal.
- ♦ TERMINATION RACKS FOR FIBER, VOICE, AND DATA PANELS
  - Description: Termination racks for the mounting of fiber, voice, and data panels and their associated cabling and connecting hardware. Also used for the mounting of electronic equipment within the IDFs.
  - Specifications:
    - Standard EIA 19-inch, steel rack, 84 inches high, minimum usable height of 77 inches (45 RU).
    - Racks shall meet the requirements of EIA-310-D.
    - Racks for patch panels shall have full-height minimum 6-inch vertical cable management (with covers) installed on each side of the rack. These ducts will allow cables plugged into the panels to be routed horizontally to either the left or right duct on each side, through the slots, and then loosely either up or down the duct as required.
    - Provide 6'-0" plug strip on back frame of rack with 20 Amp service and 10-receptacles.
    - Provide 100-rack screws per rack installed.
  - Configuration:
    - As indicated in T Series drawings.
  - Acceptable manufacturers:
    - Universal Rack Series CPI Chatsworth Products
    - Approved Equal

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- Acceptable Cable Management manufacturer:
  - CPI Chatsworth
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ FOUR POST RACKS
- Used for the mounting of MUFIDS drivers in the IDFs. Also used to mount the UPS.
- Specifications:
  - Four post EIA 19-inch, steel rack, 84 inches high, minimum usable height of 77 inches (45 RU).
  - Racks shall have independent adjustable front and rear mounting rails.
  - Provide full-height minimum 6-inch vertical cable management (with covers) installed at the four corners, as shown on T Series drawings.
  - Provide 6'-0" plug strip on back frame of rack with 20 Amp service and 10-receptacles.
  - Provide 100-rack screws per rack installed.
- Refer to contract T series drawings.
- Acceptable manufacturers:
  - CPI Chatsworth
  - Approved Equal
- Acceptable manufacturers:
  - American Power Conversion (APC)
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ EQUIPMENT CABINETS
- Cabinets used for the mounting of electronic equipment within the IDFs and MDF.
- 28" W x 30" D x 84"H.
- Layout: As indicated in T Series drawings.
- Provide with four mounting rails, fans, plexiglass doors and all mounting hardware and accessories for a complete installation.
- Provide 6'-0" plug strip vertical on back frame of rack, 3-circuits with a load capacity of no less than 5700 VA with local and remote metering capabilities. Coordinate with requirements on T Series drawings.
- Acceptable manufacturers:
  - NetShelter by American Power Conversion (APC)
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ SERVER CABINETS
- Cabinets used for the mounting of electronic equipment within the Computer Room and CUTE room.
- 24" W x 40" D x 79" H.
- As indicated in T Series drawings.

- Provide with four mounting rails, fans, plexiglass doors and all mounting hardware and accessories for a complete installation.
- Provide 6'-0" plug strip vertical on back frame of rack, 3-circuits with a load capacity of no less than 5700 VA with local and remote management capabilities. Coordinate with requirements on T Series drawings.
- Acceptable manufacturers:
  - American Power Conversion (APC)
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ TELECOM ENCLOSURES

- Wall-mounted and floor supported cabinets used for mounting of termination panels and electronic equipment serving the outlets located at the bridges and lighting poles and some remote locations shown on the drawings.
- 24" W x 24" D x 72"H NEMA 12 rated cabinet with 3-part vertical swing frame for rear access, telecommunications grounding bus bar, and fan-and-filter unit for ventilation.
- As shown on T Series drawings.
- Provide 3'-0" plug strip vertical on back frame of rack, 2-circuits with a load capacity of no less than 3800 VA with local and remote management capabilities.
- Acceptable manufacturers:
  - Chatsworth (Part # 13495-772)
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ HORIZONTAL WIRE MANAGEMENT PANELS

- Used in conjunction with the copper termination panels to manage the patch cord installation.
- Specifications:
  - One and two RU high capacity horizontal cable manager, size to match the size of the copper patch panel, with front and back cable management and covers.
  - Size: 1.7"H x 19"W x 13.1" D for one RU manager and 3.5"H x 19"W x 13.1" D for two RU manager.
- Configuration as indicated in T Series drawings.
- Acceptable manufacturers:
  - CPI Chatsworth
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ VERTICAL WIRE MANAGERS

- Used in conjunction with the open bay racks to manage the patch cord installation.
- Specifications:
  - 6"W and 8"W high capacity vertical cable manager, as shown on T Series drawings, with dual hinged doors.
  - Size: 83.9"H x 6"W x 9.7" D for end of row and for post rack managers and 83.9"H x 8"W x 9.7" D for in between racks manager.

- CPI Chatsworth CCS Series double sided vertical wire manager. Covered front and open back.
- Configuration as indicated in T Series drawings.
- Acceptable manufacturers:
  - CPI Chatsworth
  - Approved Equal
- Provide a mock-up for Owner's approval prior to installation.

♦ COPPER UTP PATCH CORDS
- Owner will install and connect equipment in the racks. Contractor shall include (1) 7-foot, Category 6 patch cord for 50% of number of IMO ports in this bid. C shall provide a unit price for additional patch cords and additional lengths (5', 10', and 15') in base bid. Per unit price shall be clearly identified separate from the remainder of the bid.
- Description: 4-UTP patch cords used to connect station field to network equipment in the IDF, or work area equipment at IMO's end.
- Specifications:
  - All patch cords shall be made of stranded cable, RJ45 to RJ45, without boots.
  - All patch cords shall be factory assembled and tested, constructed with Category 6 cable and connectors, same manufacturer as horizontal cable.
- Configuration:
  - Patch cords used for data will be blue.
  - Patch cords used for voice will be orange.
  - Patch cords used for uplinks will be yellow.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ FIBER OPTIC CABLE- HORIZONTAL
- Used for outlets requiring fiber optic connection (LCD displays and EDS machines), as shown on T Series drawings.
- Specifications: Plenum rated multimode and single-mode fiber optic cable shall comply with the requirements noted under *AIR-BLOWN OPTICAL FIBER CABLE BACKBONE.*
- Configuration as indicated in T Series drawings.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ COPPER UTP CABLE - HORIZONTAL
- Description: High performance 4-pair Category 6 unshielded twisted pair (UTP), solid conductor cable used for station (IDF to IMO) cable.
- Specifications:
  - Cable shall meet or exceed the minimum mechanical and electrical characteristics for Cat 6 horizontal cable as specified by the latest TIA/EIA 568.B2-10 Draft or approved standard.

- Proven to support IEEE 802.3ab – 1000Base-T and IEEE 802.3af – DTE Power via MDI (Power over Ethernet)
- Configuration:
  - All voice cables shall be gray in color.
  - All data cables shall be light blue in color.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope 1071 cable)
  - Approved Equal

♦ COPPER UTP CABLE – OUTSIDE RATED HORIZONTAL

- Description: High performance 4-pair Category 6 unshielded twisted pair (UTP), solid conductor cable used for station (IDF to IMO) cables rated for outdoor use.
- Specifications: Cable shall meet or exceed the minimum mechanical and electrical characteristics for Cat 6 horizontal cable as specified by EIA/TIA 568 standard.
- Configuration (color coding):
  - All voice cables shall be gray in color.
  - All data cables shall be light blue in color.
- Acceptable manufacturers:
  - Systimax Solutions (CommScope)
  - Approved Equal

♦ COPPER UTP CABLE – BACKBONE (D GATE TO MDF AND MDF TO IDFS)

- Backbone 400-pair and 100-pair Category 3 unshielded twisted pair (UTP) cable, as described in the contract drawings.
- Specifications: Cable shall meet or exceed the minimum mechanical and electrical characteristics for Cat 3 backbone cable as specified by TIA.
- Acceptable manufacturers:
  - Superior Essex
  - Approved Equal

♦ OUTSIDE RATED OUTLETS

- Description: An Outdoor Rated Outlet is defined as a voice, data or voice/data outlet provided with and weatherproof cover and back box for mounting at outdoor locations, as shown on T Series drawings.
- Specifications:
  - All connectors in an IMO shall meet or exceed the mechanical and electrical characteristics for Category 6 jacks as specified by the latest TIA/EIA 568-B standard.
  - Provide and install weatherproof-while-in-use polycarbonate covers.

  Configuration: Shall comply with paragraphs 2.23 C.
- Acceptable outlet manufacturers:
  - Systimax Solutions (CommScope) for faceplate and jacks
  - Raco Bell for cover
  - Approved Equal

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- EQUIPMENT CABINET OUTLETS (OUTLET PANEL)
  - An Equipment Cabinet Outlet is defined as a 24-position rack mounted patch panel containing four 8-pin modular jacks for data applications, two 8-pin modular jacks for voice applications and eighteen blanks, using color coding to differentiate between the two applications. Consult with Owner as to any allowable variations to equipment cabinet outlets.
  - Specifications:
    - All jacks in an Equipment Cabinet Outlet shall meet or exceed the mechanical and electrical characteristics for Category 6 jacks as specified by the latest TIA/EIA 568-B.2-10 Draft or approved standard.
  - Configuration: group Voice and Data outlets as shown on T-Series Drawings.
    - The right four two 8-pin modular connectors shall be orange in color, used for data applications.
    - The left two 8-pin modular connectors shall be ivory in color, used for voice applications.
    - The TIA T568B wiring configuration will be used for all 8-pin modular jacks.
  - Acceptable outlet manufacturers:
    - Systimax Solutions (CommScope)
    - Approved Equal
- PLYWOOD BACKBOARD
  - Wall-mounted plywood used for the mounting of termination blocks and equipment in the IDFs and MDF on all walls as shown in the T Series drawings.
  - Specifications: 19 mm (3/4") A-C plywood, void free, 2.4m (8') height, securely fastened to the wall. Plywood shall be fire rated to meet applicable codes. To reduce warping, plywood shall be kiln-dried to maximum moisture content of 15%.
  - Configuration: Mount "A" side out and paint with fire retardant white paint, leaving one fire rating stamp per board visible. Flush hardware and supports shall be used to mount the plywood.
- FIRESTOPS
  - All firestop products shall be listed and meet with the approval of the local authority having jurisdiction for each application situation. All penetrations made to install building elements (e.g. conduits, cable trays, cables, fixtures, boxes) must be firestopped to return the barrier to its specified fire rating.
  - The function of a firestop is to prevent fire, smoke, or water from passing through a barrier penetration.
  - Specifications: mechanical or nonmechanical firestops: ready sleeves, EZ path modules, putty, intrumescent sheets and wrap strips, silicone foams, and premanufactured pillows.
  - All firestop products shall meet with Owner's approval for ease of use in on going cable operations.
  - Acceptable manufacturers:
    - STI Firestop
    - 3M
    - Approved Equal
  - Mechanical fire stops (used for cable tray)

- Fire rated cable pathway devices shall be used for all low-voltage, video, data and voice cabling where frequent cable moves, adds and changes may occur. Such devices shall:
  - Meet the hourly fire-rating of wall and or floors.
  - Be UL Classified for the surrounding construction.
  - Be compliant with a cable load ranging from zero to 100% visually full.
  - Not require fill-ratio calculations to be made to ensure cable load is within maximum allowed by UL System.
  - Be "Zero-Maintenance", zero-maintenance is defined as;
- No action required by cabling technicians to open and/or close the pathway to create access for cable moves, adds or changes, such as, but not limited to:
  - Opening or closing of doors.
  - Removal and or replacement of any material such as but not limited to firestop caulk, putty, pillows, bags foam muffins, foam blocks, or foam closures of any sort
- Acceptable manufacturers:
  - STI Firestop
  - 3M
  - Approved equal
- If the cable tray penetrates through a firewall install all components of the fire-rated assembly even if there are no cables present.

♦ INNERDUCT

- Description: Used to protect the station fiber in the cable tray and conduit and to facilitate future cable installation in vertical pathway conduits feeding the Basement level.
- Specifications: corrugated innerduct and multi celled textile innerduct.
- Configuration: corrugated innerduct used for station fiber optic cable protection; or multi celled textile innerduct used for future cable addition.
- Acceptable manufacturers:
  - Pyramid
  - Max Cell
  - Approved Equal

PART 3 - INSTALLATION

♦ FIBER INSTALLATION

- Fiber bundle installation:
  - Reusable, PEF jacketed (Polyethylene Extruded Foam), fiber bundles shall be installed according to manufacturer's recommended procedures.
  - PEF jacketed optical fiber cable bundles shall be continuously inserted and propelled or blown into the individual tubes utilizing compressed nitrogen as the propellant per the manufacturer's instructions. The blowing installation process and the fiber bundles must also be designed to allow removal, replacement, and reuse of the fiber bundles at any time in the future as deemed necessary by the Owner.
  - Slack in each PEF jacketed fiber bundle shall be provided as to allow for future re-

termination in the event of connector or fiber end-face damage. Adequate slack shall be retained to allow termination at a 30" high workbench positioned adjacent to the termination enclosure(s). A minimum of 1 meter (39") of slack shall be retained at the work area, and a minimum of 3 meters (approximately 10') of slack shall be retained in equipment rooms and telecommunications closets.

- Qualified, licensed personnel utilizing state-of-the-art equipment and techniques shall complete all optical fiber terminations.

- Fiber termination:
  - All fibers shall be terminated in the IDFs onto the rack-mounted fiber panels, the number of panels in each IDF as shown on drawings. Racks shall be equipped with sufficient couplers and jumper storage shelves to terminate and secure the maximum number of fiber strands that could be accommodated by all the tubes installed.
  - Fan out all optical fiber cable to allow direct installation of connectors. Sleeve over individual fiber with a Kevlar reinforced furcation tube. At the convergence point of all furcation tubes, provide strain relief with a high-density plastic fan-out collar. Additionally, provide a minimum of 1m (3 feet) of slack, coiled at each wiring connection/patch panel.
  - All fibers shall terminate into LC connectors.
- LABELING
  - All labeling shall be in accordance with ANSI/TIA/EIA-606 unless otherwise noted by the Owner.
  - Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the Owner prior to Temporary Certificate of Occupancy (TCO) to allow the Owner's personnel to connect and test Owner-provided equipment in a timely fashion.
- FIRESTOPPING
  - Upon completion of the installation, all cable pathways must be properly fire stopped per the NEC, local code requirements, and in full conformance with the manufacturers published installation instructions. The final field installation shall be reviewed and approved by the local AHJ (Authority Having Jurisdiction).

END OF SECTION 27 00 00