SECTION 27 16 19

COMMUNICATIONS PATCH CORDS, WORK AREA CORDS, AND CROSS-CONNECT WIRE

BASED ON DFD MASTER SPECIFICATION DATED 09/03/24

Notes to A/E:

This section has been written to cover most (but not all) project requirements that you will encounter. Depending on the project, you may need to add material, delete items, or modify what is currently written.

Edit all areas as applicable to meet the requirements of the project. Common options or features recognized by the DFD, or items where A/E input is needed are enclosed in [brackets] and/or <less-greater brackets>.

Editing instructions are included throughout the document (italic text; red if viewed/printed in color). These instructions should be hidden or deleted for printing. Text can be hidden by modifying the MS-WORD Style “A/E Instructions” to use “Hidden Text” as part of the Font type. To display Instructions formatted as “Hidden Text”, configure MS-Word File Options /Display to “Show” Hidden Text on Screen.

The document is structured to automatically update the Table of Contents when printed or in response to an “Update Field” command (right mouse click on TOC opens menu) in MS-Word. Confirm that any changes are reflected in the TOC. TOC entries are Hyperlinks and can be used to navigate the document.

Revision History:

In the on-line “DFD Document Library” under “Master Specifications/Design Guidelines / 27 – Communications” see “Div. 27 Revision History”.

1. GENERAL

Scope

This section describes the general, product and execution requirements relating to furnishing of Communications Patch Cords, Work Area Cords and/or Cross-Connect Wire for the project. Included are the following topics:

[PART 1 - GENERAL](#_Toc175826003)

[Scope](#_Toc175826004)

[Related Work](#_Toc175826005)

[References](#_Toc175826006)

[Quality Assurance](#_Toc175826007)

[Submittals](#_Toc175826008)

[PART 2 - PRODUCTS](#_Toc175826009)

[Copper Twisted Pair Patch Cords and Work Area Cords](#_Toc175826010)

[Fiber Optic Patch Cords](#_Toc175826011)

[Coax Patch Cords and Work Area Cords](#_Toc175826012)

[Cross-Connect Wire](#_Toc175826013)

[PART 3 - EXECUTION](#_Toc175826014)

[General](#_Toc175826015)

[Method of Delivery](#_Toc175826016)

[Configurations and Quantities](#_Toc175826017)

[Warranty](#_Toc175826018)

Edit to confirm where quantities are listed. Default DFD recommendation is for the quantity of these items to be included in the PART 3 of this section. Guidelines for acceptable quantities are provided there.

Refer to [PART 3] [Schedules] for quantity, color (if applicable), length and configuration of each item.

Related Work

Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 27 10 00 – Structured Cabling

References

See Section 27 10 00 – Structured Cabling.

Quality Assurance

Patch Cords and Work Area Cords shall be factory manufactured. Field-assembled cords are not acceptable.

Cords shall be 100% factory tested.

Submittals

See specification Section 27 10 00 - Structured Cabling.

Upon request, submit samples of each Patch/Work Area Cord planned for project.

1. PRODUCTS

Edit for Cord type(s) applicable to the project. Delete other items or indicate “Not applicable to this project”.

Copper Twisted Pair Patch Cords and Work Area Cords

General

For purposes of this section, “Patch Cords” refer to those cords used at the Horizontal Cross-connect; Work Area Cords are those used in the user/work area to connect between the horizontal cabling and user devices.

In a Zone Cabling installation, the cables between the Consolidation Point (CP) and the Equipment Outlet (EO) are considered part of the Permanent Link. Refer to specification Section 27 10 00 for requirements, if applicable.

Patch Cords and Work Area Cords shall be labeled with (1) manufacturer part number and (2) length (if not included in par number). At least one end of the cord shall be labeled.

Modular Plugs shall incorporate Strain-relief and be a Snag-less design. Size of the assembly shall allow for patch cords to be positioned in adjacent ports of Modular Patch Panel specified in Section 27 10 00 - Structured Cabling and agency network electronics. Confirm fit with agency.

Patch/Work Area Cord assembly shall meet performance requirements of TIA-568-C.2. See PART 3 for performance “Category” requirements.

Modular Patch Cords and Work Area Cords

Note: Use of 26- or 28-AWG cords can be considered at Agency request where merited by cord quantity and density. This is not recommended by DFD and results in a reduction in the maximum channel length. Confirm specifying such 28-AWG cords with DFD. Consider F/UTP cords at security or other device where horizontal cabling is F/UTP

Construction:

* 4-Pair; [24][26][28] AWG stranded copper twisted pairs.
* [Unshielded Twisted-Pair (UTP)][Unshielded Twisted-pair with overall Shield (F/UTP)]
* 8-Position, 8-Conductor (8P8C) Modular Plug at both ends; Straight-through pair orientation.

Modular Plug Pin/Pair Assignments (pinning): TIA T568A/B.

Cords for Indoor locations:

* Cable jacket material shall be PVC. Jacket color(s) shall be as indicated in Part 3.

Cords for Outdoor or “wet” locations:

* Cable jacket shall be PE (Polyethylene) or other material that provides moisture, water and UV protection for outdoor applications.
* Cable temperature range : -40° C to +60° C.
* Jacket color N/A; typically, black or gray.

Cable jacket shall be marked with manufacturer’s name and cable type.

Patch/Work Area Cord assembly shall meet performance requirements of IEEE 802.3af and 802.3at for Power-over Ethernet applications.

Use of Modular-to-110 Patch Cords are typically used for voice cross-connects between horizontal and backbone cable. Specify Category 3 performance unless approved otherwise by the DFD.

Modular-to-110 Patch Cords

Patch Cord assembly shall meet performance requirements of TIA-568-C.2. Category 3.

Construction:

* 1-, 2- and/or 4-pair; 24 AWG stranded copper twisted pairs. Refer to PART 3 for requirements.
* Unshielded (UTP)
* 8-Position, 8-Conductor (8P8C) Modular Plug at one end and 110-type connector at opposite end. 110-type connector width shall match pair count.

Modular Plug Pin/Pair Assignments (pinning):

* 1-pair cords – Pair terminated on pins 5 & 4.
* 2- and 4-pair cords – Per specification Section 27 10 00 – Structured Cabling (Horizontal Link).

110-type connectors shall be designed to ensure proper orientation of plug when connecting to termination block.

Cable jacket material shall be PVC and be marked with manufacturer’s name and cable type. Jacket color(s) shall be as indicated in PART 3.

Include Industrial/Ruggedized Work Area Cords where required for industrial, dusty/dirty areas or other environments. Otherwise delete or indicate “Not applicable to this Project”.

Industrial/Ruggedized Work Area Cords

Cord shall be design intended for industrial application.

Patch Cord assembly shall meet performance requirements of TIA-568-C.2. See PART 3 for performance “Category” requirements.

Construction:

* 4-pair; 24 AWG solid copper twisted pairs.
* [Unshielded (UTP)][Unshielded Conductors with overall Shield (F/UTP)]
* 8-Position, 8-Conductor (8P8C) Modular Plug at both ends.
* Cable jacket shall be industrial grade design and be UV and oil-resistant.

Modular Plug Pin/Pair Assignments (pinning): TIA T568A/B.

Patch cord plug (one end) shall incorporate housing designed to mate with “Outlet for Dirty or Harsh Environment” specified in Section 27 10 00 - Structured Cabling. Plug assembly shall meet IP67 sealing requirements when so mated.

Fiber Optic Patch Cords

General

Patch Cords shall be labeled with (1) manufacturer part number and (2) length (if not included in part number). At least one end of the cord shall be labeled.

Construction:

* Tight-buffer.
* Simplex (1 fiber) and/or Duplex (2 fibers) as indicated in PART 3.
* Incorporate optical fiber type(s) meeting specifications of backbone cabling in Section 27 10 00 - Structured Cabling.
* Incorporate connector type(s) as indicated in PART 3 of this section.
* Incorporate strain relief at rear of each connector body.

Optical connectors shall comply with TIA-604 “Fiber Optic Connector Intermateability Standards (FOCIS) and applicable addenda for connector type(s) specified.

Duplex patch cords shall have channels (fibers) shall be of equal length. Channels shall be identified by strain-relief boot color or other means.

* Duplex Cords fitted with duplex connectors (e.g., SC, LC) shall be configured so fiber position A connects to B and B connects to A per TIA-568-C.3.

Cable jacket material shall be PVC. Jacket shall be factory marked indicating manufacturer and cable type.

See PART 3 for fiber type(s).

Multimode Patch Cords

General specifications above shall apply.

Cable jacket color shall indicate fiber type as follows:

* 62.5-micron; OM1 - ORANGE
* 50-micron LASER-optimized; OM3 – AQUA

Optical Connector:

* Ferrule Material - Ceramic or glass-in-ceramic.
* Ferrule Polish - Physical Contact (PC)
* Connector Body Color (SC or LC) – BEIGE

Single-mode Patch Cords

General specifications above shall apply.

Cable jacket color shall be YELLOW to indicate fiber type.

Optical Connector:

* Ferrule material - Ceramic or glass-in-ceramic
* Ferrule Polish - End-face geometry shall be in compliance with Telcordia GR-326-CORE, Issue 3.
* Insertion Loss (mated pair) shall be 0.30 dB or better.
* Connector Body Color – UPC polish: BLUE; APC polish: GREEN

Coax Patch Cords and Work Area Cords

Patch cord shall:

* Be RG-6 dual-shield (foil + braid) coaxial cable with stranded-copper center conductor.
* Be 75 Ohm.
* Incorporate Male F-type (threaded) connectors at both ends.

Connector shall incorporate strain relief where connector mates with cable.

Cable jacket material shall be PVC and be color BLACK. Jacket shall be factory marked indicating manufacturer and cable type.

Cross-Connect Wire

Cross-connect wire shall be:

* 24-AWG, Copper Twisted-pair
* Unjacketed

Insulation color:

* 4-pair - white-blue/blue, white-green/green, white-orange/orange & white-brown/brown
* 1-pair - white-blue/blue or white-green/green (Refer to PART 3)
* 2-pair - white-blue/blue & white-green/green

Spool holders, where applicable, shall be assemblies designed for that purpose. Refer to Section 27 10 00 - Structured Cabling.

1. EXECUTION

General

Furnish Patch/Work Area Cords and/or Cross-connect Wire in the configuration(s) and quantities as follows below.

Quantities, jacket color(s) and length(s) indicated are for purposes of bidding. Confirm actual requirements with agency during construction.

Method of Delivery

Where contractor is responsible for installation of Patch/Work Area Cords and/or Cross-connect Wire, install products as-specified to construct cross-connect between horizontal and backbone cabling.

Where contractor-furnished products are to be agency-installed, furnish per Division 1 - General Requirements, “Loose and Detachable Parts”.

Deliver spares per Division 1 - General Requirements, “Loose and Detachable Parts”.

Configurations and Quantities

Quantities

Providing Patch Cords on DFD Projects for new and remodeled buildings is acceptable. Quantities should be limited, however. Acceptable quantities are as follows:

Actual number of 4-pair Modular patch cords for “Voice” and “Data” as required for 1st Year occupancy of a new or re-modeled building. This would include patch cords at both the work area and at the “Horizontal Cross-connect” / Wiring Hub (e.g., Telecom Room; TR). If the Agency wishes to connect more jacks, that would be their cost.

Actual number of 4-pair UTP Modular-to-110 patch cords as required to complete horizontal-to-backbone cross-connect as specified in Section 27 10 00 +10%.

Fiber optic patch cords as required to connect the building to the campus/institution network. For a redundant connection, this would typically be (2) duplex patch cords at the project building and (2) at the “other end”. Additional patch cords may be added to support CATV distribution where applicable.

Fiber optic patch cords as required to connect the Main (communications) Equipment Room with each of the Telecom Rooms (TR). This is to provide connectivity for the new networks. Assuming a redundant connection, this would equate to (4) duplex patch cords per Telecom Room – (2) at TR and (2) at the Main Cross-connect (Main Equipment Room). Additional patch cords may be added to support CATV distribution where applicable.

Quantities greater than indicated above must be approved by the DFD.

If exact quantities and length(s) cannot be determined in preparing the bid documents, A/E should make their best estimate to be assumed for purposes of bidding.

DO NOT IDENTIFY quantities as a percentage of installed copper horizontal links or optical fibers.

Enter Quantity in parenthesis (e.g., “Quantity (200)”).

Performance

Edit for performance limit(s) applicable to the project. Category 6 is typical. Category 6A cord is typical for Wireless Access Point (WAP) locations. Category 5e cords are typically used only when the project adds to an existing system. Unshielded cords are typical even in installations where the horizontal cabling is shielded (F/UTP). Confirm any requirement for F/UTP cords with the agency and DFD.

Copper Twisted Pair Patch Cords and Work Area Cord

4-pair Modular Patch/Work Area Cord:

* Performance: TIA Category [6] [6A] [5e]
* Jacket Color: [COLOR]
* Length: [ ] ft. – Quantity [(Qty)]
* Length: [ ] ft. – Quantity [(Qty)]

4-pair Modular Patch/WAP Cord:

* Performance: TIA Category [6] [6A]
* Jacket Color: [COLOR]
* Length: [ ] ft. – Quantity [(Qty)]
* Length: [ ] ft. – Quantity [(Qty)]

4-pair Modular Patch/SECURITY Cord:

* Performance: TIA Category [6] [6A]

Indoor-type

* Jacket Color: [COLOR]
* Length: [ ] ft. – Quantity [(Qty)]
* Length: [ ] ft. – Quantity [(Qty)]

Outdoor-type

* Length: [ ] ft. – Quantity [(Qty)]
* Length: [ ] ft. – Quantity [(Qty)]

Modular-to-110 Patch Cord:

* Performance: TIA Category 3
* Jacket Color: [COLOR]
* [1] [2] [4]-pair, Length: [ ] ft. – Quantity [(Qty)]
* [1] [2] [4]-pair, Length: [ ] ft. – Quantity [(Qty)]
* [1] [2] [4]-pair, Length: [ ] ft. – Quantity [(Qty)]

Industrial 4-Pair Modular Work Area Cord:

* Performance: TIA Category [6] [5e]
* BLACK Jacket
* Length: [ ] ft. – Quantity: [(Qty)]
* Length: [ ] ft. – Quantity: [(Qty)]

Fiber Optic Patch Cords

Fiber Type: Multimode [OM1 (62.5/125 µm)] [OM3 (50/125 µm)]

* [Simplex] [Duplex], [SC] [LC] [ST]< OTHER>-to- [SC] [LC] [ST] <OTHER>, Length: [ ] meter - Quantity: [(Qty)]
* [Simplex] [Duplex], [SC] [LC] [ST]< OTHER>-to- [SC] [LC] [ST] <OTHER>, Length: [ ] meter – Quantity: [(Qty)]

Where mixed-polish cords are specified (e.g., UPC-UPC and UPC- APC) edit to indicate length and quantities of each.

Fiber Type: Single-mode OS2

* Ferrule Polish - [Ultra-Physical Contact (UPC)] [Angled Physical Contact (APC)] [Ultra-Physical Contact (UPC) one end; Angled Physical Contact (APC) one end].
* [Simplex] [Duplex], [SC] [LC] [ST]< OTHER>-to- [SC] [LC] [ST] <OTHER>, Length: [ ] meter - Quantity: [(Qty)]
* [Simplex] [Duplex], [SC] [LC] [ST]< OTHER>-to- [SC] [LC] [ST] <OTHER>, Length: [ ] meter - Quantity: [(Qty)]

Coax Patch Cords and Work Area Cords:

Cable Type: RG6 dual-shield

* Length: [ ] ft. - Quantity: [(Qty)]
* Length: [ ] ft. - Quantity: [(Qty)]

Cross-Connect Wire

Edit to match project requirements. Otherwise, delete both paragraphs and indicate “Not applicable to this project”.

Provide cross-connect wire as required to complete contractor-installed cross-connects per specification Section 27 10 00 – Structured Cabling, or project Drawings.

Furnish cross-connect wire on spool(s) in pair-count and length as follows:

* 1-pair (white-blue/blue) Length on spool: [ ] ft.
* 1-pair (white-green/green) Length on spool: [ ] ft.
* 2-pair Length on spool: [ ] ft.
* 4-pair Length on spool: [ ] ft.

Provide Spool Holders per specification Section 27 10 00 - Structured Cabling, and project Drawings.

Warranty

See Division 1, General Conditions, and General Requirements - Guarantee Documents

Manufacturer shall replace components that fail in materials or workmanship within specified warranty period.

Warranty Period (minimum):

* Twisted Pair Modular Patch Cords – 5 years
* Modular-to-110 Patch Cords – 5 years
* Fiber Optic Patch Cords – 5 years

Warranty shall be direct from the cord manufacturer(s) to Owner.

END OF SECTION