097. 130 PWH
08-07-2017

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
MANILA

04 AUG 2017

DEPARTMENT ORDER)
)
NO. 97)
Series of 2017)

SUBJECT: DPWH Standard Specification for Item 1105 – Network Cabling System

It has been the thrust of the Department to provide effective standard specifications in the implementation of various infrastructure projects. As such, there is a need to set a standard specification for the proper installation and connection of network cabling system. The attached **DPWH Standard Specification for Network Cabling System, Item 1105** is hereby prescribed for the guidance and compliance of all concerned.

This specification shall form part of the on-going revision of the DPWH Standard Specifications for Public Work Structures – Buildings, Ports and Harbors, Flood Control and Drainage Structure and Water Supply Systems, Volume III, 1995 Edition.

This Order shall take effect immediately.

MARK A. VILLAR
Secretary

RAFAEL C. YABUT
Senior Undersecretary
Officer-In-Charge

14.1.2 FET/RGT

Department of Public Works and Highways
Office of the Secretary
WIN7U01501

OIC-46
BVS-153

DPWH STANDARD SPECIFICATION
FOR ITEM 1105 – NETWORK CABLING SYSTEM

1105.1 Description

This Item shall consist of furnishing and installation of Network Cabling, equipment and associated components to form a complete coordinated system ready for operation in accordance with the Plans and Specifications.

1105.2. Definition

For the purpose of this item, the following terms shall be defined:

1. American Wire Gauge (AWG) – The standard gauge for measuring the diameter of conductors.
2. Cable - Networking hardware used to connect one network device to other network devices. Different types of network cables, such as coaxial cable, optical fiber cable, and twisted pair cables, are used depending on the network's physical layer, topology, and size.
3. Category 5 (Cat5) and Category 6 (Cat6) – Performance classes for cables, jacks, and other interconnection components.
4. Data Cabinet - A data cabinet is an enclosure with fitted, fixed or removable side panels and doors. The cabinet contains a rack for mounting electronic hardware and equipment.
5. Fiber Optic Cable - A cable containing one or more optical fibers that are used to carry light. The optical fiber elements are typically individually coated with plastic layers and contained in a protective tube suitable for the environment where the cable will be deployed.
6. Insulation Displacement Connector (IDC) – A connector designed to be attached to the conductor(s) of an insulated cable by a connection process which forces a selectively sharpened blade through the insulation, bypassing the need to strip the conductors of insulation before connecting.
7. Lucent Connector (LC) Adapter - A small form factor fiber optic connector.
8. Modular Jack – A connector with a recessed opening for making contact with multiple conductors, usually for 4, 6, or 8 wires. Such a jack, when used with its matching plug, makes for easy connection and disconnection to and from a communications network.
9. Network Cabling System – A complete system of cabling and associated hardware, which provides a comprehensive telecommunications infrastructure. This infrastructure serves a wide range of uses, such as to provide telephone service or transmit data through a computer network.
10. Optical Fiber Connector - A mechanical device mounted on the end of a fiber optic cable, light source, receiver or housing that mates to a similar device. It allows light to be coupled, optically, into and out of a fiber optic cable. A connector allows a fiber optic cable to be connected or disconnected repeatedly from a device.
11. Patch Cord - A length of cable with connectors on the ends that is used to connect an end device to a power source.
12. Patch Panel - A device or unit featuring a number of jacks, usually of the same or similar type, for the use of connecting and routing circuits for monitoring, interconnecting, and testing circuits in a convenient, flexible manner.
13. U/RU (Rack Unit) - A standard unit of measure for designating the height in computer enclosures and rack cabinets. A U equals 1.75 inches.

14. Subscriber Connector (SC) Adapter - This contains the alignment sleeve for the precise alignment of the connector ferrules. Available in simplex, duplex and higher density configurations based on application needs.
15. Terminal Block - A screw-type electrical connector where the wires are clamped down to the metal part by a screw. It is a connector which allows more than one circuit to connect to another circuit. It often contains two long aluminum or copper strips that are designed to connect different components. These strips create a bus bar for power distribution that is sent to the connected components.
16. Unshielded Twisted Pair (UTP) Cable – A cable made up of a bundle of twisted pairs. The twisted pairs are usually 22 or 24 AWG sized wires twisted around each other. The wires are typically made of copper with polyethylene (PE) or Fluorinated Ethylene Propylene (FEP) insulation which is color coded depending on the application of the cable being made.

1105.3 Material Requirements

1105.3.1 Data Cabinet

The data cabinet shall be made of powder coated metal. It shall have a quick release door, removable side panels and adjustable front and rear panels, integrated locks on doors and side panels for increased security, adjustable front and rear mounting profiles. The data cabinet shall be either wall mounted or free standing.

1105.3.1.1 Wall Mounting Data Cabinet

The item cabinet shall either be 6U, 9U, 12U, 15U, 18U or 22U.

1105.3.1.2 Free Standing Data Cabinet

This item shall be a 42U Universal Server Rack fully welded frame to provide multiple supports in all directions.

1105.3.2 Distribution Frame Panel

The distribution panel shall be used for backbone purposes. This item shall be a rack mount fiber optic device with a 19 in. panel and SC Duplex Adapter. It shall have a splicing tray and connectors to protect fusion splices and fiber excess.

1105.3.2.1 Sub-Distribution Frame Panel

This item shall be used to connect/transmit signal to the main distribution panel. It shall have 12 ports, installed on the data cabinet.

1105.3.2.2 Main Distribution Frame Panel

This item shall be used to connect every optical distribution panel in the network. It shall have 24 or 48 ports installed on the free standing data cabinet.

1105.3.3 Terminal Block

The terminal block shall be made of flame-retardant thermoplastic, with the base consisting of horizontal index strips for terminating UTP cable conductors. It shall have bases available in rack or frame configurations and for rack mounting with cable management hardware. It shall have a minimum continuous current capacity of 15A at rated voltage of 380V. The minimum size of terminal blocks shall be 2.5 mm^2 and be suitable for clamping wire between 0.1 mm^2 to 2.5 mm^2. Terminal blocks used to connect cables of different voltage shall be segregated into groups and be preferably identified by different color.

1105.3.4 Patch Panel

1105.3.4.1 UTP Patch Panel

The patch panel shall be category 6, 1U high and shall support 24 modular jack ports or 2U high and support 48 modular jack ports. It shall accept RJ-45, 8 position modular plugs. The category 6 UTP modular jack insulation displacement contacts shall be capable of terminating solid conductors from Ø 0.5 mm to 0.65 mm (22 to 24 AWG).

The panel shall be used to link wall plate connection to the data switch located on the data cabinet. Patch panels shall terminate the building cabling on an IDC type connector or module.

1105.3.4.2 Fiber Connect Panel/Fiber Patch Panel

The fiber connect panel shall be modular with snap in SC or LC adapters. It shall be equipped with a fixing mechanism that ensures cable retention and support of incoming fiber optic cable and be able to accommodate both direct termination and splicing.

1105.3.5 Network Cable

The network cable shall either be fiber optic or copper with compatible connectors.

1105.3.5.1 Unshielded Twisted Pair (UTP) Cable

It shall be a Cat5 or Cat6 cable with compatible 10baseT, 100baseTX, and 1000baseT Ethernet connection that shall be used to connect wall plate ports to the UTP Patch Panel. When using Cat6 cable, it shall be ensured that all cabling components – jacks, patch panels, patch cords and the like – must be Cat6 certified, and extra caution shall be given to the proper termination of the cable ends.

1105.3.5.2 Fiber Optic Cable

It shall be an 8-core fiber (OM3 Multi-mode for indoor application and OS1 Single-mode for outdoor application) with either the subscriber connector (SC) or lucent connector (LC) that shall be used to connect the Sub-Distribution Frame Panel to Main Distribution Frame Panel. The configuration of the cable shall be such that it is arranged in tubes of 12 fibers. Fill tubes will be used as required.

1105.3.6 Patch Cord

Patch cords shall be provided when patching of voice and/or data circuits is required at the cross-connections. The patch cords supplied shall be able to support the designed applications. Color coding of patch cords in the telecommunication closet shall be considered, an example of this would be: blue colors for work stations, gray colors for voice, red colors for servers, green colors for hub-to-hub connections, and yellow for other type of connections.

1105.3.6.1 UTP Patch Cord

The UTP Patch Chord shall be a Cat5 or Cat6 with a data rate of 1000Mbps. It shall be assembled with a 3 or 5 meter cable length and RJ-45 male connector on both ends. This shall be used to connect computers and peripherals to the network and data switches.

1105.3.6.2 Fiber Patch Cord

The Fiber Patch Chord shall be a 1 to 3 meter long, multimode graded index fiber with a 50 micron core with 125 micron cladding (multi-mode) and 9 micron core with 125 micron cladding (single mode) to suit the installed fiber optic cable with LC or SC ceramic connectors at each end. It shall be used to connect optical network equipment to the main distribution panel.

1105.3.7 Wall Plate

The wall plate shall either be single, 2 or 3- gang port and shall have a modular outlet with RJ-45, coaxial video, RCA, s-video, and fiber optic connectors to connect computers and peripherals to the network.

1105.3.8 Modular Jack

The modular jack shall be made of durable terminal with 8 pins compatible with Cat5 and Cat6 cables for data connections or 4 pins compatible with standard six-position modular connectors (RJ11) for voice/analog connection.

1105.3.9 Floor Mounted Port

The floor mounted port shall either be a 2 or 3 gang port. It shall be made of steel/metal with either gold or silver finish. The ports shall be made of a durable terminal with 8 pins compatible with Cat5 and Cat6 cables/connectors.

1105.3.10 Network Equipment

1105.3.10.1 Core Switch

The core switch shall be used to interconnect data switches and shall serve as a gateway to a wide area connection (WAN) or the internet. It shall have the following specifications:

1. Type: Layer 3
2. Port: 48 ports (non PoE) with 2 slots for Small Form-Factor Pluggable (SFP) uplink

3. Interface: 48 10/100//1000 mbps
4. Capacity: 104 Gbps
5. Form Factor: Rack Mounted
6. Power: 100 – 240 VAC / 50/60 Hz

1105.3.10.2 Access Switch

The access switch shall link the connections coming from the patch panel to the core switch. The following are the specifications for the access switch:

1. Type: Layer 2
2. Port: 48 ports/24 ports with 1 slot Small Form-factor Pluggable (SFP) uplink
3. Interface: 10/100/1000 mbps
4. PoE: optional
5. Capacity: 104 Gbps for 48 ports / 48 Gbps for 24 ports
6. Switch Form: Rack Mounted
7. Power: 100 – 240 VAC / 50/60 Hz

1105.3.10.3 Router

The router shall be used to connect satellite offices to the central connection. It shall have the following specifications:

1. Port: 8 ports with 2 WAN Ports
2. Interface: 10/100/1000 mbps
3. Form Factor: Rack Mounted
4. Power: 90 – 240 VAC / 50/60 Hz

1105.4 Construction Requirements

1105.4.1 General

Installation of Network Cabling System shall comply with the governing laws and applicable codes and standards such as the Philippine Electronics Code and the ANSI/TIA-568, Telecommunications Standards.

1105.4.2 Installation

Install all system components and cross-connect hardware according to manufacturers' specifications and instruction as well as all applicable local codes and standards. All horizontal and backbone cables shall be installed in the following manner:

1. Cables shall be installed in continuous lengths from origin to destination.
2. All horizontal cables shall not exceed 90 meters from the telecommunications outlets in the work area to the horizontal cross connect or FD.
3. The cable's minimum bend radius of 4 times the cable diameter.
4. The maximum cable pulling tension of 25 lbs. shall not be exceeded.
5. The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

6. Cables shall be dressed and terminated in accordance with the standards, manufacturer's recommendations, and best industry practices.
7. Cables shall be neatly bundled and dressed to their respective panels or blocks.
8. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
9. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties.
10. The cable jacket shall be maintained as close as possible to the termination point.
11. Optic fiber cable shall be of non-metallic construction. The optic fibers shall not be constrained firmly against other fibers, strength members, moisture barrier compound or any other cable components in order that the fiber strain is decoupled from the strain in other components when the cable is under tension.
12. The wall plate shall be fairly near the work station, that the maximum length form the work station can be no longer 5 m.

1105.4.3 Personnel Qualification

The installation of network cabling system, including wiring, cable termination and, testing shall be done by a certified installer under the supervision of a duly registered Professional Electronics Engineer (PECE) and / or certified designer for Network Cabling System.

The installer shall be certified and experienced in the proper installation and testing of network cabling and trained by a cabling system manufacturer.

1105.5 Testing

All cables and hardware shall be 100% tested for defects in installation and to verify cable performance under installed conditions. All conductors of each installed cable shall be verified useable by the Contractor prior to system acceptance.

All UTP and fiber optic cable field testing shall be performed with an approved test device. 100% of cables installed shall be tested and shall all result to PASS remarks channel or permanent link.

All field testers shall be factory calibrated each calendar year by the field test equipment manufacturer.

1105.6 Method of Measurement

The work under this Item shall be measured by lump sum actually placed and installed network cabling system as indicated on the plans. Cables shall be measured by roll while other components shall be measured by set.

1105.7 Basis of Payment

The quantity as determined in Section 1105.4 shall be paid for at unit price stipulated in the Contract's Bill of Quantities. The payment shall constitute the full compensation for furnishing all the necessary materials, providing necessary equipment and tools in installing the Network Cabling System, labor cost and all the incidental expenses necessary to complete the work.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
1105 (1) a	Data Cabinet, Wall Type	Set
1105 (1) b	Data Cabinet, Free Standing	Set
1105 (2) a	Distribution Frame Panel, Sub	Set
1105 (2) b	Distribution Frame Panel, Main	Set
1105 (3)	Terminal Block	Set
1105 (4)	UTP Patch Panel	Set
1105 (5)	Fiber Connect Panel	Set
1105 (6)	UTP CAT5 Cable	Roll
1105 (7)	UTP CAT6 Cable	Roll
1105 (8)	Fiber Optic Cable	Roll
1105 (9)	Fiber Connector	Set
1105 (10)	Patch Cord CAT5	Set
1105 (11)	Patch Cord CAT6	Set
1105 (12)	Fiber Patch Cord	Set
1105 (13)	Modular Jack	Set
1105 (14) a1	Wall Plate, Single	Set
1105 (14) a2	Wall Plate, 2 port	Set
1105 (14) a3	Wall Plate, 3 port	Set
1105 (15) a1	Floor Mounted, 2 port	Set
1105 (15) a2	Floor Mounted, 3 port	Set
1105 (16)	Network Equipment	Set
1105(17)	Network Cabling	Lump Sum

References:

1. DPWH Design Guidelines, Criteria and Standards: Volume 6 – Public Buildings and Other Related Structures

2. Philippine Electronics Code

3. American National Standards Institute/Telecommunications Industry Association ANSI/TIA-568 - Telecommunications Standards

4. Internet

   http://wolandblog.com/upload/Cabling_The_Complete_Guide_to_Network_Wiring.pdf

   http://www.networkcablingsandiego.com/cabling-glossary/

   http://www.datalan.co.uk/content/glossary.asp

   https://www.brocade.com/content/dam/common/documents/content-types/product-design-guide/cabling-best-practices-ga-bp-036-02.pdf