

**TELECOMMUNICATIONS
INFRASTRUCTURE
SPECIFICATIONS**

- CABLING -

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17110 Communication Equipment Rooms

17110 Communication Equipment Rooms

The Contractor shall be responsible for providing and implementing any infrastructure necessary in the Communication Equipment Rooms in a proper, workman-like, and neat manner.

A) Equipment Racks/Cabinets/Shelves

a) Equipment Rack

Southwest Data Products (SWDP) Part Number:

SWE570BLK 84" Tall 19" Equipment Rack

All closet Equipment Racks must be securely bolted to the floor and supported at the top via cable tray using a SWDP Channel Rack to Runway Mounting Plate (Part Number SWE2595).

b) Free-standing Equipment Cabinet

Southwest Data Products (SWDP) Part Number:

SWE310BLK 84" Tall Modem Rack Frame with two (2) sets of mounting rails (SWDP Part# SWE730)

c) Wall Mounted Rack

Where required wall mounted racks shall be provided.

Southwest Data Products (SWDP) Part Number:

SWE2348BLK 35" (20U) Wall Mounted Swing Gate Rack, 18" deep.

d) Additional Frames, Racks and Cabinets

Additional Frames, Racks and Cabinets shall be provided as required for the individual project.

e) Cable Trays and Ladder Racks.

Where shown, ladder tray shall be provided and installed (See section 17130).

B) Cable Management - Vertical and Horizontal

Vertical:

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17110 Communication Equipment Rooms

Corning Part Number: CDF-IBS-7 Interbay Storage Unit

Panduit Part Number: WMPVSF20 Vertical Side Wire Manager for 35" Wall Mounted Swing Gate Rack.

Horizontal:

Panduit Part Number: WMPS 1U Jumper Management Panel

Panduit Part Number: WMPH2 2U Jumper Management Panel

C) Optical Fiber Panels

Provide Optical Fiber Panels as described in Section 17150.

D) Fiber Splice/Termination

Provide Fiber Splice/Termination Hardware as described in Section 17150.

a) Optical Fiber Interface NEMA box

12" x 12" x 4" NEMA junction box with 3/4-inch and/or 1-inch knock-outs. A 2-inch, smooth-walled, reamed, metallic conduit installed with end bushings shall be run from the NEMA box to the OSP Fiber Optic Equipment Rack, as indicated on the specific projects drawings.

E) Grounding Bars

Appropriate Bonding and Grounding Busbars and conductors shall be provided for the protection of personnel and equipment conforming to all applicable codes and standards. (See section 17155.)

F) Tie Wraps

Tie wraps shall be provided and installed as required. (See section 17130.)

G) D rings and T Posts

Contractor shall provide all D rings and T Posts, as required to properly support cables.

H) Power Strips

Power strips shall be provided and installed as indicated on the design drawings.

Leviton Part Numbers:

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17110 Communication Equipment Rooms

- 5500-20L Twist-Lock Power Strip, 6-20A duplex receptacles, switched (for Floor Racks and Cabinets).
- 5500-192 Straight Blade Power Strip, 6-20A duplex receptacles, switched (for Wall Mounted Racks).

17120 Main Distribution Frames and Service Entrances

A) Grounding Requirements

Appropriate Bonding and Grounding Busbars, conductors and transient protection devices shall be provided for the protection of personnel and equipment conforming to all applicable codes and standards. (See section 17155.)

B) Ladder Tray

Where shown, ladder tray shall be provided and installed. (See section 17130.)

C) Optical Fiber Splice Panels and Trays

Where shown, Optical Fiber Panels and Fiber Splice/Termination equipment shall be provided and installed. (See section 17150.)

17150 Backbone Cabling Requirements

A) Fiber Backbone – Inside Plant (ISP)

a) Inside Cable Characteristics

Fiber intra-building backbone cables shall be Corning (or approved equal) MIC type dual window, 900 micron tight-buffered, 62.5/125 micron or 50/125 laser optimized multimode and 8.3/125 micron single-mode as required, and comply with NEC Article 770 “Optical Fiber Cables and Raceways” type OFNR or OFNP, as appropriate. Performance requirements must meet or exceed ANSI/TIA/EIA-568-B.3 and ANSI/TIA/EIA-568-B.3-1 requirements for optical fiber cabling systems.

b) 62.5 Micron Multimode

Inside 62.5-micron multimode fiber cable shall be:

Corning Part Numbers (OFNP rated cable):

nnnK88-33130-29, nnn = number of strands (for 2-24 strands) MIC cable

nnnK88-61130-29, nnn = number of strands (for 24-48 strands) Unitized MIC cable

Corning Part Numbers (OFNR rated cables):

nnnK81-33130-24, nnn = number of strands (for 2-24 strands) MIC cable

nnnK81-61130-24, nnn = number of strands (for 24-48 strands) Unitized MIC cable

c) 50 Micron Laser Optimized Multimode

Inside 50-micron multimode fiber cable shall be Corning MIC LOMMF 300:

Corning Part Numbers (OFNP rated cable):

nnnS88-33180-29, nnn = # of strands (for 2-24 strands) MIC cable

nnnS88-61180-29, nnn = # of strands (for 36-48 strands) Unitized MIC cable

Corning Part Numbers (OFNR rated cables):

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nnnS81-33180-24, nnn = number of strands (for 2-24 strands) MIC cable

nnnS81-61180-24, nnn = number of strands (for 36-48 strands) Unitized MIC cable

d) Single-mode

Inside single-mode fiber cable shall be:

Corning Part Numbers (OFNP rated cable):

nnnR88-33131-29, nnn = number of strands (for 2-24 strands) MIC cable

nnnR88-61131-29, nnn = number of strands (for 24-48 strands) Unitized MIC cable

Corning Part Numbers (OFNR rated cables):

nnnR81-33131-24, nnn = number of strands (for 2-24 strands) MIC cable

nnnR81-61131-24, nnn = number of strands (for 24-48 strands) Unitized MIC cable

e) Hybrid (Single-mode / 62.5 Micron Multimode)

Inside hybrid fiber cable shall be:

Corning Part Number (OFNP rated cable):

036X88-611XX-29, 12SM/24MM Unitized MIC Hybrid Cable

Corning Part Number (OFNR rated cable):

036X81-611XX-24, 12SM/24MM Unitized MIC Hybrid Cable

f) Hybrid (Single-mode / 50 Micron Laser Optimized Multimode)

Inside hybrid fiber cable shall be:

Corning Part Number (OFNP rated cable):

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17150 Backbone Cabling Requirements

024X88-A8718-29, 12SM/12MM MIC Hybrid SM/LOMMF 300 Cable

048X88-A8823-29, 24SM/24MM MIC Hybrid SM/LOMMF 300 Cable

Corning Part Number (OFNR rated cable):

024X81-A9015-24, 12SM/12MM MIC Hybrid SM/LOMMF 300 Cable

048X81-A8720-24, 24SM/24MM MIC Hybrid SM/LOMMF 300 Cable

Equivalent fiber cable may be substituted for the above only with the prior approval of Rutgers University - Telecommunications Division. Data sheets must be supplied.

B) Fiber Backbone – Outside Plant

a) Outside Cable Characteristics (Aerial/Duct)

The cable shall be of loose-tube design.

b) 62.5 Micron Multimode

Outside multimode fiber cable shall meet the following specifications:

ALTOS Cable:

Corning Part Number:

nnnKW4-T4130A20

nnn = number of strands.

FREEDM Cable:

Corning Part Number:

nnnKWF-T4130A20

nnn = number of strands.

62.5/125 micron, multimode, dual window, 250 micron buffer, waterblocked, loose tube.

c) Single-mode

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17150 Backbone Cabling Requirements

Outside single-mode fiber cable shall meet the following specifications:

ALTOS Cable:

Corning Part Number:

nnnRW4-T4101A20 nnn = number of strands.

FREEDM Cable:

Corning Part Number:

nnnRWF-T4101A20 nnn = number of strands.

8.3/125 micron, single-mode, dual window, 250 micron buffer, waterblocked, loose tube.

d) Hybrid (Single-mode / 62.5 Micron Multimode)

Outside hybrid fiber cable shall meet the following specifications:

ALTOS Cable:

Corning Part Number:

nnnXW4-141XXA20 nnn = number of strands.

FREEDM Cable:

Corning Part Number:

nnnXWF-141XXA20 nnn = number of strands.

8.3/125 micron, single-mode and 62.5/125 micron multimode, dual window, waterblocked, loose tube.

e) Installation of Fiber

Fiber optic cables shall be protectively enclosed in innerduct for their entire length. (See section 17130.)

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17150 Backbone Cabling Requirements

All cables shall be inspected as they are pulled off the reel for any obvious defects. Report immediately any defects to Rutgers University and halt further use of the cable from that reel, pending a determination of the quality of the reel by the manufacturer.

All cables shall be continuous with no factory or field splices unless approved by Rutgers University. Pulling and laying cable on sharp edges is not permitted.

All fiber cable must be installed in accordance with manufacturer recommended tensile and bending specifications. In no case shall pulling load exceed 600 pounds in a straight pull or 230 pounds in a pull having a 90 degree bend.

Pulling tension shall be constantly monitored when using a mechanical pulling device such as a winch. There shall be a limit clutch on the cable puller. A paper printout of the pulling tension shall be provided for all pulling operations.

The direction of the pull is important especially when bends are involved. Ideally, the cable set-up location should be at the end closer to the bend. This is critical when there is an offset since bearing pressures can rise quickly. Bearing pressure must not exceed 150 pounds per foot. Care should be taken so that pulls are not designed too close to the maximum value of tension.

Ideally, there shall be no more than two 90 degree changes of direction in any single pull. If there are more than two 90 degree changes of direction, however, back-feeding or center pulling techniques must be used.

No residual tension shall remain on the cable after pulling except what is due to the cable's weight in a vertical rise, which shall not exceed 135 pounds.

Vertical cables shall be supported via use of a split mesh grip.

The manufacturer's minimum bend radius specifications shall not be exceeded. In no case shall the bend radius be less than 16 times the cable's diameter.

Lubricant approved by the cable manufacturer must be used when installing fiber cable. The lubricant must be manufacturer guaranteed to be non-destructive to the cable sheath, the conduit, or any portion of the innerduct. Furthermore, the lubricant must be manufacturer guaranteed not to harden, cake, or deteriorate with age so as to "glue" the cable to the conduit over time.

All backbone cables shall employ industry standard color coding.

No more than 50 feet of OSP backbone cable may be installed in a building without conduit. Where more than 50 feet of OSP backbone cable is required in a building, the cable shall be installed in Rigid Metal or Intermediate Metal conduit or

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17150 Backbone Cabling Requirements

Indoor/Outdoor rated cable shall be used. Where conduit or Indoor/Outdoor cable cannot be used, splicing may be necessary.

f) Service Loop

A service loop of at least 10' shall be provided within 6' of the fiber panel. Service loops shall be securely fastened to the backboard or ladder tray with appropriate fasteners, maintaining the proper bend radius at all times, as agreed upon by Rutgers University.

C) Copper Voice Backbone - Inside Plant

Copper voice backbone cable used in the inside plant shall be:

Nordx/CDT (or approved equivalent) type ARMM, 24 AWG solid copper conductors grouped in 25 pair binders, with a corrugated aluminum shield bonded to a PVC outer jacket conforming to NEC Article 800 "Communications Circuit" type CMR.

Nordx/CDT Part Numbers: 227131010 thru 227131130.

Where cable runs through ducts, plenums or other spaces used for environmental air, cables shall be run in conduit or plenum rated cable shall be used. Plenum rated copper voice backbone cable used in the inside plant shall be:

Mohawk/CDT (or approved equal) 24 AWG solid copper conductors grouped in 25 pair binders, plenum rated outer jacket conforming to NEC Article 800 "Communications Circuit" type CMP.

Mohawk/CDT Part Numbers: M56 and M57 Series.

The voice backbone cable shall be sized at 125% (minimum) of the horizontal pair count. Contractor shall cross-connect all four pairs between backbone and horizontal cables.

The manufacturer's minimum bend radius specifications shall not be exceeded.

The corrugated shield of the ARMM cable shall be bonded to the TMGB and/or TGB. (See section 17155.)

Where plenum rated voice backbone cables are used, each cable shall be provided with a #10 AWG Coupled Bonding Conductor (CBC), tie wrapped to the cable (with plenum rated tie wraps), at intervals not to exceed 10 feet. The CBC shall be bonded to the TMGB and/or TGB. (See section 17155.)

D) Copper Voice Backbone - Outside Plant

Copper voice backbone cable used in the outside plant shall be:

Superior Essex (or approved equivalent), 24 AWG solid copper conductors grouped in 25 pair binders, with a moisture proofing filling compound and with a corrugated aluminum shield with a polyethylene outer jacket, conforming to ANSI/ICEA S-84-608-1994; RUS 7 CFR 1755.890 (PE-89). Cable shall be suitable for direct burial, installation in duct or installation aerially when attached to a support strand.

Superior Essex Part Number: SEALPIC - FSF Series.

The manufacturer's minimum bend radius specifications shall not be exceeded.

The corrugated shield of the cable shall be bonded to the TMGB and/or TGB. (See section 17155.)

E) Coax Backbone – Inside Plant

Coaxial backbone cables shall be;

Quad Shield, 500 series Flexible Feeder and must comply with NEC Article 820 Community Antenna Television and Radio Distribution Systems type CATVR.

Times Fiber Communications,
Inc. Part Number: 02852R-TX15AQ-VBR (or approved equal)

Where cable runs through ducts, plenums or other spaces used for environmental air, cables shall be run in conduit or plenum rated cable shall be used. Plenum rated coaxial backbone cables shall be:

Solid Aluminum Shield, 500 series Trunk and must comply with NEC Article 820 Community Antenna Television and Radio Distribution Systems type CATVP.

CommScope Part Number: P3 500 JCAP (or approved equal)

The manufacturer's minimum bend radius specifications shall not be exceeded.

F) Coax Backbone – Outside Plant

Coaxial backbone cables shall be Flex Outdoor External Trunk:

Quad Shield, Flexible Feeder, polyethylene outer jacket, single flooded. Cable shall be suitable for installation in duct.

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Times Fiber Communications, Inc. Part Number: TX15AQ-FEB
(02858) or approved equal

Aerial rated cable shall be provided where cable run aerially. When run aerially, cables shall be attached to a support strand. Aerial rated coaxial backbone cables shall be:

Solid Aluminum Shield, dielectric core, fully bonded copper clad center conductor, medium density polyethylene jacket, 500 series Trunk.

CommScope Part Number: P3 500 JCA (or approved equal)

The manufacturer's minimum bend radius specifications shall not be exceeded.

G) Copper Voice Connectors

Copper voice backbone cables shall be terminated on wall-mounted 110-style blocks.

Category 5e 110-style blocks shall be:

Panduit Part Number's: P110-BW-100-X (100 pair) and
P110-BW-300-X (300 pair)

All pairs of the backbone cable shall be terminated on each end, using a combination of five (5) C4 and one (1) C5 connector blocks per 25 pair. The contractor shall cross-connect all four pairs of the horizontal voice cables from the horizontal cross-connect field to the backbone cross-connect field using 4 pair cross-connect wire.

Wire troughs shall be installed above and below all 110-style blocks.

Panduit Part Number: P110-JTW-X

OSP Cables shall be terminated on suitable protector blocks, as required.

H) Fiber Connectors

a) General

All fiber strands shall either be terminated or coiled in an approved fiber connector housing or coiled in an approved fiber splice housing.

b) Termination

Multimode cabling installations require 568SC type beige connectors (and connector panels) with ceramic ferrules and composite housings. All paired SC connectors must be joined together with SC duplex clips.

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Corning Part Numbers:

Multimode SC Connectors:

95-000-41 UniCam 62.5-micron multimode connector with ceramic ferrule.

95-050-41-X UniCam 50-micron multimode connector with ceramic ferrule for laser optimized multimode fiber.

SC Duplex Clips: 95-400-03-BP

Single-mode cabling installations require 568SC type blue connectors (and connector panels) with ceramic ferrules and composite housings. All paired SC connectors must be joined together with SC duplex clips.

Corning Part Numbers:

Single-Mode SC Connectors: 95-200-42 (UniCam single-mode connector with ceramic ferrule, Ultra PC)

SC Duplex Clips: 95-400-03-BP

Corning UniCam connectors shall be installed using a Corning UniCam Termination Kit with the Continuity Test Set (CTS) option and with a handheld laser light source.

Corning Part Number: TKT-UNICAM-CTS (test set with CTS option)
VFL-300, or approved equivalent (light source).

Maximum allowable connector loss:

Loss(max) < 0.75 dB per ST Connector Pair

Loss(max) < 0.75 dB per SC Connector Pair

Corning FAN-BT25-06 (6 fiber tubes) and FAN-BT25-12 (12 fiber tubes) buffer tube fan-out kits or equivalent must be used on loose tube cables.

568SC Polarization

The backbone cabling terminating in the 568SC connectors must maintain the correct polarization throughout the cabling system. The backbone cabling shall be installed so that odd numbered fibers are terminated in Position A (right side) and even numbered fibers are terminated in Position B (left side), when viewed from the back of

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17150 Backbone Cabling Requirements

the connector panel. ANSI/TIA/EIA-568-B.3 Section 5 (pair-wise cross-over) SHALL NOT BE FOLLOWED.

Terminations shall occur in approved wall-mountable or rack-mountable connector housings.

Corning Part Numbers:

Wall-mountable Closet Housings:

WCH-06P	6 connector housing (72 fibers max.)
WCH-08P	8 connector housing (96 fibers max.)
WCH-DUST-CVR	Dust Cover for WCH-08P housing
WCH-DUST-CVR-D	Dust Cover for WCH-06P housing

Rack-mountable Closet Connector Housings:

CCH-03U	Closet Connector Housing for Six connector panels (72 fibers max.)
CCH-04U	Closet Connector Housing for Twelve connector panels (144 fibers max.)

Connector Panels:

CCH-CP06-59	CCH Connector Panel with three 568SC (SC duplex) adapters, single-mode, ceramic insert, composite housing.
CCH-CP06-91	CCH Connector Panel with three 568SC (SC duplex) adapters, multimode 62.5-micron, composite insert, composite housing.
CCH-CP06-E7	CCH Connector Panel with three SC duplex, Xcelerate Plus Solutions laser-optimized 50–micron multimode, ceramic insert, composite housing.
CCH-CP12-59	CCH Connector Panel with six 568SC (SC duplex) adapters, single-mode, ceramic insert, composite housing.
CCH-CP12-91	CCH Connector Panel with six 568SC (SC duplex) adapters, multimode 62.5-micron, composite insert, composite housing.

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CCH-CP12-E7 CCH Connector Panel with six SC duplex, Xcelerate Plus Solutions laser-optimized 50-micron multimode, ceramic insert, composite housing.

I) Fiber Splicing

The intent is to *not* splice backbone cables. However, in the event that splicing of backbone cables is approved, the location of all splices shall be identified and all splices shall be accessible.

In those cases where splicing is necessary, only low-loss, low-reflectance fusion splices will be allowed. No splicing will be allowed without owner's prior approval. Final approval in the method of splicing/connectorization rests with the University.

Maximum allowable splice loss:

Loss(max) < 0.3 dB per Fusion Splice

All splices shall be made in splice trays inside either a Splice Case, Wall-mountable Closet Housing or a rack mountable Closet Splice Housing.

Corning Part Numbers:

Splice Cases:

UCA0-05-24	24 strand splice case (includes splice trays)
SCF-4C18-01-36	36 strand splice case (includes splice trays)
SCF-6C22-01-72	72 strand splice case (includes splice trays)
SCF-6C28-01-144	144 strand splice case (includes splice trays)

Wall-mountable Closet Housings:

M67-060 series	Splice trays for WCH housings
WCH-SPLC-4-8	Splice tray holder for WCH housings

Rack-mountable Splice Housings:

CJH-02U	2U splice housing (holds 4 trays, 48 fibers max.) Provide one (1) CJP-02U 2U Jumper Management Panel for each CJH-02U.
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CSH-05U 5U splice housing (holds 22 trays, 264 fibers max.)

Splice Trays:

M67-045-C Single-mode/Multimode trays for 12 fusion & 6
mechanical splices

M67-060 Reduced-length splice tray for WCH Wall-mountable
Closet Housings.

J) Grounding and Bonding

See grounding and bonding requirements in section 17155.

17160 Horizontal Cabling Requirements**A) Connectors/Couplers/Adapters****a) ISDN Compatibility**

Elements of the voice and data distribution system, including cable, termination methods, and jacks, must be ISDN compatible incorporating ANSI/TIA/EIA-568-B.2 jack designation T568B.

B) Faceplates/Jacks

The University has defined the Wiring Plans (WP) in the table below:

Types of Wiring Plans
WP1 (1 Voice/1 Data)
WP2 (1 Voice/1 Data/1 FTV)
WP2c (1 Voice/1 Data/1 FTV) – Coiled
WP3 (1 Voice)
WP4 (2 Voice)
WP5 (1 Data)
WP6 (2 Data)
WP7 (3 Data)
WP8 (4 Data)
WP9 (1 Voice/3 Data)
WP10 (1 Wall Telephone)
WP11 (1 Voice/2 Data)
WP12 (2 Voice/1 Data)
WP13 (2 Voice/2 Data)
WP14 (2 Voice/2 Data/1 FTV)
WP15 (2 Voice/4 Data)
WP16 (3 Voice/4 Data)
WP17 (4 Voice/4 Data)
WP18 (2 Voice/3 Data)
WP19 (1 Voice/2 Data/1 FTV)
WP20 (1 Outdoor Phone Cable)
WP21 (1 Voice/4 Data)
WP22 (3 Voice/3 Data)
WP23 (4 Voice)

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WP24 (2 Voice/6 Data)
WP25 (4 Voice/2 Data)
WP26 (2 Voice/2 Data/2 FTV)
WP27 (3 Voice/2 Data)
WP28 (8 Data)
WP29 (2 Voice/4 Data/1 FTV)
WP30 (1 Public/pay telephone)
WP31 (1 Voice/3 Data/1 FTV)
WP32 (2 Data/1 FTV/1 RTV)
WP33 (8 Voice)
WP34 Reserved for future use
WP35 Reserved for future use
WP36 Reserved for future use
WP37 Reserved for future use
WP38 Reserved for future use
WP39 Reserved for future use
WP40 (1 Monitoring Access Control)
WP41 (2 Data/1 Fiber)
WP42 (3 Data/1 Fiber)
WP43 (4 Data/1 Fiber)
WP44 (5 Data/1 Fiber)
WP45 (6 Data/1 Fiber)
WP46 (4 Data/4 Fiber)
WP47 (4 Data/1 FTV)
WP48 (2 Voice/3 Data/1 FTV)
WP49 (2 Fiber)
WP50 (1 Fiber)
WP51 (1 Data/1 Fiber)
WP52 (1 Voice/1 Data/1 Fiber)
WP53 (2 Voice/1 Data/1 Fiber)
WP54 (1 Voice/1 Data/1 FTV/1 Fiber)
WP55 (1 Voice/2 Data/1 Fiber)
WP56 Reserved for future use
WP57 (1 Data/1 Fiber/1 FTV)
WP58 (3 Data/1 FTV)
WP59 (1 Fiber/1 FTV)

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17160 Horizontal Cabling Requirements

WP60 (1 FTV/1 RTV)
WP61 (1 RTV)
WP62 (1 FTV)
WP63 Reserved for future use
WP64 (2 Data/1 FTV)
WP65 (1 Security Coax)
WP66 (1 House/Campus Phone)
WP67 (1 Data/1 FTV)
WP68 (2 Data/2 FTV)
WP69 (6 Data)
WP70 (2 Voice/1 FTV)
WP71 (2 Voice/1 Data/1 FTV)
WP72 (1 Voice/1 FTV)
WP73 (3 Voice)
WP74 (5 Data)
WP75 (1Voice/5 Data)
WP76 (3 Voice/1 Data)

Note: FTV is forward television (coax); RTV is return television (coax and audio cables). All Station Fiber is duplex.

a) Table Notes

Work area connecting hardware shall be Panduit MINI-COM Network Cabling System Executive Series and MINI-COM Snap-in Connector Modules or approved equivalent. Typical outlet will use four position faceplate, others will use six-position (include blanks as needed). Each four-pair UTP voice/data cable will terminate on an eight-position modular jack (wall plate color for voice and black for data) using ANSI/TIA/EIA-568-B.2 wiring designation T568B. Duplex fiber will terminate in beige (multimode) SC connectors and connect to the outlet 568SC (duplex SC) adapter. **FTV** coax will terminate in F-type connectors and connect to F-type coupler modules at the outlet.

4 Module Space, Single Gang (non-sloped) Faceplate:

Panduit Part CFPE4IW
Number:

6 Module Space, Single Gang (non-sloped) Faceplate:

Panduit Part CFPE6IW
Number:

10 Module Space, Double Gang (non-sloped) Faceplate:

Panduit Part CFPE10IW
Number:

Single Gang Bezel (for sloped modules):

Panduit Part CBEIW
Number:

Double Gang Bezel (for sloped modules):

Panduit Part CBEIW-2G
Number:

2 Module Space, ½ size, Sloped Module Insert:

Panduit Part CHS2IW-X
Number:

2 Module Space, ½ size, Flat Module Insert:

Panduit Part CHF2IW-X
Number:

½ size, Blank Module Insert:

Panduit Part CHB2IW-X
Number:

4 Module Space Surface Mount Box:

Panduit Part CBX4IW-A
Number:

6 Module Space Surface Mount Box:

Panduit Part CBX6IW-A
Number:

6 Module Space Multi-Media/Fiber Outlet:

Panduit Part CBXF6IW
Number:

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Where indicated for individual projects, alternate colors must be provided.

Following is a description of each type of WP that has been defined by Rutgers University. The descriptions are based upon Category 5e cables and components. Certain WPs shall be priced in two ways, once with flat faceplates and once with sloped faceplates. In addition, the Contractor shall provide pricing for alternate WPs that utilize Category 6 cables and components. Rutgers University shall decide for each specific project, if Category 5e or Category 6 WPs shall be provided and installed.

WP1 (1 Voice/1 Data)

Wiring Plan WP1 and others containing voice and data shall consist of CAT 5e voice and data cables. At the station end, the voice and data cable(s) shall be terminated on an eight-position ANSI/TIA/EIA-568-B.2 designation T568B, CAT 5e modular jack.

At the HC end, the voice cable shall be terminated on a 110-style wall-mounted, CAT 5e punch-down block and the data cable shall be terminated on an ANSI/TIA/EIA-568-B.2 wiring designation T568B, CAT 5e modular jack, wall or rack mounted as appropriate

WP2 (1 Voice/1 Data/1 FTV)

WP1 with an RG6 type quad shield coaxial cable added for viewing of campus programming. At the station end the coax cable shall be terminated on an F coupler. At the Horizontal Cross-connect (HC) end a 10 foot coil of coax cable shall be coiled on the ladder tray above the video field.

WP2C (1 Voice/1 Data/1 FTV) Coiled in Podium

WP1 with an RG6 type quad shield coaxial cable added for viewing of campus programming. All station cable ends shall terminate in the appropriate connectors and 3 ft. of cable shall be coiled in the podium.

WP3 (1 Voice)

WP3 shall consist of a CAT 5e voice cable. At the station end, the voice cable shall be terminated on an eight-position ANSI/TIA/EIA 568A designation T568B, Category 5e modular jack. At the Horizontal cross-Connect (HC) end, the cable shall be terminated on a 110-style wall-mounted, Category 5e punch-down block.

WP4 (2 Voice)

WP4 shall consist of two (2) CAT 5e voice cables. At the station end, the voice cables shall be terminated on eight-position ANSI/TIA/EIA 568A designation

T568B, Category 5e modular jacks. At the Horizontal cross-Connect (HC) end, the cables shall be terminated on 110-style wall-mounted, Category 5e punch-down blocks.

WP5 (1 Data)

WP5 shall consist of a CAT 5e data cable for connecting a computer workstation. At the station end, the data cable shall be terminated on an eight-position ANSI/TIA/EIA-568-B.2 wiring designation T568B, CAT 5e modular jack. At the Horizontal Cross-connect (HC) end, the data cable shall be terminated on an ANSI/TIA/EIA-568-B.2 wiring designation T568B, CAT 5e modular jack, wall or rack mounted as appropriate.

WP6 (2 Data)

WP6 shall consist of two (2) CAT 5e data cables for connecting computer workstations. At the station end, the data cables shall be terminated on eight-position ANSI/TIA/EIA 568A designation T568B, Category 5e modular jacks. At the Horizontal Cross-connect (HC) end, the data cables shall be terminated on ANSI/TIA/EIA 568A wiring designation T568B, Category 5e modular jacks, wall or rack mounted as appropriate.

WP7 (3 Data)

WP7 shall consist of three (3) CAT 5e data cables for connecting computer workstations. At the station end, the data cables shall be terminated on eight-position ANSI/TIA/EIA 568A designation T568B, Category 5e modular jacks. At the Horizontal Cross-connect (HC) end, the data cables shall be terminated on ANSI/TIA/EIA 568A wiring designation T568B, Category 5e modular jacks, wall or rack mounted as appropriate.

WP8 (4 Data)

WP8 shall consist of four (4) CAT 5e data cables for connecting computer workstations. At the station end, the data cables shall be terminated on eight-position ANSI/TIA/EIA 568A designation T568B, Category 5e modular jacks. At the Horizontal Cross-connect (HC) end, the data cables shall be terminated on ANSI/TIA/EIA 568A wiring designation T568B, Category 5e modular jacks, wall or rack mounted as appropriate.

WP9 (1 Voice/3 Data)

WP9 shall consist of one (1) CAT 5e voice cable and three (3) CAT 5e data cables. Terminations and cable runs as per WP1 and WP2.

WP10 (1 Wall Telephone)

WP10 shall consist of a CAT 5e voice cable to support a wall phone. At the station end, all four pairs of the voice cable shall be terminated on an eight-position modular (ANSI/TIA/EIA-568-B.2 wiring designation T568B) wall phone jack mounted in a stainless steel mounting plate (Panduit Part Number: KWP5); jack shall be mounted at a height of 42" for handicap access. At the Horizontal cross-Connect (HC) end, the cable shall be terminated on a 110-style wall-mounted, CAT 5e punch-down block.

WP11 (1 Voice/2 Data)

WP11 shall consist of one (1) CAT 5e voice cable and two (2) CAT 5e data cables. Terminations and cable runs as per WP1

WP12 (2 Voice/1 Data)

WP12 shall consist of two (2) CAT 5e voice cables and one (1) CAT5e data cable. Terminations and cable runs as per WP1.

WP13 (2 Voice/2Data)

WP13 shall consist of two (2) CAT 5e voice cables and two (2) CAT 5e data cables. Terminations and cable runs as per WP1.

WP14 (2 Voice/2 Data/1 FTV)

WP14 shall consist of two (2) CAT 5e voice cables, two (2) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP15 (2 Voice/4 Data)

WP15 shall consist of two (2) CAT 5e voice cables and four (4) CAT 5e data cables. Terminations and cable runs as per WP1.

WP16 (3 Voice/4 Data)

WP16 shall consist of three (3) CAT 5e voice cables and four (4) CAT 5e data cable. Terminations and cable runs as per WP1.

WP17 (4 Voice/4 Data)

WP17 shall consist of four (4) CAT 5e voice cables and four (4) CAT 5e data cable. Terminations and cable runs as per WP1.

WP18 (2 Voice/3 Data)

WP18 shall consist of two (2) CAT 5e voice cables and three (3) CAT 5e data cable. Terminations and cable runs as per WP1.

WP19 (1 Voice/2 Data/1 FTV)

WP19 shall consist of one (1) CAT 5e voice cable, two (2) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP20 (1 Outdoor Phone Cable)

WP20 shall consist of a direct-burial cable encased in a 1" conduit. This wire plan will be used to support isolated telephones, such as outdoor emergency telephones. At the station end, the cable shall be connected to screw terminals on either the telephone or an eight-position modular jack (ANSI/TIA/EIA-568-B.2 wiring designation T568B wiring). At the Main Cross-connect (MC) or Horizontal Cross-connect (HC) end, a screw-terminal block shall be used to transition to cross-connect or a patch cord. In those cases where this cable leaves a building, a transient protector meeting applicable codes and sections of UL 497 shall be provided at the entrance point. The Vendor shall be responsible for compliance with all federal, state and local regulations in effect.

WP21 (1 Voice/4 Data)

WP21 shall consist of one (1) CAT 5e voice cable and four (4) CAT 5e data cables. Terminations and cable runs as per WP1.

WP22 (3 Voice/3 Data)

WP22 shall consist of three (3) CAT 5e voice cables and three (3) CAT 5e data cables. Terminations and cable runs as per WP1.

WP23 (4 Voice)

WP23 shall consist of four (4) CAT 5e voice cables. At the station end, the voice cables shall be terminated on eight-position ANSI/TIA/EIA 568A designation T568B, Category 5e modular jacks. At the Horizontal cross-Connect (HC) end, the cables shall be terminated on 110-style wall-mounted, Category 5e punch-down blocks.

WP24 (2 Voice/6 Data)

WP24 shall consist of two (2) CAT 5e voice cables and six (6) CAT 5e data cables. Terminations and cable runs as per WP1.

WP25 (4 Voice/2 Data)

WP25 shall consist of four (4) CAT 5e voice cables and two (2) CAT 5e data cables. Terminations and cable runs as per WP1.

WP26 (2 Voice/2 Data/2 FTV)

WP26 shall consist of two CAT 5e voice cables, two (2) CAT 5e data cables and two (2) quad shield RG-6 coaxial cables. Terminations and cable runs as per WP1 and WP2.

WP27 (3 Voice/2 Data)

WP27 shall consist of three (3) CAT 5e voice cables and two (2) CAT 5e data cables. Terminations and cable runs as per WP1.

WP28 (8 Data)

WP28 shall consist of eight (8) CAT 5e data cables. Terminations and cable runs as per WP1.

WP29 (2 Voice/4 Data/1 FTV)

WP29 shall consist of two (2) CAT 5e voice cables, four (4) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP30 (1 Public/Pay Telephone)

WP30 shall consist of a voice cable to support a public/pay phone. At the station end, all four pairs of the voice cable shall be terminated on an eight-position modular (ANSI/TIA/EIA-568-B.2 wiring designation T568B wiring) public/pay phone jack; jack shall be mounted at a height of 42" for handicap access. At the Horizontal Cross-connect (HC) end, the cable shall be terminated on a 110-style wall-mounted, Category 5e punch-down block.

WP31 (1 Voice/3 Data/1 FTV)

WP31 shall consist of one (1) CAT 5e voice cable, three (3) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP32 (2 Data/1 FTV/1 RTV)

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WP32 shall consist of two (2) CAT 5e data cable (terminations and cable runs as per WP1), two (2) quad shield RG-6 coaxial cables and two (2) Belden 88761 audio cables. For the FTV and RTV: at the station end 1 foot coils of cable shall be provided in a double gang deep back box, at the Horizontal Cross-connect (HC) end 10 foot coils of cable shall be coiled on the ladder tray above the video field.

WP33 (8 Voice)

Wiring Plan WP33 shall consist of eight (8) CAT 5e voice cables. At the station end, the voice cables shall be terminated on eight (8) eight-position ANSI/TIA/EIA-568-B.2 designation T568B, CAT 5e modular jacks.

At the HC end, the voice cables shall be terminated on a 110-style wall-mounted, CAT 5e punch-down block.

WP40 (1 Monitoring/Access Control)

WP40 shall consist of one four pair CAT 5e cable. This wire plan will be used to support various monitoring, control and public safety systems. At the station end, the cable shall remain unterminated with a twelve inch pigtail and shall be concealed by a blank cover plate. At the Horizontal Cross-Connect (HC) end, the cable shall be terminated on a 110-style wall-mounted, CAT 5e punch-down block.

WP41 (2 Data/1 Fiber)

WP41 shall consist of two (2) CAT 5e data cables and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP42 (3 Data/1 Fiber)

WP42 shall consist of three (3) CAT 5e data cables and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP43 (4 Data/1 Fiber)

WP43 shall consist of four (4) CAT 5e data cables and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP44 (5 Data/1 Fiber)

WP44 shall consist of five (5) CAT 5e data cables and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP45 (6 Data/1 Fiber)

WP45 shall consist of six (6) CAT 5e data cables and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP46 (4 Data/4 Fiber)

WP46 shall consist of four (4) CAT 5e data cables and four (4) duplex 62.5/125 micron fiber optic cables. Terminations and cable runs as per WP1 and WP50.

WP47 (4 Data/ 1 FTV)

WP47 shall consist of four (4) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP48 (2 Voice/3 Data/1 FTV)

WP48 shall consist of two CAT 5e voice cables, three (3) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP49 (2 Fiber)

WP49 shall consist of two (2) duplex 62.5/125 micron fiber optic cables. At the station end, the fiber cables shall be terminated on SC connectors and mounted in ANSI/TIA/EIA 568-B.3 designation 568SC (duplex) modular adapters. At the HC end, the fiber cables shall be either terminated on SC connectors and mounted in ANSI/TIA/EIA 568-B.3 designation 568SC modular adapters (wall or rack mounted as appropriate) or spliced through to the MC and terminated as above.

WP49 assumes a maximum length of 300 meters.

WP50 (1 Fiber)

WP50 shall consist of one (1) duplex fiber. The WP50 and other WPs containing fiber shall consist of duplex 62.5/125 micron fiber optic cable. At the station end, the fiber cable shall be terminated on SC connectors and mounted in ANSI/TIA/EIA-568-B.3 designation 568SC (duplex) modular adapters. At the HC end, the fiber cable shall be either terminated on SC connectors and mounted in ANSI/TIA/EIA-568-B.3 designation 568SC modular adapters (wall or rack mounted as appropriate) or spliced through to the MC and terminated as above.

WP50 assumes a maximum length of 300 meters.

WP51 (1 Data/1 Fiber)

WP51 shall consist of one (1) CAT 5e data cable and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP52 (1 Voice/1 Data/1 Fiber)

WP52 shall consist of one (1) CAT 5e voice cable, one (1) CAT 5e data cable and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP53 (2 Voice/1 Data/1 Fiber)

WP53 shall consist of two (2) CAT 5e voice cables, one (1) CAT 5e data cable and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP54 (1 Voice/1 Data/1 FTV/1 Fiber)

WP54 shall consist of one (1) CAT 5e voice cable, one (1) CAT 5e data cable, one (1) quad shield RG-6 coaxial cable and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1, WP2 and WP50.

WP55 (1 Voice/2 Data/1 Fiber)

WP55 shall consist of one (1) CAT 5e voice cable, two (2) CAT 5e data cables and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1 and WP50.

WP57 (1 Data/1 Fiber/1 FTV)

WP57 shall consist of one (1) CAT 5e data cable, one (1) RG-6 quad shield coaxial cable and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP1, WP2 and WP50.

WP58 (3 Data/1 FTV)

WP58 shall consist of three (3) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP59 (1 Fiber/1 FTV)

WP59 shall consist of one RG-6 quad shield coaxial cable and one (1) duplex 62.5/125 micron fiber optic cable. Terminations and cable runs as per WP2 and WP50.

WP60 (1 FTV/1 RTV)

WP60 shall consist of two (2) quad shield RG-6 coaxial cables and two (2) Belden 88761 audio cables. At the station end, 1 foot coils of cable shall be provided in a double gang deep backbox with a single gang blank faceplate. At the Horizontal Cross-connect (HC) end 10 foot coils of cable shall be coiled on the ladder tray above the video field.

WP61 (1 RTV)

WP61 shall consist of one (1) quad shield RG-6 coaxial cable and two (2) Belden 88761 audio cables. At the station end, 1 foot coils of cable shall be provided in a double gang deep backbox with a single gang blank faceplate. At the Horizontal Cross-connect (HC) end 10 foot coils of cable shall be coiled on the ladder tray above the video field.

WP62 (1 FTV)

WP62 shall consist of one (1) quad shield RG-6 coaxial cable. At the station end the coax cable shall be terminated on an F coupler. At the Horizontal Cross-connect (HC) end a 10 foot coil of coax cable shall be coiled on the ladder tray above the video field.

WP64 (2 Data/1 FTV)

WP64 shall consist of two (2) CAT 5e data cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP65 (1 Security Coax)

WP65 shall consist of one (1) quad shield RG-6 coaxial cable. Both ends of the cable shall be terminated on F connectors. At the station end, a 3 foot coil of cable shall be provided in a 6 in. by 6 in. pullbox. At the Horizontal Cross-connect (HC) end, a 3 foot coil of cable shall be provided in a 6 in. by 6 in. pullbox.

WP66 (1 House/Campus Phone)

WP66 shall consist of a voice cable to support a campus phone. At the station end, 12 inches of cable shall be coiled in the existing campus phone housing. Where an existing campus phone housing does not exist, 12 inches of coil shall be coiled in a new 6 in. by 6 in. pullbox. At the Horizontal Cross-connect (HC) end, the cable shall be terminated on a 110-style wall-mounted, CAT 5e punch-down block.

WP67 (1 Data/1 FTV)

WP67 shall consist of one (1) CAT 5e data cable and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP68 (2 Data/2 FTV)

WP68 shall consist of two (2) CAT 5e data cables and two (2) quad shield RG-6 coaxial cables. Terminations and cable runs as per WP1 and WP2.

WP69 (6 Data)

WP69 shall consist of six (6) CAT 5e data cables for connecting computer workstations. At the station end, the data cables shall be terminated on eight-position ANSI/TIA/EIA 568-B.2 designation T568B, CAT 5e modular jacks. At the Horizontal Cross-connect (HC) end, the data cables shall be terminated on ANSI/TIA/EIA 568-B.2 wiring designation T568B, CAT 5e modular jacks, wall or rack mounted as appropriate.

WP70 (2 Voice/1 FTV)

WP70 shall consist of two (2) CAT 5e voice cables and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP71 (2 Voice/1 Data/1 FTV)

WP71 shall consist of two (2) CAT 5e voice cables, one (1) CAT 5e data cable and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP72 (1 Voice/1 FTV)

WP72 shall consist of one (1) CAT 5e voice cable and one (1) quad shield RG-6 coaxial cable. Terminations and cable runs as per WP1 and WP2.

WP73 (3 Voice)

WP73 shall consist of three (3) CAT 5e voice cables. At the station end, the voice cables shall be terminated on eight-position ANSI/TIA/EIA 568-B.2 designation T568B, CAT 5e modular jacks. At the Horizontal cross-Connect (HC) end, the cables shall be terminated on 110-style wall-mounted, CAT 5e punch-down blocks.

WP74 (5 Data)

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WP74 shall consist of five (5) CAT 5e data cables for connecting computer workstations. At the station end, the data cables shall be terminated on eight-position ANSI/TIA/EIA 568-B.2 designation T568B, CAT 5e modular jacks. At the Horizontal Cross-connect (HC) end, the data cables shall be terminated on ANSI/TIA/EIA 568-B.2 wiring designation T568B, CAT 5e modular jacks, wall or rack mounted as appropriate.

WP75 (1 Voice/5 Data)

WP75 shall consist of one (1) CAT 5e voice cable and five (5) CAT 5e data cables. Terminations and cable runs as per WP1.

WP76 (3 Voice/1 Data)

WP76 shall consist of three (3) CAT 5e voice cables and one (1) CAT5e data cable. Terminations and cable runs as per WP1.

C) Horizontal Cable

a) Types

The following types of cable shall be used in horizontal wiring plans:

"Voice", "Data" and "Intelligent Building" cable shall be plenum rated 4-pair, 24 AWG solid copper conductors, unshielded twisted pair, ANSI/TIA/EIA-568-B.2 CAT 5e cable conforming to NEC Article 800 "Communications Circuits" type CMP. The following shall be provided (or approved equal):

Mohawk MegaLAN 400 Part Number: M56168 (Blue for Data and Intelligent Building)

M55988 (White for Voice)

Contractor shall provide pricing for alternate Category 6 cables. Rutgers University shall decide for each specific project, if Category 5e or Category 6 WPs shall be provided and installed.

Mohawk GigaLAN Enhanced Cat 6 Part Number:

M57414 (Blue for Data and Intelligent Building)

M57413 (White for Voice)

Horizontal Data cables shall be terminated in equipment racks on 24 port and/or 48 port patch panels.

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Panduit Part Numbers: DP245E88110U (Cat 5e 24 port)
DP485E88110U (Cat 5e 48 port)
CPPKT-324-WBL (Cat 6 24 port)
CPPKT-348-WBL (Cat 6 48 port)

"Video" coaxial cables shall be plenum rated type RG6 Quad Shield and must comply with NEC Article 820 "Community Antenna Television and Radio Distribution Systems" type CATVP. Use CATVR where allowed (non-plenum).

CommScope Part Number: 2227V (plenum) or approved equivalent
F6SSVR (non-plenum) or approved equivalent

"Video" coaxial cables shall be terminated on the station end with an "F" connector.

Corning-Gilbert Part Number: GF6AHSUSA

Fiber horizontal cables shall be Corning (or approved equal) MIC type, plenum rated, dual window, 900 micron tight-buffered, 62.5/125 micron multimode and comply with NEC Article 770 "Optical Fiber Cables and Raceways", type OFNP. Performance requirements must meet or exceed ANSI/TIA/EIA-568-B.3 requirements for optical fiber cabling systems. Where permitted, riser rated cable shall be used.

Corning Part Number: 002K88-31130-29 (plenum)
002K81-31130-24 (riser)

b) ANSI/TIA/EIA-568-B.2 Compliant

All equipment, installation methods, and testing associated with UTP horizontal cables and connecting hardware shall be consistent with and certified to the ANSI/TIA/EIA-568-B.2 CAT 5e requirements.

Where Category 6 connecting hardware and cable are used, installation methods and testing of said connecting hardware and cable shall be consistent with the ANSI/TIA/EIA 568-B.2 Addendum 1, Category 6 Draft 7 (or later) requirements.

c) Installation of Horizontal Cabling

All cabling shall be installed in accordance with all applicable codes and standards. Installations shall comply with the requirements of Section 17130.

The electrical characteristics of the cables being installed are adversely affected by compression or kinking. Measures shall be employed to ensure that the cables are not walked on, pulled tight around corners, kinked, etc.

Exposed cables shall be bundled loosely at intervals not exceeding four feet (4'), or less if necessary to prevent excessive dispersion of the bundle.

There shall be reasonable similarity of the amount of slack in the individual cables in a station bundle.

There shall be reasonable similarity of the amount of slack among station bundles when station bundles are combined.

Sufficient slack shall be provided to minimize the possibility of abrasion damage or kinking.

Cables run above hung ceilings and in other concealed spaces shall be supported, from the structural ceiling above, with J-Hooks, trapezes or other approved methods. Submit method of support to Rutgers University, for approval, prior to use. Cables shall not be supported by sprinkler pipes, hung ceiling tiles, grid or other portions of the ceiling support system.

d) Terminate on Same Floor

Horizontal cables shall terminate in a Horizontal Cross-connect (HC) on the same floor as the Work Station when there is a Horizontal Cross-connect (HC) on the same floor. When a given floor has no Horizontal Cross-connect (HC), all horizontal cables for that floor will terminate at the same Horizontal Cross-connect (HC) on another floor.

17170 Testing, Identification and Administration

A) Testing

a) Acceptance Testing

Acceptance Testing for the Communications Distribution System shall be incremental and based upon testing, inspection, and documentation review by Rutgers University. Acceptance testing for the Communications Distribution System shall also minimally include:

- Inspection of the installation to insure compliance with the standards indicated.
- Receipt and review of the cable test and repair records.
- Receipt and review of all other required plant documentation such as as-built floorplans; Main Cross-connect (MC), Intermediate Cross-connect (IC) and Horizontal Cross-connect (HC) plans; CAD drawings and cable management database and link updates; etc.
- The University will oversee random tests of installed cables.

b) Cable Testing

Using a method approved by Rutgers and conforming to TIA/EIA standards, the Vendor shall test every copper/coax/fiber cable on an end-to-end basis after splicing and termination.

Each defective cable will be corrected or the cable must be replaced at the Vendor's expense.

c) Testing of New Cables

Using a method approved by Rutgers University, the Vendor shall test every horizontal cable on an end-to-end basis after termination.

d) UTP

A pair shall be deemed defective if either or both conductors are open, either or both conductors are shorted to ground or another conductor, or tip and ring are reversed. Cables shall be deemed defective if found non-compliant with TIA/EIA-568-B.1 Section 11 CABLING TRANSMISSION PERFORMANCE AND TEST REQUIREMENTS.

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No irreparable defective pairs are permitted in new horizontal cables. After correction of termination-related problems, new horizontal cables containing any irreparable defects shall be replaced at the Vendor's expense.

Cabling shall be tested using a Microtest OMNIScanner cable tester. All test results shall be submitted electronically, in a format as directed by Rutgers University.

e) Fiber

The horizontal fiber optic cables must be tested for link attenuation in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper. The tests should be performed at 850 nm and the maximum attenuation for the link shall be 2.0 dB based on maximum horizontal runs of 90m. Where the fiber is spliced through the HC, the testing must be done at 850 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper. OTDR traces will be required where horizontal fiber cables have been spliced to the backbone. Acceptable loss limits will be based on the following link attenuation equation (see ANSI/TIA/EIA-568-B.1):

$$\begin{aligned} \text{Link Attenuation} &= 3.5 \text{ dB/km} * \text{Length (km)} \\ &+ \text{number connector pairs} * 0.75 \text{ dB} \\ &+ \text{number of splices} * 0.3 \text{ dB} \end{aligned}$$

f) Coax

All backbone coax shall be sweep-tested across the full operating frequency range (50MHz to 750MHz).

g) Fiber Testing

Vendor shall be responsible for damages to cables during shipment and during handling and/or storage prior to installation. All fiber shall be tested prior to installation to insure cable integrity and to identify any damage. Rutgers will not accept damaged cables under any condition.

All fiber cable will be tested for loss and according to the manufacturer's specifications. Final tests shall be performed after all the cable has been installed, spliced, and terminated. Loss measurements shall be made with an optical power meter. An Optical Time Domain Reflectometer (OTDR) shall be used to verify length and quality. Testing shall be conducted at both operating wavelengths. At a minimum, link attenuation measurements must be made on all intra-building fiber backbone cables, and OTDR traces will be required where OSP fiber cables have been terminated and/or spliced.

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A hard-copy and 3.5 inch disk or other acceptable electronic media of the OTDR trace record will be required as part of the acceptance requirements. The OTDR trace must be legible and must clearly identify which optical fiber cable and strand has been tested, the printed name of the person conducting the test and the date of the test. Actual cable lengths from cable footage markings shall be documented.

Any cable which is found to be defective shall be repaired or replaced at the Vendor's expense.

The backbone multimode fiber optic cables must be tested for link attenuation in one direction at both 850 nm and 1300 nm in accordance with ANSI/TIA/EIA-526-14A, Method B, One Reference Jumper. The single-mode backbone links must be tested in one direction at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper.

Acceptable loss limits will be based on the following link attenuation equation (see ANSI/TIA/EIA-568-B.1):

Link Attenuation = Cable Attn + Connector Insertion Loss + Splice Insertion Loss

Cable Attn (dB) = Attenuation Coefficient (dB/km) * Length (Km)

Attenuation Coefficient

3.50 dB/km @ 850 nm for multimode
1.50 dB/km @ 1300 nm for multimode
0.50 dB/km @ 1310 nm for single-mode outside plant cable
0.50 dB/km @ 1550 nm for single-mode outside plant cable
1.00 dB/km @ 1310 nm for single-mode inside plant cable
1.00 dB/km @ 1550 nm for single-mode inside plant cable

Connector Insertion Loss (dB) = number of connector pairs * connector loss (dB)

= 2 * 0.75 dB
= 1.5 dB

Splice Insertion Loss (dB) = number of splices (S) * splice loss (dB)

= S * 0.3 dB

B) Identification / Labeling

Splices, cables, connecting hardware, pathways, MC's, IC's, HC's, ER's, TC's TR's and other spaces will be identified and labeled using the ANSI/TIA/EIA 606

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administration standard and such identification and labeling must be coordinated and approved in writing by Rutgers University Telecommunications Division prior to any labeling activity.

The developed schemes shall ensure that no two labeled items will have the same number.

a) Telecommunications OSP Labeling

PATHWAYS:	LABEL:
DUCTBANK	DB-3 LETTER CAMPUS- SEQUENTIAL #
CONDUIT	CD-3 LETTER CAMPUS- SEQUENTIAL #

SPACES:	LABEL:
MANHOLE	MH-3 LETTER CAMPUS- SEQUENTIAL #
VAULT/HUT	VT-3 LETTER CAMPUS-SEQUENTIAL #
PULL/SPLICE BOX	PB-3 LETTER CAMPUS- SEQUENTIAL #
HANDHOLE	HH-3 LETTER CAMPUS-SEQUENTIAL #
PEDESTAL	PD-3 LETTER CAMPUS-SEQUENTIAL #
UTILITY POLE	UP-3 LETTER CAMPUS-8 CHAR POLE #

WIRING SYSTEM:	LABEL:
BACKBONE CABLE	CBF (or V, C) -3 LETTER CAMPUS ID-SEQUENTIAL #

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WIRING SYSTEM:	LABEL:
VOICE TERMINATION HARDWARE (OSP)	CBV-3 LETTER CAMPUS ID-SEQUENTIAL # (NOTE: TO MATCH ASSOCIATED CABLE LABEL)
VIDEO TERMINATION HARDWARE (OSP)	TH-BLDG#-ROOM#-500 THROUGH 599
FIBER TERMINATION HARDWARE (OSP)	TH-BLDG#-ROOM#-400 THROUGH 499 also CP LETTER-CABLE IDENTIFIER-TUBE COLOR(s) TO: BLDG #-BLDG NAME (NOTE: LABELING REQUIRED FOR EACH USED COUPLER PANEL)

b) Telecommunications ISP Labeling

HORIZONTAL CABLING SYSTEM	LABEL:
VOICE CABLE	4 DIGIT SEQUENTIAL CABLE NUMBER PER FLOOR FOLLOWED BY V (EXAMPLE: 1001V)
DATA CABLE	4 DIGIT SEQUENTIAL CABLE NUMBER PER FLOOR FOLLOWED BY D (EXAMPLE: 1001D)
VIDEO CABLE	4 DIGIT SEQUENTIAL CABLE NUMBER PER FLOOR FOLLOWED BY C (EXAMPLE: 1001C)
FACEPLATE JACK	LABEL EACH JACK WITH SAME LABEL AS ASSOCIATED CABLE (EXAMPLE: 1001D)
VOICE TERMINATION HARDWARE (HORIZONTAL)	TH-BLDG#-ROOM#-200 THROUGH 299
DATA TERMINATION HARDWARE (HORIZONTAL)	TH-BLDG#-ROOM#-100 THROUGH 199
FIBER TERMINATION HARDWARE (HORIZONTAL)	TH-BLDG#-ROOM#-300 THROUGH 399
VIDEO (COAX) TERMINATION HARDWARE (HORIZONTAL)	TH-BLDG#-ROOM#-500 THROUGH 599

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RISER WIRING SYSTEM:	LABEL:
VOICE RISER & TIE CABLE	CRV-BLDG #-SEQUENTIAL #
FIBER OPTIC RISER CABLE	CRF-BLDG #-SEQUENTIAL #
VIDEO (COAX) RISER CABLE	CRC-BLDG #-SEQUENTIAL #
VOICE TERMINATION HARDWARE (RISER & TIE)	CRV-BLDG #-SEQUENTIAL # (NOTE: TO MATCH ASSOCIATED CABLE LABEL)
FIBER TERMINATION HARDWARE (ISP)	TH-BLDG#-ROOM#-300 THROUGH 399 also CP LETTER-CABLE IDENTIFIER-TUBE #(s) TO: ROOM # (NOTE: LABELING REQUIRED FOR EACH USED COUPLER PANEL)
VIDEO (COAX) TERMINATION HARDWARE	TH-BLDG#-ROOM#-500 THROUGH 599

GROUNDING & BONDING SYSTEM:	LABEL:
MAIN GROUNDING BUSBAR (TMGB)	TMGB-SEQUENTIAL #
GROUNDING BUSBAR (TGB)	TGB-SEQUENTIAL # (NOTE: STARTING FROM NEXT # AFTER TMGB #)
BONDING CONDUCTOR	BC-SEQUENTIAL # WITHIN ROOM
EQUIPMENT BONDING CONDUCTOR	EC- SEQUENTIAL # WITHIN ROOM
COUPLED BONDING CONDUCTOR	CC-SEQUENTIAL # (NOTE: TO MATCH SEQUENTIAL # OF ASSOCIATED CABLE)

c) Labeling Wall Plates and Jacks

Wall plates and/or Jacks shall be labeled in accordance with the University approved numbering scheme.

Horizontal cables shall be marked at both ends.

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The identifying number associated with each horizontal cable shall be marked where the cable is terminated, i.e., on a Horizontal Cross-connect (HC) or Main cross-Connect (MC) and on the faceplate.

d) Permanent

Labels must be of waterproof materials, with machine printed, indelible information, using either mechanical or waterproof adhesive attachment suitable for the application. Materials must comply with ANSI/TIA/EIA 606.

C) Administration

a) Cable Records / Templates

Each cable and cross-connection installed shall be documented by the Vendor in a format approved by Rutgers University including but not limited to: (See Section 17090.)

Horizontal cable templates

VOICE HORIZONTAL TEMPLATE EXAMPLE

TH	Bldg #		ER/TC		Row #	Posit #	Cable		Face Plate	Bldg # RM# FP#			Jack#	FI #	
	5 Di	6 Di	TH#	4 Di.			3 Di.	5 Di		5 Di	5 Di	6 Di			3 Di
TH	3107	203D	200	200	1	5	CHV	3107	2001	FP	3107	242	1	2001V	2
TH	3107	203D	200	200	1	6	CHV	3107	2002	FP	3107	238	1	2002V	2
TH	3107	203D	200	200	2	1	CHV	3107	2003	FP	3107	238	2	2003V	2
TH	3107	203D	200	200	2	2	CHV	3107	2004	FP	3107	238	3	2004V	2
TH	3107	203D	200	200	2	3	CHV	3107	2005	FP	3107	238	4	2005V	2

DATA HORIZONTAL TEMPLATE EXAMPLE

TH	Bldg #	ER/TC Rm #	TH#	Port #	Cable	Bldg #	Cable #	Length	Face Plate	Bldg # RM# FP#			Jack#	FI #
										5 Di	6 Di	3 Di		
TH	4145	017A	100	48	CHD	4145	B048	60.0	FP	4145	B028	1	B048D	B
TH	4145	017A	101	1	CHD	4145	B049	48.8	FP	4145	B050	1	B049D	B
TH	4145	017A	101	2	CHD	4145	B050	48.8	FP	4145	B050	2	B050D	B
TH	4145	017A	101	3	CHD	4145	B051	72.2	FP	4145	B051	1	B051D	B

VIDEO HORIZONTAL TEMPLATE EXAMPLE

TH	Bldg #	ER/TC Rm #	TH#	Port #	Cable	Bldg#	Cable #	Length	Face Plate	Bldg # RM# FP#			Jack#	FI #
										5 Di	6 Di	3 Di		
TH	3564	51B	504	6	CHC	3564	1001	47.2	FP	3564	10	1	1001C	1
TH	3564	51B	504	7	CHC	3564	1002	45.7	FP	3564	11	1	1002C	1
TH	3564	51B	504	8	CHC	3564	1003	43.0	FP	3564	12	1	1003C	1
TH	3564	51B	504	9	CHC	3564	1004	41.5	FP	3564	13	1	1004C	1

FIBER HORIZONTAL TEMPLATE EXAMPLE

TH	Bldg #	ER/TC Rm #	C_Panel S_Tray	Port Row	Posit.#	Bldg Cable	Cable #	No Tube	Strand Color	Mode	Length (meters)	Face Bldg			Jack#	FI #
												Plate	#	RM# FP#		

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5 Di	6 Di	4 Di	(CP or ST)	2 Di	2 Digit	5 Di	5 Digit	2 Digit	5 Digit	5 Di	6 Di	3 Di	6 Digit	2 Di			
TH 3561	277	301	CP	A	1	CHF	3561	3001	0	BL	MM	27.4	FP 3561	381	1	3001F	3
TH 3561	277	301	CP	A	2	CHF	3561	3001	0	OR	MM	27.4	FP 3561	381	1	3001F	3
TH 3561	277	301	CP	A	3	CHF	3561	3002	0	BL	MM	28.6	FP 3561	385	2	3002F	3
TH 3561	277	301	CP	A	4	CHF	3561	3002	0	OR	MM	28.6	FP 3561	385	2	3002F	3

Riser templates

VOICE RISER / TIE TEMPLATE EXAMPLE

TH	Bldg.#	ER/TC Rm#	TH#	Riser	Bldg#	Cable#	Pair Count	TH	Bldg.#	ER/TC Rm#	TH#
	4 Digit	6 Digit	4 Digit	Cable	4 Digit	5 Digit	4 Digit		4 Digit	6 Digit	4 Digit
TH	3011	037		CRV	3011	4	300	TH	3011	109A	
TH	3011	109A		CRV	3011	5	300	TH	3011	144B	

TH# is always Blank. Cable is entered in Template as follows:
TIE = EF to ER
RISER = ER to TC

VIDEO RISER TEMPLATE EXAMPLE

TH	Bldg#	ER/TC Rm#	TH#	Riser	Bldg#	Cable#	Length	TH	Bldg#	ER/TC Rm#	TH#
	4 Digit	6 Digit	4 Digit	Cable	4 Digit	5 Digit	3 Digit (m)		4 Digit	6 Digit	4 Digit
TH	4147	003	500	CRC	4147	1	76.5	TH	4147	017B	501
TH	4147	017B	501	CRC	4147	2	76.5	TH	4147	212	500

Cable is entered in Template as follows: EF to ER : ER to TC :

FIBER RISER TEMPLATE EXAMPLE

Cable is entered in Template as follows: EF to ER : ER to TC : Template must contain the entire Fiber Cable. All tubes and strands must be documented in Industrial Standard order, Tube 1 Strand BL, Tube 1 Strand OR. CP = Coupler Panel; NT = Not Terminated; UNK = Unknown;

TH	Bldg#	ER/TC Rm#	TH#	C_Panel	Row	Pos	Riser	Bldg #	Cable #	Tube #	Strand	Mode	Length	TH	Bldg #	ER/TC Rm#	TH#	C_Panel	Row	Pos
	5 Digit	6 Digit	4 Di	S_Tray	2 Di	2 Di	Cable	5 Di	5 Di		Color		(meters)		5 Di	6 Di	4 Di	S_Tray	2 Di	2 Di
				(CP or ST)							2 Digit		5 Di (m)					(CP or ST)		
TH	3065	4A	300	CP	F	1	CRF	3065	2	1	BL	SM	34	TH	3065	240A	300	CP	E	1
TH	3065	4A	300	CP	F	2	CRF	3065	2	1	OR	SM	34	TH	3065	240A	300	CP	E	2
TH	3065	4A	300	CP	F	3	CRF	3065	2	1	GR	SM	34	TH	3065	240A	300	CP	E	3
TH	3065	4A	300	CP	F	4	CRF	3065	2	1	BR	SM	34	TH	3065	240A	300	CP	E	4
TH	3065	4A	300	CP	F	5	CRF	3065	2	1	SL	SM	34	TH	3065	240A	300	CP	E	5
TH	3065	4A	300	CP	F	6	CRF	3065	2	1	WH	SM	34	TH	3065	240A	300	CP	E	6
TH	3065	4A	300	NT	0	1	CRF	3065	2	2	BL	SM	34	TH	3065	240A	300	NT	0	1
TH	3065	4A	300	NT	0	2	CRF	3065	2	2	OR	SM	34	TH	3065	240A	300	NT	0	2
TH	3065	4A	300	NT	0	3	CRF	3065	2	2	GR	SM	34	TH	3065	240A	300	NT	0	3

Assignment templates

Voice Horizontal to Voice Riser Assignments:

After cabling and labeling is complete a CRV TERMINATION HARDWARE RECORD is created. This documents the cross-connection from the Voice Horizontal cables to the Voice Riser. The Hardware Record is then used to generate the Assignments Template Excel Spreadsheet which is imported into the Cable Master Database.

PAIR	PAIRS	PAIRS	PAIRS	PAIRS	PAIRS	PAIRS	PAIR
	1 - 4	5 - 8	9 - 12	13 - 16	17 - 20	21 - 24	
1	1001V	1002V	1003V	1004V	1005V	1006V	25

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	26 – 29	30 – 33	34 – 37	38 – 41	42 – 45	46 - 49	
26	1007V	1008V	1009V	1010V	1011V	1012V	50
	51 – 54	55 – 58	59 – 62	63 – 66	67 – 70	71 - 74	
51	1013V	1014V	1015V	1016V	1017V	1018V	75
	76 – 79	80 – 83	84 – 87	88 – 91	92 – 95	96 - 99	
76	1019V	1020V	1021V	1022V	1023V	1024V	100
	101 – 104	105 – 108	109 – 112	113 – 115	116 – 119	120 - 124	
101	V	V	V	V	V	V	125
	126 – 129	130 – 133	134 – 137	138 – 141	142 – 145	146 - 149	
126	V	V	V	V	V	V	150
	151 – 154	155 – 158	159 – 162	163 – 166	167 – 170	171 - 174	
151	V	V	V	V	V	V	175
	176 – 179	180 – 183	184 – 187	188 – 191	192 – 195	196 - 199	
176	V	V	V	V	V	V	200

VOICE PAIR ASSIGNMENT TEMPLATE EXAMPLE

Assignment Identification	Cable	Bldg#	Cable#	Pair Number	Cable	Bldg#	Cable#	Pair Number
	5 Digits	4 or 5 Digit	4 or 5 Digit		5 Digits	4 or 5 Digit	4 or 5 Digit	
3001-101-1001-V	CHV	3001	1001	1	CRV	3001	2	1
3001-101-1001-V	CHV	3001	1001	2	CRV	3001	2	2
3001-101-1001-V	CHV	3001	1001	3	CRV	3001	2	3
3001-101-1001-V	CHV	3001	1001	4	CRV	3001	2	4
3001-101-1002-V	CHV	3001	1002	1	CRV	3001	2	5
3001-101-1002-V	CHV	3001	1002	2	CRV	3001	2	6
3001-101-1002-V	CHV	3001	1002	3	CRV	3001	2	7
3001-101-1002-V	CHV	3001	1002	4	CRV	3001	2	8
3001-101-1003-V	CHV	3001	1003	1	CRV	3001	2	9
3001-101-1003-V	CHV	3001	1003	2	CRV	3001	2	10
3001-101-1003-V	CHV	3001	1003	3	CRV	3001	2	11
3001-101-1003-V	CHV	3001	1003	4	CRV	3001	2	12

b) GIS Systems Requirements

The Vendor will locate the outside plant features using GPS data capturing techniques. GPS equipment must be approved to locate features within the

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required one-meter tolerance. Rutgers University will not provide ground control for survey purposes. The record drawings including all subsurface ductbanks, will be accurate to within one meter of the actual state plane coordinate. The spatial coordinate system used for all Rutgers campuses is the North American Datum of 1983 (NAD83).

At a minimum the contractor shall GPS all ductbanks (at 25 ft intervals) , manholes, handholes, pedestals, and poles.

c) OSP Record Documents

The Vendor shall prepare and submit record drawings of the actual work.

OSP Ductbank Drawings

The Vendor shall add its distribution cabling system in AutoCAD to any existing drawings, showing at least:

Exact route of outside plant cable including placement of manholes, handholes, pull boxes, pedestals and entrance facilities with the following:

- Ductbank numbers
- Manhole numbers
- Locator coordinate measurements from trench location to nearest building.
- Accurate location and identification of all aerial plant poles.

The record drawings including all subsurface ductbanks, will be accurate to within one meter of the actual state plane coordinate. The spatial coordinate system used for all Rutgers campuses is the North American Datum of 1983 (NAD83).

Manhole/Handhole Detail Drawings

Schematic diagrams in AutoCAD illustrating manholes, handholes, pull boxes and pedestals will be prepared to include all new construction. Consistent schematic formats will be used for each item reflecting north, south, east and west as-built elevations. All spaces will be clearly identified and labeled on the As-Built drawings and individual details, including but not limited to:

- Percentage used or full for each conduit.
- Conduit quantity, size and material composition, and conduit location with respect to manhole wall facing.
- Digitized photographs of all handholes, pull boxes and pedestals, manhole walls (including a top view).

Documentation shall be reviewed and approved by the University.

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Cabling

MODIFICATIONS

- 3/18/03 Added WP31
 Corrected WP46 In Table (Section 17160 B)
 Corrected WP47 In Table (Section 17160 B)

- 3/20/03 Added WP75

- 3/21/03 Added WP60
 Modified WP2, WP61, WP62

- 3/25/03 Added Panduit Part Numbers for RTV (Section 17160.B.a)

- 6/02/03 Added WP32 and WP33

- 9/26/03 Modified Filename

- 3/23/06 Added WP76

- 2/14/07 Added 50-micron fiber for ISP, connector and connector panel.