SECTION 16651 *(Master Template 11-01-05)*

TELEPHONE/DATA DISTRIBUTION SYSTEM

PART 1 GENERAL

1.00 DESCRIPTION

A. Furnish and install a complete Telephone/Data Distribution System as specified, including all Cabling, Termination Devices, Cable Raceway Ladder Racking, and Equipment Racks for all Telecommunications Rooms.

1.01 RELATED DOCUMENTS


C. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 RELATED SECTIONS

D. Refer to the following sections for additional requirements:

3. Specification Section 16130 – Boxes (Sizes, Styles and Types).
6. Specification Section 16651 – Telephone/Data Distribution System
7. Specification Section 16651 – APPENDIX-A (Approved Products).
8. Specification Section 16651 – APPENDIX-B (Glossary of Terms).
10. Specification Section 16651 – APPENDIX-D (EWU Station Cable Record).
14. Specification Section 16680 – Clock System.

1.03 SUBMITTALS

A. Contractor shall submit product description information prior to installation of product.

B. Contractor shall provide all product warrantees and manufacturer’s certificates of warranty.

C. Contractor shall provide all Product and Software licenses.

D. Contractor shall provide proof of product manufacture installation certification.

E. Contractor shall provide proof of appropriate State Labor and Industries Electrical licensing for each on-site employee.

F. Contractor shall provide proof of appropriate State Labor and Industries Electrical Installation Work Permits, and the Permits shall be posted at the jobsite.

G. Contractor shall submit a Proposed Station Cable Record for approval, which shall contain the following information: 1-Cable ID; 2-Faceplate ID; 3-Work Area, Room, Location and Cable Number; 4-Outlet Configuration Type from Table-03 in this Specification Section 16651; 5-Closet Position. A Template for this information is included in Specification Section 16651 APPENDIX-D, EWU-Station Cable Record.


1.04 WARRANTEES

A. Contractor shall provide SYSTIMAX® SCS Certificate of Warranty for the 20-year product warrantee on all horizontal, station cables, jacks and associated parts.

B. Contractor shall provide CORNING LANscape® Certificate of Warranty for the 25-year product warrantee on all Fiber Optic cables, terminations and associated parts.

C. All installed products shall carry the manufacturer’s full warranty.
D. The Telephone and Data distribution system shall be installed, tested, demonstrated, and placed in service and then maintained under an in-place (installation workmanship) warranty for a period of 1-year from the date of acceptance. During the 1-year warranty period, the system vendor shall maintain trouble reporting and diagnostic services and shall make service calls and perform service and repairs as required to keep the system fully operational at all times.

1.05 MANUALS

A. The Contractor shall furnish the Owner a complete set of printed system documentation which includes “as built” drawings that show station location and labeling information, all pathways and Telecommunication Rooms or cross-connect locations, all Fiber Optic and all Copper cable testing records, product and equipment brochures and manuals.

B. In addition to the printed documentation the Contractor shall supply drawings in an Auto-CAD R-14 or 2000 DXF format. This shall be provided on a CD (Compact Disk). Telephone Cables, Data Cables, and Telecommunications Pathway, shall be on their separate layer.

C. All cable and fiber test records in both electronic and paper copy shall be in Microsoft Excel compatible format.

D. The printed documentation shall be furnished in bound volumes.

E. Performance data on complete system.

F. Warrantees.

G. Record drawings (as-built):

1. Record drawings shall be provided to the Owner.
2. These drawings shall show the locations of all cabinets, racks, cable, splice closures, cross-connects, cable routes, and outlets.
3. The record drawings prepared after installation shall indicate:

   a. Routing for all intra-building pathway and media.
   b. Backboard layout detail for each Entrance and Distribution Facility including entrance penetration detail.
   c. Locations of power panels and un-interruptible power sources.
   d. Locations for protected, bonded, and grounded terminals.
   e. Cross-connection hardware locations by floor and room.
   f. Cross-connection hardware identification.
   g. Pair counts information at each Entrance and Distribution Facility.
   h. Location of all support hardware, installed equipment, and hardware.
   i. Routing, pair count, and cable make-up information for backbone cables.
j. Location and quantity of slack cable or service loops.
k. Associated building structures and equipment.

H. Pathway Assignment and Test Records:

1. Contractor shall provide complete pair assignment records for the horizontal and backbone facilities.
2. The assignment records shall indicate the fill ratio of each pathway.
3. Splice closure records shall contain splice identifier, type, manufacturer, installation date, and last access date.

1.06 DESCRIPTION

A. Provide a complete telephone and data distribution cable system throughout the facility as indicated on construction drawings.

B. The system shall include the following items as required to form a complete and operable system:

1. Construction of Telecommunication Rooms and environmental support of these spaces.
2. Telephone backboards in all Telecommunications Rooms.
3. Telephone/Data outlet devices.
4. Station cabling between the Telecommunications Room and other designated equipment locations and the outlets.
5. Termination blocks, patch panels, patch cords, cabinets, equipment racks, etc., required to support, terminate, and/or cross-connect cabling at the telecommunication intermediate distribution rooms and/or other designated equipment locations.
6. Cable management hardware including, but not limited to, ladder-type cable racks within Telecommunications rooms, jumper troughs, retainer clips, “D-rings”, and/or other appropriate cable management hardware on backboards and in equipment racks.
7. Labeling of all cables and hardware provided.
8. Documentation showing performance testing, as-built drawing that show cable pathway and station placement, labeling information, power and ground sources, product brochures.

C. The Contractor shall show satisfactory evidence that he maintains or retains a service organization capable of installing the Telephone/Data Distribution System and is capable of furnishing adequate inspection and service to the materials being installed.
1.07 REQUIREMENTS

A. Contractor shall submit a list of similar Telecommunications Systems previously installed under supervision of the person who will oversee the telephone and data distribution system work. Projects shall have been operating for at least one year, but not more than three years. Provide name of persons to contact for each project and phone number for verification.

B. Contractor shall provide a complete, functional, and tested telephone and data communications system, which includes all vertical and horizontal distribution components. This shall include over-voltage protection on all building entrance cables, and feeders.

C. Contractor employees installing the SYSTIMAX® SCS shall be certified by SYSTIMAX® SCS for product installation. There shall be a minimum of one SYSTIMAX® SCS Certified Senior Technician/Supervisor on the jobsite at all times, when the installation is being done.

D. Contractor shall provide proof of being a SYSTIMAX® SCS authorized Value Added Reseller, (VAR).

E. All copper station cable and supportive termination devices shall carry the full 20 Year SYSTIMAX® SCS product and performance warranty and shall be installed to insure that it is warrantable by the manufacturer.

F. All Fiber Optic Cable shall be manufactured by the Corning Company, and shall be installed by a Corning Certified Technician, and a CORNING Fiber Optic Cable System 25 Year Warranty shall be provided, and shall be installed to insure that it is warrantable by the manufacturer.

G. Contractor employees installing the CORNING Fiber Optic Cable System shall be certified by CORNING for product installation. There shall be a minimum of one CORNING Fiber Optic Cable System Certified Senior Technician/Supervisor on the jobsite at all times, when the installation is being done.

H. All other non-CORNING LANscape® / non-SYSTIMAX® SCS products shall carry a 5-year performance and installation warranty.

I. Telephone service over-voltage protection devices shall be located in the BET.

J. Contractor shall provide and display on site all required installation and inspection permits.

K. Contractor shall be licensed and bonded in the State of Washington.

L. Special notes to Contractors:
1) All drawings are diagrammatic; therefore, device and pathway placement is only representative of a general location. Do not scale from the drawings in order to place a device or pathway, since the drawing location may not represent the actual location. It is the responsibility of the Contractor to place these devices and pathway such that they offer full functionality without hindrance from casework, furniture, windows and doors, HVAC, and other building systems.

2) It is the Contractor's responsibility to obtain and use the proper room and space numbers or names. If the Contractor receives from the Owner any shop drawings or "as built" construction prints that do not contain proper room or space numbers, the Contractor shall obtain the correct numbers. The Contractor shall provide correct numbers on all drawings and related records it provides to the Owner.

3) Damage to equipment, service outages, and schedule delays caused by the contractor are both the financial and restorative responsibility of the Contractor.

4) The Owner will not accept any cable plant or pathway installation until it passes a physical and performance inspection. All cable not installed to manufacturer specifications will be rejected regardless of electrical and performance testing. The Owner may spot test contractor installed cable.

5) The Contractor is responsible for removing all construction debris and unused cable, boxes, and shipping containers. The work areas are to be swept clean and wet mopped prior to floor sealants or tile work.

6) The Contractor shall remove all unused and obsolete cables in trays and conduits and shall turn scrap cable over to the Owner.

7) Only water-based, propylene glycol or clay-based lubricants are acceptable as cable lubricants. Ideal brand Yellow 77 or similar soap-based cable lubricants are not acceptable and are not to be used for fiber or copper cable installation.

PART 2 – PRODUCTS (See Specification Section 16651 - APPENDIX – A for Part Numbers)

2.01 BACKBOARDS

A. See Specification Section 16652 Requirements for Telecommunications Rooms (TR’s). Architect shall incorporate the specific Specification Section 16652 requirements as follows into the appropriate project specification section(s) to facilitate the proper room construction:

1. Backboards
2. Paint
3. Floor Finishes
4. Doors and Locks
5. Firestopping
6. Lighting
7. Heating, Ventilation and Air Conditioning (HVAC)
2.02 FIRESTOPPING (Also see Specification Section 07841 Through-Penetration Fire Stop System).

A. When trays intersect with walls or other fire-rated barriers they shall employ the use of reusable, fire-rated pillows. The use of fiberglass insulation is not approved for this purpose.

B. All conduit, sleeves, and floor boxes shall be fire-calked using recognized UL 1479 and UL 2079 Elastomeric fire-rated calk. The use of latex or silicon products that do not conform to ASTM E-814 rating is prohibited.

C. All rated caulk shall be red, or reddish-brown color.

2.03 RACKS (including associated parts and accessories)

A. Racks shall be seven feet in height, and six inches in rail depth.

B. Black in color and factory painted.

C. Acceptable rack product shall be manufactured by Chatsworth Products Inc.

D. Each rack shall be fitted with one equipment shelf, Heavy-Duty Equipment Shelf for 6 inch Channel, a Chatsworth Product.

E. Each rack shall be supplied with one upper jumper tray, a Chatsworth Product.

F. Vertical Wire Managers shall be 7 feet high by 6-inches wide by 12-3/4 inches deep double-sided Chatsworth Product, and shall number two per installed Rack.

G. Each Vertical Wire Manager shall be equipped with one each Rack Radius Drop, a Chatsworth Product.

H. Each Vertical Wire Manager shall be supplied with four each Finger Snaps™ Cable Guides, a Chatsworth Product. Placement shall be approved by the owner prior to installation.

I. Each rack shall be supported with a minimum twelve inch wide Cable Runway, a Chatsworth Product, to meet all Earthquake Bracing requirements. One rack supporting Cable Runway shall be run on top of the installed racks extending to each end wall and one shall be run perpendicular, extending to each of the side walls.

J. A Cable Runway shall be installed along all four walls of the Telecommunications Room (TR) as a cable pathway within the TR, the width and route of the cable runway shall be approved by the owner prior to installation.
K. Each section of installed Cable Runway that is used for cable support shall be equipped with Cable Retaining Posts, a Chatsworth Product, installed at a maximum of twelve inch separation along the supporting pathway, on both outside rails, see APPENDIX-A for part numbers.

L. Provide and Install (Volume) each Racks with all associated hardware in each of the following Telecommunication Rooms: BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn; IDF, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn; IDF, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn. This is a total of (Volume) racks.

M. Provide and Install (Volume) each Racks with all associated hardware in each of the following Telecommunications Rooms: BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn; IDF, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn; IDF, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn. This is a total of (Volume) racks.

2.04 WIRE MANAGEMENT (Horizontal on the Equipment Racks)

A. Patch panel patch cord/wire management shall be a SYSTIMAX® SCS 1100D3 Cord Organizer, and shall be installed above and below each Patch Panel. The specific locations in racks shall be approved by the owner prior to installation.

B. Horizontal Wire/Cord Manager (CPI Upper Jumper Tray), a Chatsworth Product, shall be installed at the extreme top of all racks.

C. A CPI Cable Ring Horizontal Small (1-RU) shall be installed immediately below the FODU. The specific location shall be approved by the owner prior to installation.

2.05 CABLE SUPPORT-VELCRO TIES

A. **All** copper station cables and **All** fiber station cables shall be secured using Velcro type ties on Cable Runway, Cable Trays, and Vertical Wire Managers.

2.06 VOICE CABLE SUPPORTS ON BACKBOARDS

A. **All** copper station cables routed on the Telecom Backboards shall be secured using the appropriate size “D” Rings installed on a maximum of six inch separation; all corners shall be made with two “D” rings and with a maximum separation of six inches. The size of the “D” rings shall provide for 100 % growth. The size and route of these “D” rings shall be approved by the owner prior to installation.

B. Surface run cable may be used for the Telecommunications Room Wall Telephone, when this occurs, the station cable shall be secured to the backboard with Coaxial Cable Nails suitable for the installation, installed on a maximum of six inch separation, and shall be approved by the owner prior to installation.
2.07 COPPER ENTRANCE SERVICE CABLE

A. All copper entrance cable shall be ASP filled core with an Aluminum shield.

B. The Contractor shall Provide, Install, Splice, Terminate and Test one each nnn Pair Gel Filled Cable, Superior Essex part number DB-nnnP24-AL, from Splice AnnA in the (Name) Tunnel in the EWU Tunnel System, estimated nominal length of approximately nnnn Linear Feet to the BET, AAAAn. The OVER-VOLTAGE PROTECTION DEVICES for the (Building Name) Project shall be located in the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn). Exact wall location shall be approved by the Owner prior to installation.

C. The Contractor shall Provide, Install, Terminate and Test (Volume) each 24 AWG 100 Pair PVC Jacketed Non-Plenum Rated Connector Tie Cable extending from the output of each Over-voltage Protection Device to a separate mounted 110AW2-300 termination block to facilitate the installation of Telephone Cross-Connect Jumpers. The exact wall location shall be approved by the Owner prior to installation.

D. The termination of these Tie cables on the Over-voltage Protection Device shall utilize the Jumper Wire Path provided, NOT BEHIND THE LABELS.

2.08 OVER-VOLTAGE PROTECTION DEVICES

A. Provide, Install, and Terminate (Volume) each SYSTIMAX® SCS 100-pair lightning protection blocks with enclosure, 489ACAI-100, and (Volume) each 4C1S electronic modules, in the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn. The exact location detail on wall shall be approved by Owner prior to installation.

2.09 COPPER PATCH CORDS

A. The Patch Cords in all Telecommunications Rooms shall be SYSTIMAX® SCS-GigaSPEED® GS8E Patch Cords, light blue in color, and of sufficient length to make the connection from the Network Distribution Equipment to station patch panels. The specific volume by lengths of patch cables shall be approved by the owner prior to the purchase. One Patch Cable shall be supplied for each data station cable installed. Part Numbers are listed in APPENDIX-A. Delivery shall be in boxes.

B. One Patch Cord shall be supplied for each data cable installed. The Patch Cords shall be a SYSTIMAX® SCS-GigaSPEED® GS8E Patch Cord, green in color, 14-foot-long patch cord. Part Numbers are listed in APPENDIX-A. Delivery shall be in boxes.

C. Each Information Outlet that has a Voice Cable, shall be supplied with one RJ-14, two pair Silver Satin Cord, 25 Feet in length for the Voice Connection. Part Numbers are listed in APPENDIX-A. Delivery shall be in boxes.
D. The owner shall be responsible for the installation of all Patch Cords.

2.10 COPPER RISER CABLE

A. SYSTIMAX® SCS ARMM corrugated shield, fire resistive sheath or equivalent, as approved by the owner.

B. The Contractor shall Provide, Install, Terminate and Test as specified in this section a “SYSTIMAX® SCS ARMM-nnnn (nnn Pair) Riser Cable From the BET, AAAAn, Rm. #nnn, on Dwg. Sht. E-nnn to IDF, AAAAn, Rm. #nnn, on Dwg. Sht. E-nnn, to be Labeled as “RC1-AAAAn-AAAAn/n-nnn”, and a “SYSTIMAX® SCS ARMM-nnn (nnnPaire) Riser Cable From the BET, AAAAn, Rm. #nnn, on Dwg. Sht. E-nnn to IDF, AAAAn, Rm. #nnn, on Dwg. Sht. E-nnn, to be Labeled as “RC2-AAAAn-AAAAn/n-nnn”.

2.11 COPPER STATION TERMINATION DEVICES FOR INFORMATION OUTLETS

A. Voice Cable at station end, Voice Jacks shall be ivory-colored, SYSTIMAX® SCS MGS400-246, (This is a SYSTIMAX® SCS GigaSPEED Jack).

B. Each Voice Jack shall be fitted with a SYSTIMAX® SCS M61F-246, ivory-colored Voice icon.

C. Wall-mounted voice service devices shall use SYSTIMAX® SCS M10LW-246 equipped with a standard Voice Jack (MGS400-246).

D. Campus Network Data Jacks shall be Gigabit service rated, red-colored, SYSTIMAX® SCS MGS400-317, (This is a SYSTIMAX® SCS GigaSPEED Jack).

E. Intra-building Network Data Jacks shall be Gigabit service rated, green-colored, SYSTIMAX® SCS MGS400-226, (This is a SYSTIMAX® SCS GigaSPEED Jack).

F. Voice and Riser Cable at the Telecommunication Room end:

1. A SYSTIMAX® SCS 110-style 100 or 300-pair wall-mounted 110AW2 termination blocks with legs shall be provided and installed by the Contractor in a location on the Voice Backboard approved by the owner prior to installation. Special Note: Labeling of all 110 Blocks shall be in 100 Pair Increments, such as a 300 Pair block as blocks1, 2, and 3.

2. The110C connection clip used with the 110AW2 termination block shall be a 4 pair clip, SYSTIMAX® SCS 110C-4, for all voice Station Cables. All Riser Cables shall use the 5-pair clip, SYSTIMAX® SCS 110C-5.

3. All blocks shall have an SYSTIMAX® SCS 88A2 retainer, installed at each corner of each block.
4. Contractor shall provide and install a spool of Yellow/Blue Cross-connect wire on each Telecommunications Room Backboard located midway of the Vertical Jumper Trough on the right hand side of the Voice wall field. The exact location shall be approved by the owner prior to installation. The part number for the spool of wire is:

“General Cable “XCW-1P24S BL/Y-Y/BL”

G. Data Cable at Telecommunications Room end:

1. SYSTIMAX® SCS rack-mounted patch panel model 1100GS3-24.
2. SYSTIMAX® SCS rack-mounted horizontal wire manager model 1100D3, the volume installed shall always be the volume of patch panels plus one.

2.12 FIBER ENTRANCE SERVICE CABLES:

CONTRACTOR SHALL VERIFY ALL CABLE LENGTHS PRIOR TO ORDERING CABLE AND/OR INNERDUCT.

A. The Contractor shall Provide and Install one each 1 inch Orange Corrugated Innerduct from the BET, AAAA1, Rm. #nnn, on Dwg. Sht. E-nnn through the EWU Tunnel System to the Appropriate Primary Core Building BET, AAAAn, Rm. #nnn, this is to facilitate the installation of the Fiber Optic Cable in Paragraph 2.13.B, estimated nominal length of approximately n,nnn Linear Feet.

B. The Contractor shall Provide, Install, Terminate and Test one Fiber Optic Cable, Corning Freedom loose-tube, indoor/outdoor-rated hybrid, OFNR cable,12SM/12MM 62.5 Micron, from the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn to the Appropriate Primary Core Building BET, AAAAn, Rm. #nnn, estimated nominal length of approximately n,nnn Linear Feet.

C. The Contractor shall Provide and Install one each 1 inch Orange Corrugated Innerduct from the BET, AAAAn, Rm. nnn, on Dwg. Sht. E-nnn through the EWU Tunnel System to the Appropriate Alternate Building BET, AAAAn, Rm. #nnn, this is to facilitate the installation of the Fiber Optic Cable in Paragraph 2.11.C, estimated nominal length of approximately nnn Linear Feet.

D. The Contractor shall Provide, Install, Terminate and Test a Secondary Feed Fiber Optic Cable, Corning Freedom loose-tube, indoor/outdoor-rated hybrid, OFNR cable,12SM/12MM 62.5 Micron, from the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn to the Appropriate Alternate Core Building BET, AAAAn, Rm. #nnn, estimated nominal length of approximately nnn Linear Feet.
2.13 FIBER RISER CABLE

A. The Contractor shall Provide and Install one each 1 inch Orange Corrugated Innerducts for each Fiber Optic Riser Cable.

B. The Contractor shall Provide, Install, Terminate and Test (Volume) each Fiber Optic Riser Cables, Corning Freedom loose-tube, indoor/outdoor- rated hybrid, OFNR cable,12SM/12MM 62.5 Micron Fiber Optic Riser Cable number ONE from the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn to IDF, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn; Fiber Optic Riser Cable number TWO from the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn to IDF, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn.

2.14 FIBER ENTRANCE AND RISER CABLE TERMINATION DEVICES

A. The Contractor shall Provide and Install Fiber Optic Cable Termination enclosures and Closet Management Panels for this building. The enclosures shall be Corning/LAN-scape, CCH-04U, rack-mounted distribution panel, shall be mounted immediately below the Closet Jumper Management Panel (CJP-01U), and shall use the following connectors:

1. LC Bulkhead Connectors for single-mode fiber strands, part number “CCH-CP12-A9”, a CCH Connector Panel with six Duplex LC Bulkhead adapters, single-mode, ceramic insert, composite housing.
2. LC bulkhead connectors for multimode fiber strands, Corning part number “CCH-CP12-A8”, a CCH Connector Panel with six Duplex LC Bulkhead adapters, multi-mode, ceramic insert, composite housing.

B. Fiber Optic Cable Termination enclosures for all Buildings shall be a Corning/LAN-scape Fiber Optic Distribution Unit (FODU), equipped with a Closet Jumper Management Panel (CJP-01U). The contractor shall Provide and Install all FODUs, and Connector Panels equipped with the appropriate Bulkheads (LC for Single-mode fiber strands/LC for Multi-mode fiber strands).

2.15 FIBER OPTIC INFORMATION OUTLET TERMINATION DEVICES

A. The Faceplate shall be a SYSTIMAX® SCS Faceplate of the appropriate size, equipped with LC type connectors for Single-mode station fibers, and LC type connectors for Multi-mode fibers. (This Faceplate is approved by the Corning Company for the Warranty)

2.16 FACEPLATES FOR INFORMATION OUTLETS

A. See the “EWU TELECOM INFORMATION OUTLET CONFIGURATIONS”, Table-03 in this Section.
B. Faceplate port volumes shall match the volume of Station Fiber Optic Strands/Copper Cables to that location, see Table-03 in this section.

C. Telecom Information Outlet Box Configurations By Type Of Outlet

1. The following table illustrates the requirements for telecom information outlets that shall be incorporated into the Work by the Contractor:
### EWU TELECOM INFORMATION OUTLET CONFIGURATIONS

#### Table-03

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<th>Outlet Type</th>
<th>Information Outlet Quantities</th>
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2.17 CABLE LUBRICANT

A. Only non-soap based cable lubricant shall be used such as Ideal Aqua Gel II Product #31-378 or equivalent.

2.18 CABLE

A. All telephone and data cable shall be suitable for power-limited communications use.

B. Cable shall have a voltage rating of 300 volts minimum, and an operating temperature rating of 60°C minimum. Cable shall be plenum-rated.

C. Telephone and data cable shall have insulated, solid-copper conductors with an overall cable jacket. Cable shall be 4-pair twisted #24 AWG.

D. Cable shall be UL verified and complying with Category 6 requirements contained in EIA/TIA Standard 568A.

E. Voice cable shall be White-colored, boxed, SYSTIMAX® SCS 2071E series XL cable.

F. Campus Network Data cable shall be Blue-colored, boxed SYSTIMAX® SCS 2071E series XL cable.

G. Intra-building Network Data Cable shall be Yellow-colored, boxed SYSTIMAX® SCS 2071E series XL cable.

H. Color code for conductor insulation in telephone/data cables shall be Pin Configured (Wired) 568B per the 568A Standard as follows:
   1. First Pair: White-Blue / Blue.
   2. Second Pair White-Orange / Orange.
   3. Third Pair White-Green / Green.

I. Color code cable jackets to each outlet as follows:
   1. Voice White
   2. Data (Campus Network) Blue
   3. Data (Intra-building Network) Yellow
PART 3 – EXECUTION

3.01 GENERAL CLOSET

Telecommunications Contractor Shall Engineer, Furnish and Install the following:

A. Racks and Wire Management,

1. Rack Placement (Exact location to be determined and agreed to prior to placement)
   a. Racks shall be no closer than 4 feet from doors and per Electrical Code, 3 feet from service panels. Racks shall be placed no closer than 4 feet from wall-mounted copper riser and station cable termination blocks.
   b. Side clearance from racks and walls shall be equidistant unless this would place racks with less than 3 feet of clearance from wall and side of rack. In this case the rack side that is closest to the entry door or electrical service panel shall be placed 3 feet from the sidewall.
   c. With prior approval from the Owner, racks may be placed with one side adjoining a sidewall. In this case, rack placement shall not eclipse other cable, termination blocks, floor sleeves, or cable run ways. Wire management shall be installed on the rack that adjoins the wall.
   d. Each rack shall be bolted to the floor, and each section bolted to the other.

2. Rack Support (Exact locations shall be approved by the Owner prior to installation)
   a. Each rack shall be supported by a minimum 12-inch wide, black-colored cable runway ladder rack. It shall be attached to the rack assembly using adaptor plates and “J” bolts, which shall attach to opposite walls using wall angle brackets that are bolted to the wall.
   b. A cable runway shall extend perpendicular to the rack-mounted, longitudinally-placed wire-way which shall extend pathway to the front and rear walls.
   c. Placement of each section of the tangent running wire-way shall coincide with the vertical wire-way that serves as pathway for floor and ceiling sleeves, riser, and station cable distribution termination devices. These sections of wire-way shall attach to other sections of wire-way using corner clamps and elevation transitions of the wire-way shall employ hinge connectors.
   d. Each section of wire-way that does not connect to a wall or other sections of wire-way shall use an end closing kit or bar.
e. All cable runway sections that support cable shall include Cable Retaining Posts on both side rails at a minimum of twelve inch intervals.

3. Racks and Equipment Wire Management

a. Each rack shall have a vertical wire manager placed on each side of the rack. This assembly shall be bolted to a like assembly for each rack required. This will result in each rack being separated by two vertical wire managers.

b. Each vertical wire manager shall be equipped with Finger Snaps™ Cable Guides to provide total support for Patch Cords at the Data Switch and at the Data Patch Panel.

c. Each rack shall have an upper jumper tray mounted at the extreme top of the rack.

B. Wall-mounted Voice Termination Device Placement

1. All copper entrance, riser, and voice station cable shall terminate on separate wall-mounted, 110 style field blocks. Exact locations shall be approved by the Owner prior to installation.

2. These blocks shall be placed in 300-pair groups, separated by wire management troughs placed 1 inch from the top/bottom edge of each 300-pair block.

3. Each block shall be fitted with a wire retainer at each corner of the block.

4. Blocks shall be placed in order to separate the type of cable being terminated.

5. Termination of service entrance cables, risers, voice station cables, and special service/alarm cables are to be kept separate. They shall terminate on distinct blocks, which are to be laid out in a horizontal plane, with the top of the upper-most block at 62 inches from the floor.

6. Each field block is to be installed side to side, with a leg-less wire trough, with each trough centered on each side of each outside 300-pair block.

7. The location for block fields shall be pre-approved by the EWU Information Resources Department Coordinator, prior to placement.

8. All Copper Entrance, Riser, and Voice station cables shall enter terminating blocks from the bottom of the blocks.

9. Support for Station Cables on the Backboard shall be “D” Rings placed at no more than six inches apart.

10. Support for Entrance and Riser Cables on the Backboard shall be individual Tye Bases of appropriate size to accommodate the required cable sizes.

C. Fiber Termination and Powered Equipment Device Placement:

See Specification Section 16651 APPENDIX-E Typical Rack Layout For Equipment
1. Fiber Optic Cable termination enclosures shall be placed at the top of the electronics rack, below the Upper Jumper Tray.

2. Rack-mounted Un-interruptible Power Systems (UPS) shall be mounted at the bottom of the rack that will house the network equipment and other electronics.

3. Cords for electrical service shall be separated from station cables, and not be routed through station cable wire management devices.

D. Jumper Cables and Cross connection Wire

1. Jumper wire shall be 24 AWG, thin jacketed and color-coded for the service:
   
   a. **Blue/Yellow-yellow/Blue** for digital telephone service.
   b. **White/Orange-Orange/White** for analog telephone service.
   c. **White/Red** for alarm and evacuation telephone service.
   d. **Red/Blue-Blue/Red** for T-1 and other analog carrier service.
   e. **White/Blue-White/Orange** for data carrier services.

   **Special Note:** Insulation on some jumper wire may be too thick for proper termination on SYSTIMAX® SCS Insulation Displacement Connectors (IDC), and will “work out” after time. Only “thin” insulated jumper wire, rated for SYSTIMAX® SCS IDC products shall be used.

2. Jumpers shall be placed to provide a 2-finger slack loop at each end. Jumpers and cross connect wire shall be run in jumper troughs, and route squarely clockwise from the left side, up and over and then down the sides of terminating blocks.

3. Jumpers shall not cross blocks diagonally nor be placed or run across at the bottom of block fields.

4. The owner shall be responsible for installation of all Cross-connect Jumpers.

H. Aerial Placement

1. All aerial cable shall employ a messenger cable or have supportive member as an integral part of the cable.

2. All aerial travelers or supportive wires shall be grounded at the pole or point of attachment.

3. All aerial placed cable shall follow the guidelines set forth by the City of Cheney and permission to attach to their poles must be secured prior to installation.

4. Construction permits are required.
3.02 RISER and ENTRANCE CABLES,

Contractor Shall Provide and Install the following:

A. Service Entrance Copper Cables.
   1. All entrance cables with a metallic sheath shall have the sheath grounded at both ends of the cable at the termination point. Grounding bond such as bullet bond or similar, recognized for use in cable grounding shall be used. The use of split, bolt-type connectors shall not be allowed as a grounding lug device.
   2. The cable sheath shall be maintained to the point of termination and shall be grounded at this point for each sheath by using a #6 stranded, insulated, green jacketed copper conductor, connected to the backboard ground bar system.

B. Service Entrance Fiber Optic Cables,
   1. All Fiber Optic Cable shall have the Corning 25 Year Warranty.
   2. All fiber cable shall be of a continuous length, free from any splices, and shall not exceed 6,560 feet for multi-mode or 9,840 feet for single-mode fiber without prior approval of the Owner.
   3. Each entrance fiber cable shall have a minimum of 35 feet of maintenance loop coil at each end that shall be properly labeled and attached to or above the BET backboard, in an unused location, and above the plane of the wire-way or tray system.
   4. Entrance fiber shall be routed through 1-inch conduit or larger, to the BET, from the point of intersection with the tunnel tray system.
   5. Fiber inner-duct shall be physically joined or coupled to the conduit that shall carry the fiber to the BET.
   6. All entrance fiber pathway conduits and pull boxes shall be labeled at terminus and all intersections.
   7. Each fiber cable shall be labeled as to the fiber’s source and destination.

C. Lightning or Over-voltage Protection
   1. Telephone service feed cables shall terminate in the BET, conduit must be provided when more than 50 feet of cable is required to be placed in the building tray system.
   2. Lightning protection units shall consist of wall-mounted, SYSTIMAX® SCS 100-pair enclosures and shall use electronic protection modules.
   3. Protection devices shall be fully populated with protector modules regardless of the actual number of terminated pairs.
   4. Protection enclosures are to be stacked, one above the other in order to maintain the alignment of the splice chambers.
   5. The upper-most unit shall be placed 72 inches from the floor to the top of the unit, and is placed so that doors can be fully opened or be removed for cable maintenance.
6. Each unit shall be grounded to a suitable building system ground using a #6 stranded, insulated, green jacketed copper cable. The entrance cable and any riser that serves other distribution points shall be bonded to the terminal ground using either a strap or #6 insulated green jacketed copper wire.

D. Copper Risers

1. All copper risers shall be terminated using wall-mounted 110 style hardware in 300-pair groups. Exact locations shall be approved by the Owner prior to installation.

2. Riser blocks shall be placed between the copper entrance cable blocks and voice station distribution blocks, mounted side by side, a leg-less trough that centers on the outside of each outside 300-pair block.

3. Cable conductors shall be terminated using EIA/TIA color codes as follows:

   a. Ring
      
      1) First pair ring color Blue
      2) Second pair ring color Orange
      3) Third pair ring color Green
      4) Fourth pair ring color Brown
      5) Fifth pair ring color Slate

   b. Tip
      
      1) First group tip color White
      2) Second group tip color Red
      3) Third group tip color Black
      4) Fourth group tip color Yellow
      5) Fifth group tip color Violet

4. All riser cable shall terminate in 5-pair groups using a SYSTIMAX® SCS 110C5 clip.

5. All riser cable shall enter the termination block from below the block.

6. Cable routing shall provide for a maintenance loop in all riser cables.

7. Cable sheath bonding shall be made at the bottom of the termination block.

8. Each 25-pair binder group shall be routed into each side of the 110 block, with the odd numbered 25-pair groups routed from the left side and the even numbered 25-pair groups routed from the right side.

9. Each termination block shall carry labeling housed in colored designation strips. The colors for the strips are per EIA/TIA:

   a. Entrance cables Green
   b. House cables and service risers White
   c. Station cables Blue
10. Entrance, House, and Riser Cables shall be fastened or secured to backboards with Ty-Rap bases every six inches or less from the termination block to the cable transition to tray or wire-way.

11. Station Cables shall be supported with “D” rings every six inches or less from the termination block to the cable transition to the tray or wire way. No additional securing straps such as Velcro Tyraps are required.

E. Fiber Risers *(Corning 25 Year Warranty is Required)*

1. Each fiber cable shall terminate using a Corning/LAN-scape CCH-04U, rack-mounted distribution panel using LC bulkhead connectors for multi-mode fiber strands and LC bulkhead connectors for single-mode fiber strands.

2. Composite cables shall have their single-mode fibers placed before the multi-mode fibers are placed in the same Fiber Optic Distribution Unit (FODU) panel.

3. Each Fiber Optic Distribution Unit (FODU) panel shall be sequentially labeled. A fiber inventory shall be placed in the FODU.

4. 1 meter or longer breakout kits shall be used.

5. Fiber cable strength members shall be clamped to the strain relief device in the FODU.

6. Fiber routing from the wall-mounted maintenance coil to the termination enclosure shall use the rack wire-way. Fibers that transition into the terminating enclosures shall not exceed the Fiber Optic Cable’s bend radius.

7. All fibers in a cable shall terminate in one enclosure.

8. Fiber termination enclosures shall be placed below the upper jumper tray at the top of the electronics rack.

F. Wireless Coax Feeds

1. Antennas and aerials shall be placed in such a way as to offer the best signal path to the source or target antenna.

2. Antenna masts shall be grounded and guyed back into roof.

3. A 1-inch conduit shall serve as pathway for the coax that connects the antenna to the active transmitting electronics.

4. A #6 AWG copper grounding conductor shall be placed at the transmitter location and terminate on the backboard grounding buss bar.

5. A separate power outlet with surge suppression shall be provided to power radio equipment.

6. In cases where transmitters shall not be located in telecom spaces, provisions for access, power, lighting, and temperature control must be considered.

G. Cable TV

1. Contractor installed coax shall terminate in a service provider’s distribution cabinet. Arrangements must be made with the provider.

2. The entrance location shall be coordinated with the Owner.
Contractor shall provide and install the following:

A. Office Locations

1. Each office shall have a Type 1 Information Outlet, containing (1) voice service jack and (2) data service jacks. A minimum of two each Information Outlet locations shall be provided. The voice jack shall be placed in the first faceplate position and the data jacks occupying positions two and three of the faceplate.

2. Selected outlets shall contain Fiber Optic Cable. The style of the faceplate and number of jacks shall dictate the product used at these locations. Prior to installation, the Owner shall approve product selection and installation.

B. Classrooms

1. Each Classroom shall have at least one Type 1 Information Outlet, (1) voice service jack along with (2) data service jacks. The voice jack shall be placed in the first faceplate position with subsequent positions for the data jacks.

2. Data service to overhead, ceiling-mounted projectors shall not have a voice service cable, and shall have two data cables. This shall be a Type 6 Information Outlet. These data cables shall terminate in a M12L-246 faceplate. The data service shall terminate at the same ceiling location as the corresponding electrical outlet, using a separate box with a labeled faceplate. The owner shall be notified and approve the exact location prior to installation.

3. Selected outlets shall contain fiber along with copper station jacks. The style of the faceplate and number of jacks shall dictate the product used at these locations. The Owner shall be notified prior to installation and shall approve product selection and installation.

4. Each station location in a classroom lectern/podium shall be a Type7 Information Outlet, containing (1) voice service jack and (3) data service jacks, these cables shall terminate in a M104SMB-246, with the voice jack placed in the first faceplate position and the data jacks occupying positions two, three, and four of the faceplate.

5. The owner shall be notified prior to installation, and shall approve the exact location for the installation.

6. The outlet shall be fastened to the interior wall of the lectern in an accessible location.

7. All cables shall have a 6-foot maintenance coil that shall be fastened to the interior of the lectern with four attachments, equal distant around the perimeter of the coil.

8. Cable protection and strain relief in the form of flex conduit, plastic coil wrap, or other suitable material shall be used to make the transition from the floor box to the interior of the podium.
9. Each classroom shall have two separate data service jacks located in the wall at one foot below finished ceiling level, one in each front corner of the classroom, for wireless access. This shall be a Type 3 Information Outlet. These locations shall contain one each data cable. Classrooms of more than 1000 Square Feet shall have two additional of these wireless access data service jacks located at the rear corners of the room.

C. Technologically Equipped Classrooms

1. Special consideration shall be given to Classrooms that contain multi-media presentation/performance technology, two-way interactive tele-video technology, hands-on computer instruction technology and rooms with various combinations of these technologies which have varying requirements that differ from the standard classroom.

2. Equipment closets shall house two each Lowell Manufactured Cabinets Model “L260-70”, optional cabinet equipment shall be specified by owner prior to 100% bid specifications. Horizontal wire management, shelves, etc. The front of the cabinets shall face the classroom.

3. Each cabinet, if possible, shall have access from the hallway and the classroom by using a lockable, solid core door through the wall. The front and rear of the rack shall be accessible.

4. Each cabinet shall be fitted with four device holders, consisting of shelves or equipment drawers that shall house freestanding equipment such as VCRs or CD devices, the exact combination of holders to be approved by the Owner prior to installation.

5. The grounding requirements for these cabinets shall be consistent with those of racks placed in other telecommunication spaces. They shall employ grounding buss bars tied back to the service ground using #6 AWG, stranded, insulated, green jacketed, copper conductors.

6. Ceiling-mounted projectors shall have provisions for (2) CAT-6 Data cables, SYSTIMAX® SCS 2071E Blue, that are terminated in an IDF closet that serves that section of the building.

7. The cable that is terminated in the IDF closet, as noted in Item # 6 above, shall use a RED- colored jack at the station end and shall be treated as a Standard Information Outlet and labeled accordingly.

8. Station cables that serve the projector controls shall be separate from the data network.

D. Labs And Computer Classrooms

1. Each station location in a lab may contain only data service jacks, clustered in groups that serve tables, carrels, or other desk arrangements with exceptions.

2. Each lab area must have at least one outlet that has both voice and data service and the data jacks occupying positions two and three of the faceplate.

3. Student or staff desks in lab areas shall have (2) voice and (4) data jacks installed at each desk location. This shall be a Type 12 Information Outlet.
4. Selected outlets may contain fiber along with copper station jacks. The style of the faceplate and number of jacks will dictate the product used at these locations. Prior to installation, the Owner shall approve product selection.

E. Large Space Areas

1. Office areas and service counters that are constructed within large open areas shall employ a conduit distribution system.
2. Each office area shall have a minimum (1) Type 1 Information Outlet, containing (1) voice and (2) data jacks placed near the electrical outlet for that room or counter.
3. An interior, wall-mounted telephone shall be placed by the major entrance to the building, and shall meet ADA requirements. This shall be a Type 2W Information Outlet.
4. Auditoriums and multi-purpose rooms shall be equipped with services that can support multi-media presentations and performances.
5. These rooms shall be wired the same as the Technologically Equipped Classrooms are, as described in section “C” above.
6. These rooms/areas shall be wired with Wireless Access Information Outlets as indicated on the Drawings.

F. Wall and Outside Telephone Devices (All telephones shall be ADA compliant). These shall be Type 2W Information Outlets.

1. Phones located on exterior walls of buildings shall be ADA compliant.
2. Handrails, automatic door operator switches, awning support members, or light fixtures shall not eclipse the location for wall-mounted telephone devices.
3. Minimum side clearance to building structure, changes in grade, or entry doors shall be 30 inches for frontal approach and 48 inches for side approach.
4. A wall-mounted device outlet box shall match the mounting requirements of the intended telephone or reporting device.
5. One cable shall be run for every device.
6. Station cables shall have 2-foot maintenance loop at the device box.
7. Voice lines that extend beyond the outside surface wall of the building shall use cable rated for outside service, and these cables shall terminate in the BET on protected blocks.
8. Wall Telephone Outlet devices that are non-public accessible shall be installed 60 inches above floor level at the vertical center of the outlet box.

G. Mechanical Rooms

1. Each Information Outlet location in a mechanical space shall contain Two (2) voice service jacks and Six (6) data service jacks, with the voice jack placed in faceplate positions 1 and 2, with the data jacks placed in the
remaining 6 positions of a SYSTIMAX® SCS M28L series Faceplate. This shall be a Type 14 Information Outlet.

2. Placement of this outlet shall be as close to the Energy Management System panels as possible.

H. Elevators

1. A dedicated voice cable shall be placed at each elevator machine equipment control panel. This cable shall be placed into the cabinet with enough slack for termination.
2. The telephone in the elevator car shall be programmed for Automatic Ring Down on receiver removal or button pushed.
3. Each cabinet cable shall be left un-terminated at the elevator control panel.
4. All elevator voice service cables shall terminate in the BET regardless of the floor that the instrument is located on. These cables shall terminate on a separate 110 blocks, which are distinct and separate from the general station cable termination blocks.
5. Each elevator machine room shall have a dedicated voice cable for a wall-hung phone placed nearest the access door. This shall be a Type 2W Information Outlet.

I. Stairwells

1. Building stairwell evacuation or rescue assist phones sites shall have (1) voice cable installed as per the equipment manufacturer’s specification. This shall be a Type 2W Information Outlet.
2. All stairwell evacuation phone and elevator voice service cables shall terminate in the BET regardless of the floor that the instrument is located on. These cables shall terminate on a separate 110 block that is distinct and separate from the general station cable termination blocks.
3. Voice cable shall be coiled and un-jacked in the device box that is supplied for this purpose.

J. Visitor Services

1. Waiting and reception rooms, lounges, and gathering areas shall have one (1) Type 1 Information Outlet containing one (1) voice and Two (2) data jacks, located at the primary seating area.

K. Telecommunications Rooms

1. Each Telecommunications Rooms (BET, IDF’s) shall have a wall-mounted telephone outlet located on the wall that faces the equipment rack. This shall be a Type 2W Information Outlet. This outlet box shall be mounted at 60 inches, on vertical center above the floor.
L. Custodial Spaces

1. Each custodial space used as an office shall have a Type 1 Information Outlet consisting of one (1) voice and two (2) data jacks. This outlet box shall be mounted on the same plane and adjacent to the electrical service.

2. Storerooms and custodial workspaces shall have a wall-mounted telephone outlet nearest the door. This shall have a Type 2W Information Outlet. This outlet box shall be mounted at 60 inches, on vertical center above the floor.

M. Hallways and Common Areas

1. Hallways and common areas shall have convenience wall telephones installed in gathering areas, vending machine or similar areas. This shall be a Type 2W Information outlet, containing (1) Voice jack.

2. Office suite lunch and break rooms, conference and meeting rooms shall have a Type 1 Information Outlet containing (1) voice and (2) data jacks. In lunchrooms, a separate wall-mounted telephone outlet shall be provided. This shall be a Type 2W Information Outlet.

N. Printers, Copy Machines, and Work Rooms

1. Each location designated as a printer station shall have a Type1 Information Outlet consisting of (1) voice and (2) data cables installed at each outlet location.

2. Each copy machine shall require (1) voice and (1) data service cable.

3. Each workroom shall have at least (1) voice and (2) data jacks in the space in addition to telecom need of each printer or copy machine located in this room.

O. Wireless Transceivers

1. Wireless Information Outlet locations shall be equipped with one SYSTIMAX® SCS 2071E Blue cable, to be terminated on a SYSTIMAX® SCS MGS400-317 Red jack at the transceiver location. This shall be a Type 3 Information outlet.

P. Clock System

1. Contractor shall install one (1) Type 3 Information Outlet for each clock.

Q. Telecom Information Outlet Configurations

1. Table-03 located in this section, paragraph 2.15 FACEPLATES FOR INFORMATION OUTLETS, and illustrates the requirements for Telecommunications Information Outlets that shall be incorporated into the Work by the Contractor.
3.04 MEDIA TERMINATION

A. Voice Station Cable

1. Station voice service cables shall be plenum-rated CAT 6 UTP, SYSTIMAX® SCS 2071E with a White-colored jacket. They shall terminate on SYSTIMAX® SCS 110-style hardware in the closet and an Ivory-colored CAT-6 jack, SYSTIMAX® SCS MGS400-246, at the station end.

2. All Station Cable shall be installed by pulling from the closet to the Information Outlet location in order to maintain proper conductor twists at the termination Block and at the Jack.

3. The voice jack shall be placed in the first position on the faceplate and be fitted with an Ivory-colored telephone icon, SYSTIMAX® SCS M61F-246. Station cables shall enter the wall-mounted, 110 style termination blocks from below the block.

4. Voice cable shall be routed in order to provide a slack loop or routed slack of 10 feet.

5. All 4-pair, voice station cables shall terminate in the telecommunications room on SYSTIMAX® SCS 110 blocks, using a 110C-4 clip.

6. Cable sheath shall be maintained to within ½-inch of the C-4 terminating clip while maintaining the twist of cable pairs up to the point of termination.

7. Cables shall be tied and neatly bundled, not dressed and with a minimum bend radius of 8 times the cable diameter.

8. Cable hook and latch type ties shall not be over tightened.

9. Each horizontal cable shall be terminated on a dedicated telecommunications outlet. Multiple appearances of the same cable at several distribution points (called bridged taps) shall be avoided.

10. Wiring configuration for connections to elevators, reporting device, stairwell rescue assist devices, and similar likes shall be confirmed with the telephone and data equipment vendor.

11. All Information Outlets, both voice and data, shall be wired EIA/TIA 568B Pin Configuration.

12. Voice cable labels at the terminal closet end shall have labels placed as to be readable without the removal of terminating hardware or support rings, these shall be flag type labels.

13. All entrance cables and risers shall use the SYSTIMAX® SCS 110C-5 clip.

14. Conductors of these cables shall be terminated sequentially on the blocks using the standard tip and ring color code.

15. Each 100-pair 110-style block shall be fitted with a SYSTIMAX® SCS 88A2 retainer at each corner or the block.

B. Data Station Cable

1. Data Station Cables shall be plenum-rated, CAT-6 UTP, SYSTIMAX® SCS 2071E series XL with a Blue-colored jacket for Campus Network, and CAT-6 UTP, SYSTIMAX® SCS 2071E series XL with a Yellow-colored jacket for Intra-building Network. They shall terminate on rack mounted
SYSTIMAX® SCS “1100GS3-24” 24-port CAT-6 rated, 24-port patch panels in the closet and a red-colored SYSTIMAX® SCS MGS400-317 CAT-6 jack at the station end.

2. All Station Cable shall be installed by pulling from the closet to the Information Outlet location in order to maintain proper conductor twists at the Patch Panel and at the Jack.

3. Wiring configuration for connections to jacks shall be confirmed with the telephone and data equipment vendor. All devices, both voice and data, shall be wired TIA/EIA 568B Pin Configuration.

4. Each horizontal cable shall be terminated on the insulation displacement connectors on the rear of the patch panels in Room Number / Outlet Location sequence.

5. All terminations shall be made in a neat and workmanlike manner, with the cables routed from the rear left side for patch panel ports 13 through 24, and from the rear right side for patch panel ports 1 through 12.

6. Cables shall be secured using hook and latch fasteners (Velcro or similar brand).

7. Campus Network Data station cables shall terminate on a separate dedicated rack using rack mounted SYSTIMAX® SCS “1100GS3-24” 24-port CAT 6 RJ45 patch panels. Each patch panel shall be separated using a horizontal wire manager.

8. Digital Clock Campus Network Data station cables shall terminate on a separate rack mounted SYSTIMAX® SCS “1100GS3-24” 24-port CAT 6 RJ45 patch panel, located in the Equipment Rack. Each patch panel shall be separated using a horizontal wire manager.


10. A horizontal cable organizer/wire manager (SYSTIMAX® SCS 1100D3) shall be mounted just below each patch panel.

11. A wire manager shall be placed above the top-most and below the last patch panel in each rack.

12. Each Station Cable run shall be limited to 90 meters in length.

13. Cable shall be UL verified which complies with Category 6 requirements contained in EIA/TIA 568A Standard. Voice Cable shall be Category 6, SYSTIMAX® SCS 2071E White Plenum Rated, and Data cables shall be Category 6, SYSTIMAX® SCS 2071E Blue Plenum Rated, both to be terminated as 568B pin configuration.

a. Color code for conductor insulation in Telephone/Data cables shall be as follows:

1) First Pair: White-Blue / Blue
2) Second Pair: White-Orange / Orange
3) Third Pair: White-Green / Green
4) Fourth Pair: White-brown / Brown

b. Color code cable jackets to each outlet shall be as follows:
1) Cable 1: (Voice) White
2) Cable 2: (Data) Blue
3) Cable 3: (Data) Blue

14. Care shall be exercised during installation not to damage the cable insulation. Damaged cables shall be removed and replaced.
15. Cable pulling lubricant shall be non-soap based. Only Poly Water or clay-based lubricants are acceptable.
16. Wall-mounted patch panels shall have the cables routed next to the hinge-side of the patch panel and mounted in a manner that permits the front of the patch panel to fully swing out for easy access to the rear of the patch panel.

C. Fiber Station Cable (Corning 25 Year Warranty is Required)

2. Composite cables shall have their single-mode fibers placed before the multi-mode fibers are placed in the same FODU panel. Station fiber shall also terminate in like fashion but shall follow the placement of risers in the FODU panel. Each FODU shall be sequentially labeled. A fiber inventory shall be placed on the front cover of each panel.
3. Cable pulling lubricant shall be non-soap based. Only Poly Water or clay-based lubricants are acceptable.
4. Each station fiber cable shall be labeled in accordance to the labeling plan covered at the end of this section.
5. Fiber shall terminate at the same location as other voice and data jacks. It will need to fit an angled faceplate (Product SYSTIMAX® SCS M14L-246 or M16L-246). Single-mode station fibers shall terminate on LC type connectors. Multimode fibers shall terminate on LC type connector.
6. Fiber cable strength members shall be clamped to the strain relief device in the FODU.
7. Fiber routing from the wall-mounted maintenance coil to the termination shall use the top of rack wire-way. Fibers that transition into the terminating enclosures shall be installed as not to exceed the fibers bend radius.
8. All fibers in a cable shall terminate in one enclosure. Fiber cable bundle groups shall not be split up in order to utilize other enclosures.
9. Each station fiber cable shall terminate on it’s own personality plate or Universal Fiber Optic Build-out adaptor which has been designed to accept either LC type bulkheads.
10. For each station fiber cable, single-mode fiber shall be positioned first followed by the multimode fibers.
11. All Fiber Optic Cables shall be installed in appropriately sized innerduct.

D. Wall-mounted Devices
1. Wall phone locations shall have a separate cable for each device.
2. All cable that feeds all wall-mounted devices shall terminate in the BET on distinct blocks adjacent to the service entrance and riser cables.
3. Record vaults or secured areas shall have a wall phone or similar device and placed in the space at the entrance.
4. Mechanical spaces shall have one wall-mounted telephone outlet plus Voice and Data service to the building EMCS panel, as described herein.
5. Outside entrance phone service shall terminate in a weatherproof, wall-mounted phone designed for the purpose.
6. Elevator phone line cables shall terminate in the elevator equipment control panel serving each elevator.
7. Security panels shall have one voice cable placed into the cabinet.
8. Fire reporting panels shall have one voice cable placed into the cabinet.
9. Stairwell evacuation phones or notification devices shall have a separate cable to each location.

E. Cable TV/CATV Coax Cable

1. All coax shall terminate using “F” type connectors that shall mount directly on distribution equipment or be placed on SYSTIMAX® SCS M81C-B media coupler kit, which fits all of the M1- style faceplates.

3.05 SERVICES TERMINATION

A. T-1 Circuits

1. All T-1, DSL, and Frame relay circuits shall terminate on a dedicated demarcation block unless the Owner grants an exception. In this case, the maintenance of the extended demarcation shall be the responsibility of the carrier.

B. Alarm Circuits

1. All alarm circuits shall terminate on separate blocks identified for this purpose.
2. Cross-connect wire shall be color-coded and the terminating clip shall be fitted with an indicating strip or “keep off” device.

C. Radio or Wireless

1. Coaxial feeds from antennas shall have lightning protection installed at the point of entrance.
2. The ground conductor shall be #6 stranded, insulated, copper wire, which shall bond to a service ground.
3. The use of sprinkler or other piping, trays, or conduit for grounding source shall not allowed.
4. A service jack for the transmitter shall be within the space used to house the transmitter and shall connect using a jumper cable. In some cases power shall be supplied to the transmitter and this shall be derived from a UPS or generator circuit.

5. All cables used in the transmission path shall be labeled “radio feed”.

D. Cable TV Demarcation

1. Both entrance and riser distribution of service provider provided and installed cable is the responsibility of the service provider. These cables shall not be run in with or interfere with any Owner infrastructure.

2. Support equipment shall be kept separate from any Owner system.

3. Prior to installation, the Contractor shall obtain approval from the Owner for the installation and placement of all cables and equipment used for the distribution/transmission of CATV.

E. OPX Demarcation

1. All Off-Premise Distribution Exchange (OPX) circuits shall terminate on separate blocks identified for this purpose.

2. Cross-connect wire shall be color-coded. These circuits may share the same blocks as T-1 service.

F. Special Circuits (card readers, credit card terminals, and cash registers)

1. Separate patch panels and wall-mounted terminal blocks shall be used to demark these services. In areas where building station cable shall be used to distribute the special circuit, unique colored, patch cords or cross connect wires shall be used.

G. Non-Network Fiber

1. These fibers shall not occupy spaces used by the Owner’s Telecommunications Department without specific approval from the Owner’s Information Resources Department.

3.06 MASTER CONTROL PANELS

A. Master Control Panels Data Network Access Provisioning (Fire Alarm and Access Control).

1. The Contractor shall provide, install, and terminate a Siecor 6 Strand Fiber Optic cable, Part number “000681-31-150-24, at the Fire Alarm Control Panel, located in the basement Electrical Rm. #nnn on Dwg. Sht. E-nnn and the FODU(Fiber Optic Distribution Unit), located in the BET, AAAAn, Rm. #nnn on Dwg. Sht. E-nnn.
2. The Contractor shall coordinate entry into the Fire Alarm Control Panel with the fire system sub-contractor.
3. The Contractor shall terminate the fiber optic cable with Siecor UniCam ST connectors, part number FAN-BT25-06.
4. All Fiber Strands shall be terminated, tested and certified to have no more than 10db loss.
5. The fiber optic cables shall be installed in the conduit provided in Specification Section 16650.
6. The Contractor shall furnish and install Fiber Optic innerduct from the point of entry into the BET, securing the innerduct to the installed Cable Rack all the way to the FODU.
7. The Contractor shall provide two each ST to SC Duplex MM Fiber Optic Patch Cords, Graybar Electric part number “GBSTC-D2-02”.
8. The Contractor shall provide two each ST to ST Duplex MM Fiber Optic Patch Cords, Graybar Electric part number “GBST2-D2-02”.
9. Fiber Optic Patch cords shall be delivered to the owner for installation.
10. The Contractor shall provide and install one each SYSTIMAX® SCS 1100D3 Horizontal wire/cord manager, to be mounted just below the Allied Telesyn switch installed on Section 16651.3.06.A.9 above (See APPENDIX-A for part numbers).
11. The Contractor shall provide and install one each Chatsworth Shelf just below the wire/cord manager installed on Section 16651.3.06.A.10 above (See APPENDIX-A for part numbers).
12. The Contractor shall provide and install one TAC Series NetPlus Router to be placed on the shelf installed on Section 16651.3.06.A.11 above.
13. The Contractor shall provide, install, and terminate a single Belden-M8723 Shielded cable in the one inch conduit provided on Specification Section 16650, from the Master Access Control Panel to the BET, the cable terminates on the NetPlus Router.

3.07 LABELING

The Telecommunications Contractor shall submit one sample of ALL types of proposed labels to the owner for approval prior to printing any labels.

A. All horizontal station cables shall carry a Black Ink Type on a Blue flag label that shows media type, building, closet name and floor number, room number, room location letter, and cable number. Each cable, conduit, and termination block or device shall carry a label that shows media type, origin and destination by use of alphanumeric algorithms and mnemonics.

B. Labels for rack-mounted patch panels with Data Cable Terminations shall use Black Ink Type on 9 mm (3/8 inch) wide White tape that show room number and Information Outlet location in room and IO port number only. Example: 246-a2, or 246A-a2.
C. All Data Cables terminating at patch panels shall be labeled as to its destination with a Black Type on 12 mm (1/2 inch) Flag Label. These labels shall be installed on each cable exactly four inches from the termination point, and in accordance with the labeling scheme described herein.

D. Voice Labels for the 110 Termination Blocks shall be Black Ink Type on Blue Labels, showing room number, outlet location and faceplate port number. Example: 246-a1, or 246A-a1.

E. When Voice cables are present in an Information Outlet, they shall be numbered starting with 1 and always occupy the first position in the faceplate.

F. Media type mnemonic shall reflect the physical cable type not the imposed service Class.

1. Media types mnemonics that shall be used:

<table>
<thead>
<tr>
<th>Media Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>CAT 5 or CAT5e 10/100-MB rated intra-building, horizontal UTP copper station distribution cable.</td>
</tr>
<tr>
<td>GS</td>
<td>GigaSPEED or 1000TX rated intra-building, horizontal UTP copper distribution cable.</td>
</tr>
<tr>
<td>TC</td>
<td>Copper Tie cables used in intra-building copper connectivity between Telecommunication Rooms on the same floor.</td>
</tr>
<tr>
<td>RC</td>
<td>Copper Riser-rated cables used in intra-building connectivity between Telecommunication Rooms on different floors.</td>
</tr>
<tr>
<td>OC</td>
<td>Copper Underground-rated cable used for inter-building copper connectivity with added mnemonics.</td>
</tr>
<tr>
<td>AC</td>
<td>Copper Aerial–rated cable used for inter-building copper connectivity with added mnemonics.</td>
</tr>
<tr>
<td>SF</td>
<td>Fiber Station cable used in intra-building, horizontal station distribution.</td>
</tr>
<tr>
<td>TF</td>
<td>Fiber Tie cable used in intra-building fiber optic connectivity between Telecommunication Rooms on the same floor.</td>
</tr>
<tr>
<td>RF</td>
<td>Fiber Riser cable used for intra-building fiber optic connectivity between Telecommunication Rooms on different floors.</td>
</tr>
<tr>
<td>OF</td>
<td>Fiber Cable used for inter-building fiber optic connectivity.</td>
</tr>
<tr>
<td>CX</td>
<td>CATV coaxial cable used in intra-building distribution.</td>
</tr>
<tr>
<td>CV</td>
<td>CATV coaxial cable used for inter-building service.</td>
</tr>
</tbody>
</table>

G. Building mnemonics are derives from a 3-letter acronym for this building. It is AAA.

H. Telecommunication Room names are derived form its placement from Building Entrance Terminal (BET). The BET and any stacked or vertically aligned Telecommunications Rooms (TR’s) are identified by the capital letter “A”. The
BET shall be identified as “AAAA1”, Rm. #1nn as indicated on Dwg. Sht. EY-nnn(E-nnn); the Second Floor IDF shall be identified as “AAAA2”, Rm.#2nn as indicated on Dwg. Sht. EY-nnn(E-nnn); the Third Floor IDF shall be identified as “AAAA3”, as indicated on Dwg; Sht. EY-nnn(E-nnn). Secondary TR’s, those that are in a different Riser shall be identified with “B”, “C”, etc.

I. The Patch Panels are labeled from top to bottom, in the center of the patch panel as a numeric. Example “1”, “2”, “3”, etc. This label shall be Black Ink Type on 9 mm (3/8 inch) wide White tape, printed vertically.

J. The Patch Panel Ports shall be labeled with the Information Outlet identification and it is simply the room number-IO location in room. Example: “216B-a2”. This label shall be Black Ink Type on 9 mm (3/8 inch) wide White tape.

K. Sub-rooms are indicated by a capital letter such as A, B, C etc. Example “216B-a2”.

L. After the room number, the Information Outlet location is narrowed down by the use of a lower case alpha character that denotes the position of the outlet relative to the main entry into the room or area. The main entry of any room or area shall be the door or pedestrian path closest to the serving Telecommunication Room. Rotating in a clockwise direction, the Information Outlet nearest to the left side of the entry shall be identified as “a” followed by “b”, “c”, etc. Example, the first outlet in “AAA-246” would read as “AAAA2246-a”. The next would be “AAAA2246-b”.

M. All Station Cable Labels shall be Flag Labels with Black Ink Type on Blue Label Tape, 12 mm (½ Inch) Wide, and shall be printed Twice on the Flag Label, to facilitate readability. These printings shall be separated by sixteen (16) spaces so that the printing does not wrap around the cable. The first two character positions and the last number, placed only on the cable labels themselves, is the cable type and jack position number. Example: “GSAAAA2246-a1”. Voice cables are listed first, followed by the data cables. Voice cables start at the first position and subsequent incremental cables are labeled in consecutive increments for every voice cable located in the Information Outlet. Each subsequent data cable would be numbered after the last voice cable. Each outlet in a room follows this convention and each outlet will have a cable numbered 1, then 2, and so forth.

N. Station Cable labels shall be installed on each Data Cable exactly four inches from the termination point, at both ends of the cable, and in accordance with the labeling scheme described herein.

O. Station Cable labels shall be installed on each Voice Cable exactly four inches from the SYSTIMAX®SCS 110 Termination Block in the Telecommunication Room, and exactly four inches from the termination point at the jack location, and in accordance with the labeling scheme described herein.
P. A Type 1 station outlet shall contain (one) voice jack and (two) data jacks. The cables and placement of these jacks shall be voice cable, listed as “1”, placed in faceplate position 1; first data cable listed as “2”, placed in faceplate position 2 and the second data cable listed as “3” placed in faceplate position 3.

Q. The label that is placed on the faceplate indicates the building, closet and floor, room number and jack number. The label omits the cable type and cable number. Example: The faceplate that the second data cable “GSAAAA2246-a3” would be found on the faceplate labeled as AAAA2246-a. This label shall be Black Ink Type on 9 mm (3/8 inch) wide Blue Tape.

R. Color Coding:

1. Color-coding of labels and designation strips used on patch and termination blocks shall use Blank ink on the following colors:

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Leads on the Owner side of the Local Operating Company or other telecommunications carrier’s demarcation point.</td>
</tr>
<tr>
<td>Purple</td>
<td>Leads from common switching equipment ports.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Leads from auxiliary equipment (i.e., dialup modems) and special services (alarms, hazardous voltages).</td>
</tr>
<tr>
<td>White</td>
<td>Backbone leads from Entrance Facility (BET) to the equipment rooms or Intermediate Distribution Facilities (IDF) also referred to as the vertical distribution leads.</td>
</tr>
<tr>
<td>Blue</td>
<td>Leads from closets to work (station) area information outlets; also referred to as horizontal distribution leads.</td>
</tr>
<tr>
<td>Gray</td>
<td>Backbone leads between IDF’s and secondary or satellite telecommunications rooms.</td>
</tr>
<tr>
<td>Orange</td>
<td>Telecommunications carrier’s leads (carrier’s sided of the demarcation point). This would be used for extended T-1 circuits to telecommunications rooms and classrooms.</td>
</tr>
<tr>
<td>Red</td>
<td>Alarms or critical systems. This would be for intrusion alarms, rescue assistance devices and the like.</td>
</tr>
<tr>
<td>Brown</td>
<td>Inter-building backbone leads.</td>
</tr>
</tbody>
</table>

S. Each termination and cross-connect block, terminal or patch panel shall carry labeling that shows both the function and entity identity. Abbreviations would include:

1. **STB** for Station Terminal Block.
2. **RTB** for Riser Terminal Block.
3. **CTB** for Cross-connect Terminal Block.
4. **ETB** for Entrance Terminal Block.
5. **FODU or FD** followed by a sequential number for Fiber Optic Distribution Unit or Fiber Distribution.

6. **P** followed by a sequential number for the station cable Patch Panel.

7. **CXP** for Coax cross-connect patch point.

8. **BXP** for Balun cross-connect patch point.

9. **SCX** for Special Circuit cross-connect point.


11. **OVP** for Over-Voltage Protector, followed by a sequential number for each protector.

T. **Permanent room numbers shall be used for labeling. Room Numbers shall be confirmed with the Owner prior to labeling.**

U. The submitted “Proposed Station Cable Record” as approved by the owner shall be utilized to make all labels. An example of this Station Cable Record is included in Specification Section 16651 APPENDIX-D.

V. **Special Mandatory Labeling Requirements:**

1. **There shall be No Lower Case:**
   a. “I’s, ( i )”;
   b. “J’s, ( j )”;
   c. “L’s, ( l )”;
   d. “O’s, ( o )”

   used for Information Outlet location identifiers.

2. **Character Positions** in the Labeling Scheme are extremely critical, and are a **Mandatory Requirement** that they be followed **EXACTLY.** It shall be understood by the Telecommunications Contractor that **Hyphens, Upper Case and Lower Case Letters shall be in their required positions on all labels. No DEVIATIONS in Character Positions shall be allowed.**

W. **Special Labeling Requirements for Wireless Access Point Type 3 Information Outlets and Cables.**

1. **WAP’s Terminated in Lift Out Ceilings:**

   WAP IO’s and Cables shall be labeled as a Geographic location.

   Typical examples when there are multiple hallways in a building:

   Examples of Hallways:

   (1) North Hallway that runs East and West: “N”.
   (2) East Hallway that runs North and South: “E”.
   (3) South Hallway that runs East and West: “S”.
   (4) West Hallway that runs North and South: “W”.

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Examples of Labels:

First WAP Cable installed in the Science Hall (SCI) East Hall shall be labeled as follows:
Cable Label: “GSSCID1EHall-a1”;
Information Outlet Label: “SCID1EHall-a”;
Patch Panel Label: “EHall-a1”.

Second WAP Cable installed in the Science Hall IDF SCID1 East Hall shall be labeled as follows:
Cable Label: “GSSCID1EHall-b1”;
Information Outlet Label: “SCID1EHall-b”;
Patch Panel Label: “EHall-b1”.

2. WAP’s Terminated on Exposed Cable Trays in Hallways and Atriums:

WAP Cables shall be labeled as a Geographic location.

Typical example of Labels for Atriums:

First WAP Cable installed in the Computer Engineering Sciences Building (CEB) First Floor Atrium (ATRM) shall be labeled as follows:
Cable Label: “GSCEBA1ATRM-a1”;
Information Outlet Label: “CEBA1ATRM-a”;
Patch Panel Label: “ATRM-a1”.

Second WAP Cable installed in the Computer Engineering Sciences Building (CEB) First Floor Atrium (ATRM) shall be labeled as follows:
Cable Label: “GSCEBA1ATRM-b1”;
Information Outlet Label: “CEBA1ATRM-b”;
Patch Panel Label: “ATRM-b1”.

Typical example of Labels for exposed Cable Trays:

First WAP Cable installed in the Computer Engineering Sciences Building (CEB) North-South Hall First Floor shall be labeled as follows:
Cable Label: “GSCEBA1NSHall-a1”;
Information Outlet Label: “CEBA1NSHall-a”;
Patch Panel Label: “NSHall-a1”.

Second WAP Cable installed in the Computer Engineering Sciences Building (CEB) North-South Hall First Floor Hall shall be labeled as follows:
Cable Label: “GSCEBA1NSHall-b1”;
Information Outlet Label: “CEBA1NSHall-b”;
Patch Panel Label: “NSHall-b1”.

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First WAP Cable installed in the Computer Engineering Sciences Building (CEB) East-West Hall First Floor shall be labeled as follows:
Cable Label: “GSCEBA1EWHall-a1”;
Information Outlet Label: “CEBA1EWHall-a”;
Patch Panel Label: “EWHall-a1”.

Second WAP Cable installed in the Computer Engineering Sciences Building (CEB) East-West Hall First Floor Hall shall be labeled as follows:
Cable Label: “GSCEBA1EWHall-b1”;
Information Outlet Label: “CEBA1EWHall-b”;
Patch Panel Label: “EWHall-b1”.

3.08 TESTING AND DOCUMENTATION

A. Testing shall be performed in a timely manner and prior to acceptance by the owner.

B. Tests shall be conducted for termination order, polarity (pair reversals), opens, grounds and shorts, NEXT, cable lengths (record all lengths in the test report), attenuation, Signal to Noise Ratio, ELFECT, PSNEXT, ACR, propagation delay, and return loss.

C. Contractor shall be responsible for testing cables to SYSTIMAX® SCS GigaSPEED standards using Fluke DSP 4000 equipment (or equivalent), and providing a copy of the test report to the owner.

D. Installation and testing of the telephone and data distribution system shall be performed in a manner that shall prevent damage to system devices and equipment. Any damage resulting from the Contractor’s activity shall be repaired at the Contractor’s expense.

E. A representative of the Owner shall witness testing, this shall require scheduling.

F. When errors or defective components are found, the source of each error shall be determined, corrected, and the components re-tested at the Contractors expense, following the testing procedures described in this manual.

G. Telephone/Data work shall be coordinated with the Owner’s Telecommunications Department. Contact information shall be provided by the owner.
A. A custom template shall be prepared for each major project by the Owner’s Telecommunications Department.

END OF SECTION 16651