

**SECTION 16740
CATV SYSTEM**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Radio frequency active and passive components
- B. Optical active and passive components
- C. Support and termination hardware
- D. Documentation requirements

1.02 RELATED SECTIONS

- A. Contract Terms and Conditions
- B. Section 16710 - Telecommunications General Requirements
- C. Section 16715 - Telecommunications Acceptance Testing
- D. Section 16722 - Telecommunications Basic Materials and Methods
- E. Section 16725 - Telecommunications Cable
- F. Section 16730 - Underground Structures - Telecommunications
- G. Section 16760 - Telecommunications Grounding and Bonding

1.03 APPLICABLE PUBLICATIONS

- A. As defined in section 16710 - Telecommunications General Requirements.

1.04 SUBMITTALS

The Contractor shall submit the following materials to the University's representative prior to the initiation of project-related work:

- A. Product data for:
 - 1. Rack mount amplifiers, splitters, directional couplers, rack mount panels, eight port taps, attenuators, connectors, terminators, in-line equalizers, and self-terminating wall plate assemblies.
 - 2. Optical receivers, connectors, adapters, attenuators, and single-mode fiber optic jumper cables.
- B. Manufacturer's Installation Instructions: Three copies of the manufacturer's installation instructions, prior to beginning any installation work, for the following equipment and components:
 - 1. Rack mount amplifier, splitters, directional couplers, rack mount panels,

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eight port taps, attenuators, connectors, terminators, in-line equalizers, and self terminating wall plate assemblies.

2. Optical receivers, connectors, adapters, attenuators, and single-mode fiber optic jumper cables.

C. Broadband Communications Engineer Qualifications

1. The Contractor shall submit documented proof that all work undertaken on the CATV System is under the direct supervision of a qualified broadband communications engineer.
2. A "qualified broadband communications engineer" is defined as someone who can demonstrate successfully completing the design and installation of CATV systems for a period of at least five years. Also acceptable is the completion of a manufacturer's certified training course in system design and a minimum of two years of experience. Experience shall include system design, acceptance testing, and documentation.
3. The Contractor shall submit a copy of any valid professional designation certificate issued by the Society of Cable Telecommunications Engineers (SCTE), or an approved equivalent.
4. The submittal will document a minimum of five completed projects utilizing products and materials similar to those involved in the current work.

D. Broadband Communications Technician Qualifications

1. The Contractor shall submit certification reflecting the qualifications of the technicians who will be responsible for the installation, activation, and testing of the CATV System equipment.
2. The Contractor shall submit a copy of any valid professional designation certificate issued by the Society of Cable Telecommunications Engineers (SCTE), or an approved equivalent.
3. If no such certification exists, the Contractor shall obtain the services of certified Broadband Communications Technicians to undertake the CATV System work.

E. CATV System Design Schematics

1. Prior to any CATV System equipment installation, the Contractor shall submit design schematics that reflect signal levels and expected performance figures of the system, based upon the particular equipment to be used.
2. Prior to equipment installation, the Contractor shall submit a red-lined copy of the CATV System schematics that reflects any changes based upon field conditions, product limitations, and/or the owner's representative's request.

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PART 2 MATERIALS

2.01 RACK MOUNT AMPLIFIER

- A. Materials: The rack mount amplifier shall meet or exceed the following specifications:
 - 1. Frequency range: 40 to 750 MHz.
 - 2. Flatness: plus or minus 1 dB
 - 3. Gain: 31 dB
 - 4. Noise figure: 7 dB
- B. Manufacturers: Blonder Tongue Laboratories, Inc. (RMDA 750-30P), Quality RF Services, Inc., or approved equivalent.

2.02 RF SPLITTERS

- A. Materials: indoor type splitters shall meet or exceed the following specifications:
 - 1. Frequency range: 5 to 1000 MHz.
 - 2. RFI: -130 dB
- B. Manufacturers: Blonder Tongue Laboratories, Inc. (SCVS-2), Viewsonics, Inc., or approved equivalent.
- C. Materials: outdoor type splitters shall meet or exceed the following specifications:
 - 1. Frequency range: 5 to 1000 MHz.
 - 2. Impedance: 75 Ohms
- D. Manufacturers: Blonder Tongue Laboratories, Inc., (TLS-1000-2), Motorola, or approved equivalent.

2.03 DIRECTIONAL COUPLERS

- A. Materials: indoor type directional couplers shall meet or exceed the following specifications:
 - 1. Frequency range: 5 to 1000 MHz.
 - 2. Impedance: 75 Ohms
- B. Manufacturers: Blonder Tongue Laboratories, Inc. (SCW or SRT series), Viewsonics, Inc., or approved equivalent.
- C. Materials: outdoor type directional couplers shall meet or exceed the following specifications:

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1. Frequency range: 5 to 1000 MHz.
 2. Impedance: 75 Ohms
- D. Manufacturers: Blonder Tongue Laboratories, Inc., (TLS-1000 series), Motorola, or approved equivalent.

2.04 RACK MOUNT PANELS

- A. Materials: Rack mount panels shall meet or exceed the following specifications:
1. Size: 3.5" X 19"
 2. Designed for mounting passive devices on the back of the panel
 3. Designed to eliminate the requirement for drilling holes and installing screws and/or bolts through the front of the panel
- B. Manufacturers: Viewsonics Inc. (VSMP 3.50), Winsted, Inc., or approved equivalent.

2.05 EIGHT PORT TAPS

- A. Materials: eight port taps shall meet or exceed the following specifications:
1. Frequency range: 5 to 1000 MHz.
 2. Impedance: 75 Ohms
 3. Designed for outdoor use
- B. Manufacturers: Blonder Tongue Laboratories, Inc., (DMT-1000-8 series), Motorola, or approved equivalent.

2.06 RF ATTENUATORS

- A. Materials: RF attenuators shall meet or exceed the following specifications:
1. Frequency range: 5 to 1000 MHz.
 2. Accuracy of attenuation values: plus or minus .5 dB
 3. Designed to attenuate RF signals to comply with system design criteria
 4. Values: 3 dB, 6 dB, 8 dB, 10 dB, 12 dB, 16 dB, and 20 dB
- B. Manufacturers: Toner Cable Equipment, Inc. (FAM – value), Thomas & Betts Corp., or approved equivalent.

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COAXIAL CABLE CONNECTORS

- A. Materials: "F" type connectors shall meet or exceed the following specifications:
 - 1. SCTE IPS-401 and Bellcore GR-1503-Core specifications
 - 2. The "F" style connectors for the RG-6 CATVP coaxial cable shall be all brass construction
 - 3. The "F" style connectors for the RG-6 CATVP coaxial cable shall be high performance sealed compression type connectors
 - 4. Only an "F" connector recommended by the cable manufacturer shall be installed
- B. Manufacturers: Corning Gilbert, Inc. (GF-US-6Q), Thomas & Betts Corp., or approved equivalent.
- C. Materials: .500 type connectors shall meet or exceed the following specifications:
 - 1. Return loss: -30 dB up to 1 GHz.
 - 2. Pull force meets or exceeds yield strength of the cable
 - 3. Operational temperature range: -40 degrees F to 170 degrees F
 - 4. Manufactured from aluminum alloy and coated with iridite
 - 5. Equipped with silver plated brass terminals
 - 6. Must be re-enterable and reusable
- D. Manufacturers: Corning Gilbert, Inc. (GRS Series), Thomas & Betts, or approved equivalent.

2.07 RF TERMINATORS

- A. Materials: "F" type RF terminators shall meet or exceed the following specifications:
 - 1. Frequency range: 5 to 1000 MHz.
 - 2. Designed to be installed on "F" series ports
- B. Manufacturers: Corning Gilbert, Inc. (GTR-59-A), Thomas & Betts Corp., or approved equivalent.
- C. Materials: .500 type RF terminators shall meet or exceed the following specifications:
 - 1. Frequency range: 5 to 1000 MHz.
 - 2. Designed to be installed on eight port taps.
- D. Manufacturers: Corning Gilbert, Inc. (GTR Series), Thomas & Betts Corp., or approved equivalent.

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2.08 IN LINE EQUALIZERS

- A. Materials: In line equalizers shall meet or exceed the following specifications:
 - 1. Frequency range: 5 to 1000 MHz.
 - 2. Values: 3 dB, 6 dB, and 9 dB
- B. Manufacturers: Toner Cable Equipment, Inc. (XEQ-99-value), Signal Vision Inc., or approved equivalent.

2.10 SELF TERMINATING WALL PLATE ASSEMBLY

- A. Materials: Self terminating wall plate assembly shall meet or exceed the following specifications:
 - 1. Termination: 75 Ohm
 - 2. Designed to provide automatic termination of interface when mating connector is disconnected
 - 3. Equipped with a flush ivory plastic plate
- B. Manufacturer: Thomas & Betts Corp. (TF811), custom order item, no other source known.

2.11 OPTICAL RECEIVER

- A. Materials: Optical receiver shall meet or exceed the following specifications:
 - 1. Optical input wavelength: 1310 nm, plus or minus 20 nm
 - 2. Receiver type: PIN detector
 - 3. Input level: -5 dBm, plus or minus 2 dB
 - 4. RF output operational bandwidth: 10 – 750 MHz.
 - 5. RF output impedance: 75 Ohms
 - 6. Tilt: flat across the spectrum
 - 7. Minimum RF output level: +20 dBmV
 - 8. Equipped with 19" rack mount option
- B. Manufacturers: Blonder Tongue Laboratories, Inc., FRRA Series or approved equivalent.

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2.12 FC/APC CONNECTOR PIGTAIL

- A. Materials: FC/APC connector pigtail shall meet or exceed the following specifications:
 - 1. Bellcore GR-326, Issue 3
 - 2. Configured as a pigtail cable assembly suitable for fusion splicing
 - 3. Pigtail shall consist of high quality singlemode fiber optic cable
 - 4. Equipped with strain relief boots
 - 5. Back reflections: -60 dB
- B. Manufacturers: Telect, Inc. (520-2000-001-XP), Molex Inc., or approved equivalent.

2.13 FC/APC ADAPTER

- A. Materials: FC/APC adapter shall meet or exceed the following specifications:
 - 1. Typical insertion loss: .15 dB
 - 2. Designed for installation in a fiber optic adapter panel.
- B. Manufacturers: Corning Cable Systems (TER-521), Molex, Inc., or approved equivalent.

2.14 OPTICAL ATTENUATOR

- A. Materials: The optical attenuator shall meet or exceed the following specifications:
 - 1. Optical wavelength: 1310 nm
 - 2. Configured as fixed values measured in dB
- B. Manufacturers: C-COR.net (P35ATN series), Corning Cable Systems, or approved equivalent.

2.15 SINGLEMODE FIBER OPTIC JUMPER CABLE

- A. Materials: singlemode jumper cable shall meet or exceed the following specifications:
 - 1. Equipped with FC/APC connectors on both ends
 - 2. Maximum insertion loss: .3 dB
 - 3. Maximum back reflection: -65 dB
- B. Manufacturers: Blonder Tongue Laboratories, Inc. (FIUJ-S4 series), C-COR.net, or approved equivalent.

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2.16 PROJECTOR A/V CONTROLS BOX AND CONTROLLER

- A. At each location shown on the drawings as needing an A/V box, place a surface-mounted SP Controls SmartBox – S235. This box is 20 1/4" wide by 24 1/2" tall and 6" deep. It has a drop down front door with the space to store a DVD or VCR Player.
- B. Include in each Smart Box a SP2-CHAS SmartPanel System Controller, Small Chassis Model including 4 input patch modules in each controller.
- C. Manufacturer: SP Controls, Inc. (415) 642-2600.

2.17 MISCELLANEOUS HARDWARE

- A. The Contractor shall provide and install all hardware necessary to produce a fully operational CATV System.
- B. Miscellaneous hardware shall include but is not limited to nuts, bolts, washers, screws, cable ties, straps, spacers, hooks, sleeves, strain reliefs, clamps, arms, braces, and brackets.

PART 3 EXECUTION

SCOPE OF WORK

- A. The Contractor shall be responsible for the professional installation of all CATV System passive and active components.
- B. The Contractor shall provide all test and measurement equipment required for the CATV System proof of performance testing procedures. Refer to Specification Section 16715 – Telecommunications Acceptance Testing for the requirements.

COMPLETE SYSTEM

- A. The Contractor shall be responsible for the connection of the CATV System to the University's headend located in room P-154, building #21.
- B. The Contractor is responsible for coordinating the installation and activation of the CATV System to ensure that a complete and fully operational system is available for use by the University.
- C. The Contractor is not responsible for the installation of any VHF/UHF antenna system and/or the installation of any satellite antenna system.

GENERAL INSTALLATION GUIDELINES

- A. All CATV System installation and activation work shall be performed according to published industry guidelines, rules and regulations. If a dispute occurs, local, state and national codes have precedence; then CSU Stanislaus policies and procedures; then standards such as Electronics Industry Association (EIA), the National Cable Television Association (NCTA); then finally, the manufacturer's recommendations.

STUDENT RECREATION AND WELLNESS CENTER
CALIFORNIA STATE UNIVERSITY LONG BEACH
LONG BEACH, CA

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- B. All work shall be installed and constructed at the highest level of quality workmanship and professionalism.

DETAILED DISTRIBUTION SYSTEM DESIGN

- A. The Contractor shall provide the submittals identified in Section 1.4 before beginning any work on the CATV System identified in this section.
- B. The CATV System design submittals shall approximate the level of detail commonly expected for such applications, with the addition of projected loss figures based upon actual products to be used and the actual length of each coaxial and/or fiber optic cable run.
- C. The Contractor shall ensure that the CATV System meets or exceeds the following system design criteria at any and all CATV System drops:
 - 1. Minimum signal level: 3 dBmV
 - 2. Maximum signal level: 10 dBmV
 - 3. Maximum difference between adjacent video carriers: 1 dB
 - 4. Maximum difference between any video carriers: 7 dB
 - 5. Carrier to noise ratio: 43 dB (minimum)
 - 6. Hum: 1%

RACK MOUNT AMPLIFIER

- A. The Contractor shall install the rack mount amplifier according to the manufacturer's recommendations.
- B. The rack mount amplifier shall be installed in the equipment rack, as depicted in the Contract Documents.
- C. The Contractor shall install the appropriate pad and equalizer, in the rack mount amplifier, based on field conditions and the actual products used.

RF SPLITTERS

- A. The Contractor shall install the RF splitters according to the manufacturer's recommendations.
- B. The Contractor shall connect the RF splitters as depicted in the Contract Documents.

DIRECTIONAL COUPLERS

- A. The Contractor shall install the directional couplers according to the manufacturer's recommendations.
- B. The Contractor shall connect the directional couplers as depicted in the Contract Documents.

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RACK MOUNT PANEL

- A. The Contractor shall install the rack mount panel according to the manufacturer's recommendations.
- B. The Contractor shall mount the indoor type splitter and directional coupler on the rack mount panel.
- C. The rack mount panel shall be installed in the equipment rack, as depicted in the Contract Documents.

EIGHT PORT TAPS

- A. The Contractor shall install the eight port taps according to the manufacturer's recommendations.
- B. The Contractor shall mount the eight port taps on a bracket and install on a backboard and/or a cable tray.
- C. The Contractor shall provide and install an "F" type 75 Ohm terminator on all unused ports of the eight port taps.

3.10 RF ATTENUATORS

- A. It is recommended that the Contractor measure the signal levels at all of the CATV System outlets prior to ordering the RF attenuators to accurately identify the values and quantities required.
- B. The Contractor shall install the RF attenuators according to the manufacturer's recommendations.
- C. The Contractor shall provide and install the RF attenuators, as required, to provide the RF levels identified in the CATV System design criteria.
- D. The Contractor shall install the RF attenuators on the output ports of the eight port taps.

3.11 COAXIAL CABLE CONNECTORS

- A. The Contractor shall install the coaxial cable connectors according to the manufacturer's recommendations.
- B. The Contractor shall provide and install the coaxial cable connectors on all CATV System equipment interconnection cables and drop cables.
- C. The Contractor shall only utilize crimping tools recommended by the cable and/or connector manufacturers.

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3.12 RF TERMINATORS

- A. The Contractor shall install the RF terminators according to the manufacturer's recommendations.
- B. The Contractor shall provide and install an "F" type terminator on all unused ports of the eight port taps and on the rack mounted amplifier test points.
- C. The Contractor shall provide and install a .500 type terminator on each end of line.

3.13 N LINE EQUALIZERS

- A. It is recommended that the Contractor measure the preliminary signal levels at all of the CATV System outlets prior to ordering the in line equalizers in order to accurately identify the values and quantities required.
- B. The Contractor shall install the in line equalizers according to the manufacturer's recommendations.
- C. The Contractor shall provide and install in line equalizers, as required, to provide the RF levels identified in the CATV system design criteria.
- D. The Contractor shall install the in line equalizers, after the RF attenuator (if applicable), on the output ports of the eight port taps.

3.14 SELF TERMINATING WALL PLATE ASSEMBLIES

- A. The Contractor shall install the in self terminating wall plate assemblies according to the manufacturer's recommendations.
- B. The self terminating wall plate assemblies are a custom order item with a four (4) week lead time. Also, all orders must be made in multiples of twenty (20) units.
- C. The Contractor shall install self terminating wall plate assemblies at all CATV System outlets.

3.15 OPTICAL RECEIVER

- A. The Contractor shall install the optical receiver according to the manufacturer's recommendations.
- B. The Contractor shall provide and install all appropriate LASER warning signs.
- C. The optical receiver is a custom order item with an 18-22 week lead time.
- D. The Contractor shall install the optical receiver in the equipment rack, as depicted in the Contract Documents.

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3.16 FC/APC CONNECTOR PIGTAIL

- A. The Contractor shall install the FC/APC connector pigtail according to the manufacturer's recommendations.
- B. The Contractor shall provide and install the FC/APC connector pigtail on the singlemode optic designated for use by the CATV System.

3.17 FC/APC ADAPTER

- A. The Contractor shall install the FC/APC adapter according to the manufacturer's recommendations.
- B. The Contractor shall provide and install the FC/APC adapter on an adapter plate in the fiber optic patch panel, as depicted in the Contract Documents.

3.18 DOCUMENTATION REQUIREMENTS

- A. Prior to installation of the CATV System equipment, the Contractor shall provide all documentation, identified in #1.4 Submittals, to the University Representative.
- B. After installation of the CATV System equipment, the Contractor shall provide as-built floor plans reflecting the coaxial cable lengths and the locations of all CATV System outlets to the University Representative.
- C. After installation of the CATV System equipment, the Contractor shall submit as-built drawings that reflect the component configurations, the actual locations of the equipment installed, and the method of interconnection to the University's Representative.

END OF SECTION