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## PART 1 GENERAL

### 1.1 SCOPE

- A. Provide a complete coaxial cable distribution system for CATV as specified here in and as shown in the Contract Documents.

### 1.2 WORK INCLUDED

- A. The Vendor performing the work of this section shall provide all necessary project management, labor, materials, equipment, services, and other items required, whether specified or not, to furnish a complete and functional distribution facility. Among the items required are:
  1. Coaxial cable and termination hardware
  2. Outlet devices and faceplates
  3. Labeling in MDF and IDF Room(s) and at station locations
  4. Installation test data

### 1.3 QUALITY ASSURANCE

#### A. Vendor Qualifications

1. Work in this section shall be performed by a low-voltage Vendor with demonstrated experience in the installation of commercial coaxial cabling.
2. The Vendor performing the work of this section shall have demonstrated experience in the installation and testing of all cable plant components specified herein.
3. The Vendor performing the work of this section shall have installed cable plant in buildings similar in size and scope to this Project.
4. The Vendor performing the work of this section shall be trained by the equipment manufacturers in the installation and testing of the proposed system. The Technicians in the field shall demonstrate knowledge of material and installation on the product line. Only full-time permanent employees/staff of the company are approved to provide site supervision and testing.
5. Vendor performing the work of this section's employees directly involved with the supervision, installation, testing, and certification of the system shall be trained by the selected system manufacturers. Training by employee type is required as shown below:
  - a. Project Managers/Supervisors/Project Foreman: All shall be certified by Jones/NCTI or equivalent.
  - b. Test Technicians: All shall be certified with service technician training by Jones/NCTI or equivalent.
  - c. Installation Technicians: All shall be certified with service technician training by Jones/NCTI or equivalent.

#### B. Project Meetings

1. Pre-installation meeting: Early in the construction time line, and before any Shop Drawings are produced, if required, the Vendor shall schedule a pre-installation meeting where communications infrastructure installation issues shall be discussed.

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2. Pre-installation walk-through: Prior to commencing installation of coaxial communications infrastructure, the Vendor shall coordinate a pre-installation walk-through with the Owner's UW-IT personnel and all trades having related work.
  - a. The walk-through shall address installation of penetrations, sleeves, conduit, cable tray, grounding and bonding, and electrical power and other building support infrastructure requirements.
  - b. The Lead or Forman who will be on site for the execution of the project shall be at this walk-through.
  - c. At Owner's sole discretion, this walk-through may occur as part of the pre-installation meeting.

C. Warranty

1. Refer to RFQQ 5.5 "Warranties"

D. Regulatory Requirements

1. All work shall be performed in accordance with the latest revisions of all national and local governing codes and standards, including:

International Building Code (IBC)	International Conference of Building Officials (ICBO) 12505 Bellevue-Redmond Road, Bellevue, WA 98005
Seattle Building Code and the Seattle Electrical Code (SEC)	City of Seattle, DPD 700 Fifth Avenue, Suite 2000, Seattle, WA 98124-4019
NEC	National Electrical Code
NFPA 75	Protection of Electronic Computer and Data Processing Equipment
NFPA 78	Lightning Protection Code
NFPA 101	Life Safety Code
FCC Part 76	With special attention to Section 611 CFR Title 47, Radiation Leakage Standards for Cable TV

E. Other References

1. All work shall be performed in accordance with the latest revisions of all ANSI/TIA/EIA, BICSI, and UWIT standards. Whichever is strictest shall take precedence.

NCTA	Recommended Practices for CATV Measurement
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F. Conflicts Among Governing Codes and Documents

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1. Refer to RFQQ 5.2 "Standards Compliance".

#### 1.4 MATERIALS, EQUIPMENT, AND PRODUCT SUBSTITUTIONS

- A. No substitutions allowed.

#### 1.5 SUBMITTALS

- A. Submittal Procedures.

1. Provide complete manufacturer's product literature (not distributor's catalog sheets) for all products specified here in, referenced to the applicable paragraph in the Product Section. Provide manufacturer's recommended installation methods including maximum cable pull tension and minimum bend radius of all cable. No substitutions allowed.
2. Provide shop drawings a minimum of 15 days prior to any cable installation. Prior to beginning cable installation, UWIT must approve shop drawings. Shop drawings shall include at minimum the following:
  - a. Cable types and routing.
  - b. System wiring diagrams showing expected locations of all splitters, taps and amplifiers along with interface of all components in the system.
  - c. Expected performance levels of each splitter, tap and amplifier used in system and required signal level in dB of legs off each splitter, tap and amplifier.
2. Provide details of MDF and IDF cable management.
3. Provide sample labels for all cable label and termination label types including station outlet tapes (with printed sample).
5. Provide list of all foreman, lead installers and testing technicians who will work on the Project. Include for each person a summary of experience. Provide training class certificates for each technician.

#### 1.6 CONSTRUCTION SCHEDULE

- A. Refer to RFQQ 5.6.1 "Construction Progress Schedule"

In addition to the requirements in the above referenced section, the following milestones shall be referenced in the Project construction schedule:

- Start/completion of continuity-of-service work
- start of cable installation
- start of installation testing and successive testing milestones
- start of final inspection process

- B. Pre-construction conference

Prior to submittal of shop drawings, Vendor shall schedule with Owner/UWIT a pre-construction meeting to review installation details including labeling and wire management. Project Manager and Project Foreman for Vendor performing the work of this section shall attend.

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C. Pre-installation MDF and IDF walk-through

Prior to any work performed in the MDF or IDF, the Vendor shall arrange a site walk through with Owner to "mark layout" for actual location of termination equipment in the MDF and IDF Rooms. Owner has the authority to make minor modifications to the layout of these Rooms with no additional cost to the Owner. The Vendor performing the work of this section's low voltage Foreman and UWIT shall be present at the pre-installation walk through.

D. Partial Completion Notification

The Vendor shall complete portions of his work early enough that Owner has adequate time to install equipment and related functions prior to substantial completion. Owner shall have complete access to the MDF and IDF Rooms, and all work shall be complete therein, at least four weeks or agreed upon date, prior to substantial completion.

1.8 INSPECTION AND SUBSTANTIAL COMPLETION

- A. Refer to RFQQ 5.7 "Standard of Performance and Acceptance".
- B. Vendor performing the work of this section shall schedule a Project punch list walk with the Owner.
- C. All corrections for items on the punch list must be completed within 7 working days or a time agreed upon with the Owner.
- D. Vendor performing the work of this section is to schedule a back punch walk to demonstrate correction of punch list items.

1.9 CONTRACT CLOSEOUT

- A. Refer to RFQQ 5.6 "UWIT Process Requirement"

PART 2 PRODUCTS

2.1 INTRODUCTION

- A. All materials constituting the CATV transmission facility shall conform to the specifications herein.
- B. The products included in this specification have been extensively evaluated by the University of Washington and constitute items of demonstrated functionality and compatibility.
- C. All products shall be new and shall be brought to the job site in original manufacturer's packaging. Electrical components shall bear the Underwriter's Laboratories label. All communications cable shall bear the manufacturer's label in accordance with NEC 800 based on flammability testing as follows:

CATV General Purpose Coaxial Cable  
CATVR Riser-rated Coaxial Cable  
CATVP Plenum-rated Coaxial Cable

2.2 RISER

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The following paragraphs describe the products used for the CATV riser cable.

A. Coaxial Cable

Nominal attenuation shall not exceed 2.9 dB per 100 feet at 1000 MHz (1GHZ)  
RG-11, quad shielded, plenum rated (as required)  
Center conductor of 14 AWG copper-clad steel  
Gas-expanded (foamed) polyethylene dielectric  
First shield of aluminum-polypropylene-aluminum laminated tape with overlap bonded to dielectric  
Second shield of 34 AWG aluminum braid wire (60% coverage)  
Jacket material of FEP or equivalent as required for cable rating  
Cabling rating of CATVP  
Impedance of 75 +/-3 Ohms  
Able to support dual path technologies

Required Product:  
Belden Series 11 #1523AP (Plenum Rated)  
Belden Series 11 # 1523A (Non Plenum)

B. CATV Termination Hardware & Equipment

1. Fiber Optic Receiver/Converter

Required Product:  
ACI ACION 1000

2. Connectors

Threaded male F-Type  
Matched to cable type used  
Single-piece connector  
Incorporate 1/2" snap and seal compression connector  
Use female/female feed-through couplings for coaxial outlets

Required Product:  
T&B (Thomas & Betts) RG-11 SNS 11AS  
T&B (Thomas & Betts) Corp RG-6 SNS1P6QS

3. Coaxial Taps/Splitters

The bandwidth shall be 5-1000 MHz; the insertion loss will vary with isolation value but shall be comparable to Regal Technologies Ltd.Rxx10 series directional couplers.  
Corrosion-resistant housings, weatherproof seals, modular design for swapping of tap assembly without the removal of the housing from the cable, and be clearly labeled with a tap value.

Required Product:  
Arris Regal #70177x (provide 8-way splitter)

4. Amplifier

Minimum bandwidth 870 MHz

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Required Product:  
ACI #MFT8/40PCS419-1

5. Equalizers

Required Products (provide both):  
ACI CEQ870/3-6-9-12 as designed  
ACI EQDA-870/3-6-9-12 as designed

6. Attenuators

Required Product:  
ACI SXP3T, 6T, 9T, 12T, 14T, 20T as designed

2.3 STATIONS

A. Cable

1. The following paragraphs describe the cabling for CATV outlets up to 150 Feet.

RG-6/u type, high definition quad-shield Cabling rating of CATVP.  
18 AWG copper-clad steel center conductor Dielectric of FEP or equivalent as required for cable rating.  
Sweep tested 5 MHz to 2.25 GHz by manufacturer and Vendor performing the work of this section.  
Aluminum-polypropylene-aluminum laminated tape with overlap bonded to dielectric first shield  
Able to support dual path technologies  
Impedance of 75 +/-3 Ohms

Required Product:  
Belden DBS #7916AP (Plenum Rated)  
Belden DBS # 1916A (Non Plenum)

2. The following paragraphs describe the cabling for CATV outlets 150 Feet to 250 feet.

Nominal attenuation shall not exceed 2.9 dB per 100 feet at 1000 MHZ (1GHZ)  
RG-11 type, quad-shield  
Center conductor of 14 AWG copper-clad steel  
Gas-expanded (foamed) polyethylene dielectric  
First shield of 34 aluminum-polypropylene laminated tape with overlap bonded to dielectric.  
Second shield of 34 AWG aluminum braid wire (60% coverage)  
Jacket materials of FEP or equivalent as required of cable rating  
Cabling rating of CATVP  
Impedance of 75 +/-3 Ohms  
Able to support dual path technologies

Required Product:  
Belden 1523AP (Plenum Rated)  
Belden 1523A (Non Plenum)

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**B. Connectors/Hardware**

The following paragraphs describe the connectors and hardware for CATV outlets. Typical configurations combine a jack and a faceplate.

**1. F-56 Connectors**

Threaded male F-type matched to cable type used  
Single piece connector  
Incorporate ½" snap and seal compression connector

Required Product:

T&B (Thomas & Betts) RG6 SNS1P6QS  
T&B (Thomas & Betts) RG6 SNS6PLA

**2. F-81 Splices**

Provide standard machined Female-to-Female type high frequency, "F" splices. The center clutch shall adapt to RG-6 center conductors.

Required Product:

Systemax #M81C (for use with modular wall plates)  
Gilbert GF-81-TS (for use in all other applications)

**3. 75-ohm Non-Self-Terminating Faceplate Assembly**

Install snap and seal 75-ohm terminators.

Required Products:

Gilbert "F" Series Connector GF-6-AH-S/342  
Gilbert BF-81 Female Splice

**4. Station Taps**

Provide indoor taps made of die-cast metal with machined (not cast) connectors. The band pass shall be 5-1000 MHz; the insertion loss will vary with isolation value but shall be comparable to Regal Technologies Ltd. Indoor directional couplers.

Required Product:

Arris Regal RTM2000 series

**5. Station Splitters**

Provide indoor splitters made of die-cast metal with machined (not cast) connectors. The band pass shall be 5-1000 MHz; the insertion loss will vary with isolation value but shall be comparable to Regal Technologies Ltd. gold label series indoor splitters.

Required Product:

Arris Regal 701777x

**6. Faceplates**

**a. Plastic, double gang, 8-port**

Required Product:

Systemax M28L-246

**b. Stainless Steel, double gang, 8-port**

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Required Product:  
Semtron, Inc. #2FM-(8)0E-LUC or Uniprise UNF-MFM-DG8P-L-ST

## PART 3 EXECUTION

### 3.1 PRODUCT INSPECTIONS

- A. All products shall be inspected prior to installation to verify that they are of proper gauge and otherwise meet specifications. Any physical damage to products is unacceptable. Uniform jacket thickness, tightness, or buckling should be checked. All outlet devices, cross-connect blocks, and other components shall also be inspected prior to installation.
- B. Within one week of inspection, the Vendor performing the work of this section shall submit a statement certifying that all cable and components met specifications or were replaced.
- C. Existing Service Interruption
  - 1. The Vendor performing the work of this section shall prevent interruption of service by identifying and providing a proposed plan for temporary supports and protection of existing communications cables, cross-connect blocks, and equipment throughout demolition and construction. In the event existing active communications cabling, outside the scope of the Project, needs to be relocated, the Vendor shall immediately notify the construction coordinator.
  - 2. If accidental interruptions do occur, the Vendor shall immediately notify the construction coordinator so that service may be re-established as soon as possible.

### 3.2 CABLE INSTALLATION

#### A. General

The Vendor performing the work of this section shall ensure that communications cable is installed with care, using techniques which prevent kinking, sharp bends, scraping, cutting, or deforming the jacket, or other damage. Installation shall be subject to periodic inspections by Owner. The Vendor performing the work of this section shall replace unacceptable cable at no additional expense to the Owner.

#### 1. Splices

- 1) Coaxial cables shall not be spliced
- 2) All riser cables shall be home-run to designated area in the MDF.
- 3) All station cables shall be home-run to the designated area(s) in the IDF or MDF.

#### 2. Routing

- 1) All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purpose (e.g., access boxes, ventilation mixing boxes, access hatches to air filters, switch or electrical outlets, electrical panels, fire alarm equipment, clock systems, and lighting fixtures).
- 2) The installation of cable around movable devices, instruments, sub-panels, etc., shall be provided with adequate support, length, protection, and flexibility so that the cable is not damaged in the event the equipment is moved.



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3. Pull Lines

A 3/32-inch diameter, 200-pound strength polyethylene pull line shall be installed in all coaxial cable system conduit, both empty and with cable. This provides a pull line available for the next cable installation. Each end of the pull line shall be secured.

4. Cable Bend Radius and Pull Tension

Coaxial cable cannot tolerate sharp bends or excessive pull tension during installation. Vendor performing the work of this section shall observe manufacturer's recommended bend radius and pull tension for all cable.

5. Cable Lubricants

Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces shall be cleaned free of lubricant residue.

6. Cable Support

All cable shall be supported every 4 feet vertically and horizontally. Riser cables shall be supported at each floor level with strain relief clamps at each floor penetration. Cables shall be organized neatly, by system (voice/data/video/audio, etc.), and separately supported "D-rings" shall be used to support cable vertically and horizontally by means of D-rings screwed to the outside edge(s) of the backboard. Installation of these supports shall be done with care, so as not to cause crushing or distortion of the cable or result in tighter radius bends than the minimum radius permitted for each type of cable. Cable not dressed in a neat fashion or installed with excessive slack shall be rejected.

7. Grounding

Riser cable shields in the MDF and IDFs shall be connected to the equipment ground bar tied to the building grounding electrode system.

8. Pre-Installation walk-through

Prior to commencing installation of cable plant, Vendor shall schedule a site walk-through with the Owner & UWIT to conceptually layout and mark intended installation. Vendor shall provide seven days advance notice for scheduling the walk-through.

B. Conduit Usage/Fill

1. Grounding

All coaxial cable shall be installed in grounded metal conduit as indicated in the Contract Documents.

2. Dedicated Use

Coaxial cable may share pathway with voice and data cabling but shall not share conduit with electrical power wiring, department system wiring, or any other building system.

3. Fill

Coaxial cable conduit shall not be filled beyond 40% capacity. Refer to NEC for conduit capacity for various trade sizes of conduit.

4. Cable Lubricants

Lubricants specifically designed for installing coaxial cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces shall be cleaned free of lubricant residue.

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### C. Fire-stopping

Coordinate with Section RFQQ 5.3.2 "Safety Requirements". Fire stopping can be a combination of "manufacture sleeves, muffins, caulk/putty foam or other approved methods.

During the final review and inspection period, following the Owner inspection of cable installed and tested acceptable, but prior to substantial completion, all sleeves passing through floors, roofs, and exterior walls shall be filled with approved fire-stop material in accordance with NEC 300-21. All firewall penetrations shall likewise be filled with suitable fire-stop material. Unused sleeves shall be capped or grouted.

1. In situations where cable tray, conduit, or sleeves extend outside the construction area into occupied portions of the building, they shall be capped or fire-stopped throughout the course of construction.
2. The ancillary space around all sleeves passing through fire-rated construction shall be sealed with approved fire-stop material in accordance with NEC 300-21. Unused sleeves shall be sealed with approved fire-stop material. UL listed fire-rated conduit caps may be used to seal unused sleeves and conduit except where conduits have grounding bushings.
3. In situations where cable tray, conduit, or sleeves extend outside the construction area through fire-rated construction, they shall be capped or sealed throughout the course of construction.

## 3.4 MDF/IDF

### A. Cable Installation

1. Cable not dressed in a neat fashion or installed with excessive slack is unacceptable. Cabling routed along plywood backboard shall make optimum use of wall area and shall be routed such that future modifications shall not be compromised or require rerouting of cable along backboard.
2. Cable routed along plywood backboards shall be routed as close as possible to the ceiling, floor, or edges to ensure that adequate wall or backboard space is available for current and future equipment and for cable termination. Cable shall be at least 4 inches away from electrical outlets.
3. Exact cable routing and backboard layout shall be coordinated with Owner.
4. Cable shall be routed over a path that will offer minimum obstruction to future installation of equipment, backboards, or other cables. Avoid crossing areas horizontally just above or below riser sleeve or cable tray penetrations.
5. Cable routed in cable tray shall be neatly managed, not bound in any way (tie wraps, Velcro straps, etc.). Where the cable makes the transition from cable tray to equipment rack or cabinet, the cables shall drop, as much as possible, above the footprint of the equipment rack. Cable shall not be unsupported for a distance greater than one foot from the tray or ladder rack.

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### 3.5 COAXIAL RISER CABLE

#### A. Cable Installation

1. Coaxial cable configuration shall be as shown on the Drawings.
2. Coaxial riser cables shall be terminated and labeled at each end. Labels shall be affixed with adhesive to cable one foot from termination.

### 3.6 CATV OUTLETS

#### A. Installation

1. For coaxial cable, the manufacturer's instructions for installation shall be followed, including use of the appropriately specified tool for the snap and seal. Test the strength of both the pin and body by manually pulling on the assembly and the cable.
2. Coaxial cable labels shall be identified with unique numbers or characters attached to both ends of a run, six inches from each end. Cables shall be identified on the drawings by number and be described on a coaxial cable schedule as part of the Contract Documents.
3. Provide label on faceplate. Labels shall be typed in a permanent and legible fashion and securely attached.
4. The standard outlet box is a deep 4-inch by 4-inch by 2.125-inch flush-mounted electrical outlet box with a double gang mud-ring.

### 3.7 TESTING

#### A. General

1. Before requesting a final inspection, the Vendor performing the work of this section shall perform a series of end-to-end installation performance tests. The Vendor performing the work of this section shall submit for approval a proposal describing the test procedures, test result forms, and timetable. Owner shall be notified two weeks prior to any testing so that the testing may be witnessed.
2. Acceptance of the simple test procedures discussed below is predicated on the Vendor performing the work of this section's use of the recommended products (including, but not limited to, coaxial cable and outlet devices specified in the Products paragraph), and adherence to the inspection requirements and practices set forth.

#### B. Cable Testing

1. Coaxial Distribution System Testing
  - a. The Vendor performing the work of this section shall conduct witnessed acceptance tests on the complete coax distribution system including all cable and all passive and active devices. Overall the system shall provide a Carrier/Noise ratio of >43 dB and a minimum signal level (at each jack) of +7 dBmV. Details of the methods which shall be followed in conducting the acceptance testing can be found in the current edition of the

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NCTA (National Cable Television Association) Recommended Practices for CATV Measurement. The Vendor performing the work of this section shall perform the following tests on the completed distribution system:

- b. All coaxial cable shall be sweep tested after installation for opens, shorts, and kinks with a Time Domain Reflectometer (TDR). Damaged sections shall be replaced by pulling a new cable. Indicate on the floor plans the actual length of each cable section as installed.
- c. NCTA Standard Broadcast Sweep (5 MHz to 1 GHz) tests shall be performed on the broadband system in the following manner
  - 1) Conduct a signal sweep test from the input side of the building distribution amplifier to the output side of the last amplifier in the riser stack.
  - 2) After the sweep of the riser system is completed and the building system is balanced, a sweep shall be performed from the input to the building distribution amp to the most distant jack on each floor at the output. An additional sweep shall be performed on the return system from the most distant jack on each floor at the input to the head end at the output. The Frequency Response of the installed and operating system should fall within  $N/10+2$  where N is the number of trunk amps and distribution amps in cascade.
- d. CATV engineered diagram shall be provided to Owner demonstrating all tab and loss values.
- e. Visual Carrier/Noise (C/N) shall be measured over the system from the input of the distribution amp to the output of the most distant CATV jack in the building. The test procedure shall be as outlined in the NCTA. Minimum C/N specifications are no less than 43 dB.
- f. Each and every CATV jack installed as part of this system shall output a minimum signal per channel of +7 dBmV into 75 Ohms.
- g. The signal at each CATV jack shall be free of additional noise and distortion as judged by Owner. The Vendor performing the work of this section shall demonstrate (using SLM 1474 or equivalent device) that the signal at each jack conforms to the quality standard specified by Owner. If excessive noise is present, the Vendor performing the work of this section shall either resolve the problem or demonstrate the problem is not caused by the video distribution system installed as part of this Project. At a minimum, the following tests may be required to demonstrate the origin of the problem;
  - 1) Modulation distortion at power frequencies
  - 2) Composite third order distortion for CW and modulated carriers
  - 3) Carrier to second order beat ratio
  - 4) Complete Frequency Response testing using the NCTA guidelines

## 2. Acceptance Testing

- a. The overall system shall be sweep tested from the headend location to the last outlet in each distribution leg of the system.

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- b. A certification shall be made to the fact that no frequency dropouts are present in the system that would affect any of the television channels. With the use of a properly calibrated field-strength meter, the Cable TV Distribution System Vendor will measure and record three readings, one each at 55.25 MHz, 481.25 MHz, and 870 MHz. During the testing, output from amplifier shall set at +27.5dBmV at 55.25 MHz flat. The signal strength shall not deviate more than 2dB from the signal strength calculated in accordance to cable length, grade and attenuation at the tested frequency.
- c. A report of the testing shall be submitted on the above required data prior to final acceptance. Copies shall be included in the O&M manuals. The report shall include the names of individuals performing and witnessing the test, and the manufacturer's name and model number of the equipment used in the test. A block diagram of the test setup for each test shall be included.
- d. Use Time Domain Reflectometer (TDR) to verify cable length and to test for cable faults and breaks.
- e. Use step-function high resolution Time Domain Reflectometer. Tektronix 1502C, Hewlett-Packard 1415A or equal.
- f. Results shall be automatically plotted on X-Y plotter with Y-Axis voltage reflection coefficient resolution of .001 per division. X-Axis shall resolve down to 1" of cable. TDR shall sweep cable at rate no greater than 50 feet per second or such lower rate as necessary to resolve cable vaults to the 1" and .001 VCR level.
- g. Provide completed Coaxial Riser Test Results Form and Video/TV Station Cable Test Form (copies are included herein).

#### C. Defects

1. When errors are found, the source of each error shall be determined and corrected and the cable retested.
2. All defective components shall be replaced and retested following the procedure described above.
3. A list shall be submitted for University approval of any defective components that the Vendor performing the work of this section is unable to correct with a detailed explanation and alternative proposals.

#### D. Test Records

1. Test records for cable shall be maintained using an organized format. Vendor performing the work of this section shall utilize the Coaxial Station Cable Test Results Form and the Coaxial Riser Test Results Form. Test results shall be submitted in electronic format.

### 3.8 RECORD DRAWINGS

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A. General

1. Provide record drawings which shall be incorporated into the O&M manuals.
  
3. Record drawings shall indicate the following items:
  - a. Actual cable types and routing.
  - b. Actual system wiring diagrams and locations of all splitters, taps and amplifiers used in the system.
  - c. Actual performance levels of each splitter, tap and amplifier used in system and actual signal level in dB of legs off each splitter, tap and amplifier.

END OF SECTION