DIVISION 27
Section 27 41 34

Technology Systems
Design and Installation Guidelines
for Architects and Engineers

Pinellas County
Business Technology Services

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SECTION 27 41 34 – BROADBAND DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 PURPOSE OF THIS DOCUMENT

A. The purpose of this specification section is to indicate to A&E and designers of low voltage infrastructure, working in construction or renovation projects for Pinellas County Government, the design requirements by BTS when it comes to such infrastructure. This document will be a starting point for completing a set of construction documents but SHALL NOT be used unedited as a bid document.

1.2 RELATED DOCUMENTS

A. General: Requirements indicated in the following standard apply to the work to be performed under this Specification Section:

1. TIA-568-C.4 (July 2011) “Broadband Coaxial Cabling and Components Standard”. Including addendum and errata.

B. Supplemental: Refer to the specification sections identified below for additional requirements, which are supplemented by this section:

1. 27 00 10 Technology General Provisions
2. 27 05 28 Raceways for Technology
3. 27 05 26 Grounding and Bonding for Telecommunications Systems

1.3 DEFINITIONS

A. Agile Receiver: A broadband receiver that can be tuned to any desired channel.

B. Broadband: For the purposes of this Section, wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz. A broadband communication system can simultaneously accommodate television, voice, data, and many other services.

C. Carrier: A pure-frequency signal that is modulated to carry information. In the process of modulation, it is spread out over a wider band. The carrier frequency is the center frequency on any television channel.

D. CATV: Community Antenna Television. A communication system that simultaneously distributes several different channels of broadcast programs and other information to customers via a coaxial cable.

E. CCTV: Closed-circuit television.

F. CEA: Consumer Electronics Association.

G. dBmV: Decibels relative to 1 mV across 75 ohms. Zero dBmV is defined as 1 mV across 75 ohms. dBmV = 20 log 10(V1/V2) where V1 is the measurement of voltage at a point having identical impedance to V2 (0.001 V across 75 ohms).

H. DOCSIS: Data Over Cable Service Interface Specification. This is an international telecommunications standard that permits the addition of high-speed data transfer to CATV system.

I. Headend: The control center of the master antenna television system where incoming signals are amplified, converted, processed, and combined into a common cable along with any locally originated television signals, for transmission to user-interface points. It is also called the "Central Retransmission Facility."

J. MATV: Master Antenna Television. A small television antenna distribution system usually restricted to one or two buildings.

K. RF: Radio frequency.

1.4 DESCRIPTION

A. BTS requires that the Project Engineer shall clarify in the construction documents the following questions:

1. Where and how is the CATV signal going to come into the building from the service provider?
2. Is the input to the broadband system a Satellite TV system or a cable TV service provider?
3. Would the system have a local head end?
4. Does the system need a return path or not?
5. The location and values of all distribution TAPs in the system.

B. General: The CATV system shall be a complete system with all accessories.

C. Standards: Distribution system components and overall system performance shall meet or exceed the following standards:

1. Federal Communications Commission Technical Specifications Title 47, Part 76 as applied to cable television systems.
2. TIA – 568-C.4 “Broadband coaxial cabling and components”. July 2011.
3. TIA-606-B (June 2012), “Administration Standard for Telecommunications Infrastructure” with addendum and errata.

D. RFI: Special emphasis shall be placed on radio frequency interference (RFI) integrity as licensed radio services outside the cable system share the same frequencies designated for use within.

1.5 SERVICES SUPPORTED

A. The system configuration will allow the forward distribution of the following incoming TV signals:

1. List all TV sources for the distribution system.

B. The system bandpass shall allow for the following channel loading and forward distribution. (Engineer to select one based on project requirements):

1. Sixty channels from 47 MHz to 450 MHz.
2. Seventy-seven channels from 47 MHz to 550 MHz.
3. One hundred and ten channels from 47 MHz to 750 MHz.
4. One hundred and twenty-nine channels from 47 MHz to 860 MHz.
5. One hundred and fifty-two channels from 47 MHz to 1000 MHz.

C. The system shall allow for a return path with a loading of three channels from 5 MHz to 42 MHz.

1.6 INSTALLER QUALIFICATIONS

A. Qualifications: The CATV Installer shall be experienced in the design, installation, proof of performance testing, and maintenance of broadband cable television systems comparable or larger in size and complexity to the system required on this project. Such experience shall be indicated in a list of successfully completed systems with the submittal for this system. Contact names and addresses for all references shall be provided.

B. Equipment: The CATV Installer executing this work shall own and maintain at least the following equipment for execution and maintenance of this system:

1. A CATV signal level meter capable of measuring levels between 5 and 1000 megahertz for both digital and analog channels. For example, Blonder Tongue BTPPRO-1000.
2. CATV Plant certification meter such as JDSU DSAM Wavetek Series Field Meter Model DSAM 6300.
3. A flat noise generator or sweep/marker generator capable of providing a calibrated output between 5 and 1000 megahertz.
4. An oscilloscope with a suitable RF detector for use in sweep testing system response.
5. A return loss bridge and variable termination for on-site cable sweep testing prior to installation.
6. A time domain reflectometer designed for operation into 75-ohm polyethylene dielectric cable for verification of installed cable.
7. Composite test sets, simul-sweep equipment, and other test systems capable of providing the required functions shall be considered equivalent to the equipment specified.
8. A stripping/coring tool appropriate for 0.500 inch hardline cable or larger cables.

C. Provisions: The CATV Installer shall own and maintain all necessary equipment and tooling to properly provide the system in accordance with recommendations set forth by the manufacturers of each item of system equipment.

1.7 MATERIALS ALTERNATES AND SUBSTITUTIONS

A. General: See details for alternates and substitution in Specification Section 27 00 10 Technology General Provisions.

B. Substitutions are only allowed for active components if they have exactly the same performance as the basis of design.

1.8 SHOP DRAWINGS AND SUBMITTALS

A. The CATV Installer shall follow all requirements for shop drawings indicated in Specification Section 27 00 10 Technology General Provisions.

B. Additional information to be included in the shop drawings:

1. Cut sheet of all devices to be provided as part of this system. When multiple devices are in the same cut sheet, the Installer shall highlight the specific part number to be used. Cut sheets of the following devices shall be provided:
   a. All copper and fiber optic cables
   b. All passive devices
   c. All amplifiers to be used
   d. All connectors
   e. All outlets indicating colors
   f. All surge suppressors
   g. All fiber optics equipment
2. Proof of Installer qualifications per paragraph 1.5.
3. A list of all testing equipment owned by the Installer as requested in this specification. The list shall include all make and model numbers of all devices and the last time they were calibrated.
4. Drawings indicating all outlets in the project, with cable distances included types of cables and how they are connected to the backbone system. The drawings shall include all pad and equalization calculations to the input of all amplifiers in the system.

1.9 GENERAL SYSTEM PARAMETERS

A. Devices and products described below may or may not be required for the overall design. If such devices are required during this project to achieve the design distribution parameter, the Installer shall provide such devices as a part of their design solution and said devices shall be included as part of the Installers package in the bid. These items would include those listed below as well as splitters, taps, couplers, and pads.

B. The CATV Installer shall be familiar with the ANSI/SCTE standards and shall follow those standards during the installation process.

C. Amplifiers: In most cases, the output from the amplifier shall be adequate for building distribution. However, in larger building distribution systems, additional amplifiers will possibly be required. If such is the case, Input pads and equalizers shall be provided to compensate for short spacing and cable slope, respectively. Outputs shall be adjusted to the rated sloped output of the amplifier selection (typically 36 dBmV to 44 dBmV or rated output by equipment manufacturer) at the selected frequency range indicated in this specification section.

D. Output: All outlets shall provide a minimum output of between +3 dBmV and +10dBmV for the complete frequency range specified in this section.

E. Minimum acceptable distribution system performance at all outlets shall be as follows:

1. RF Video Carrier Level: Between 3 and 12 dBmV
2. Relative Video Carrier Level: Within 3 dB to adjacent channel
3. Carrier Level Stability, Short Term: Level shall not change more than 0.5 dB during a 60-minute period
4. Carrier Level Stability, Long Term: Level shall not change more than 2 dB during a 24-hour period
5. Channel Frequency Response: Across any 6-MHz channel in 54- to 220-MHz frequency range, referenced to video, signal amplitude shall be plus or minus 1 dB, maximum
6. Carrier-to-Noise Ratio: 45 dB or more
7. RF Visual Signal-to-Noise Ratio: 43 dB or more
8. Cross Modulation: Less than minus 50 dB
9. Carrier-to-Echo Ratio: More than 40 dB
10. Composite Triple Beat: Less than minus 53 dB
11. Second Order Beat: Less than minus 60 dB
12. Terminal Isolation from Television to Television: 25 dB, minimum
13. Terminal Isolation between Television and FM: 35 dB, minimum
14. Hum Modulation: 2 percent, maximum
15. RF FM Carrier Level: 13 to 17 dB below video carrier level
16. FM Frequency Response: More than the 88- to 108-MHz frequency range, signal amplitude is plus or minus 0.75 dB, maximum
17. FM Carrier-to-Noise Ratio: More than 24 dB

F. RF Leakage: Radio frequency leakage into the system shall comply with all FCC rulings and regulations.

G. Delay: Combined reverse and forward path chroma delay, as measured at the most distant bridged port, to the headend and or main distribution point in the building and back, shall not exceed 28 nanoseconds.

H. The complete CATV distribution system shall be certified form compliance with DOCSIS 3.1.

I. All display outlets in the project shall be provided with one UTP Category cable terminated in an RJ-45 connector at the faceplate and at a patch panel in the telecommunications room side for IPTV. This cable shall be terminated in the same telecom room as the coaxial drop and shall have the same performance, warranty, and installation methods described in Specification Section 27 10 00 Structured Cabling System for all other voice/data drops in the project.

PART 2 - PRODUCTS

2.1 DISTRIBUTION AMPLIFIERS (NOT AT HEADEND)

A. This amplifier shall be used only in the distribution system and shall have the following specifications:

1. Forward Frequency Range: 54 to 1000 MHz
2. Reverse Frequency Range: 5 to 42 MHz
3. Forward gain: 35dB
4. Reverse gain: 20 dB
5. Gain Control Range: Through plug in pads
6. Slope Control Range: Through plug in equalizer
7. Input Return Loss: Greater or equal to -16dB
8. Noise Figure: Greater or equal to 6dB
9. Composite triple beat (CTB): -78 dBc
10. Composite Second order (CS) -74 dBc
11. Required output Level: 37/47 dBmV,
12. Hybrid technology: Power doubling
13. Input/Output Test Point Level: -20dB

B. Design Selection: Toner TBLE-1035-42 or approved equal with external power supply and required pads and equalizers.

2.2 PASSIVE DEVICES

A. All passive devices shall have a minimum bandwidth of 5 to 1000 MHz.

B. Splitters for drops or backbones designed with RG-6 or RG-11 lines: Splitters shall be Blonder Tongue SXRS-2, 3, 4, 6 & 8 as required by the system configuration.

C. Directional Couplers for drops or backbones designed with RG-6 or RG-11 lines: shall be Blonder Tongue SRT series, with dB TAP setting as required by the system configuration.

D. Splitters for backbones designed with PIII-500 or bigger diameter cable: shall be Toner TLP-SP series as required by the system configuration.

E. Directional couplers for backbones designed with PIII-500 or bigger diameter cable: Shall be Toner TLP-DC series as required for the system configuration.

F. Multi-taps shall be Toner Total tap with 3 or 6 tap housings as indicated by the system configuration. Tap values and quantity of tap ports as indicated in system configuration.

G. Equalizer. Equalizer shall be mounted in the tap housings and shall be a Toner TXMT plate. Equalizers could be mounted also inside distribution amplifiers. The value to equalize shall be as indicated in system configuration.

2.3 OUTLETS

A. The television outlet shall provide one "F" type barrel connector mounted alone or with other structured wiring connectors on a common face plate. Outlets shall be mounted as indicated on the documents, or as otherwise stipulated and directly in line with the proposed television location. Coordinate final location based upon provided drawings and coordination with the Owner. A three-wire grounded, 120 VAC power outlet shall be located adjacent to the television outlet and be provided by Owner selected Division 26 Installer. Coaxial cable shall be provided by the CATV Installer to each outlet location indicated on the drawings. Conduit and boxes shall also be provided according to Specifications Section 27 05 28 Raceways for Technology. Coordinate location with Electrical Installer if not already provided at time of installation.

B. Design selection: F- connector with a single barrel connector to match (faceplate style and color) the design selection of the structured wiring system as described in Specification Section 27 10 00 Structured Cabling System.

2.4 VIDEO DISTRIBUTION CABLE

A. Structural Return Loss Testing: All cable shall be 100% swept tested. Return loss shall be no less than 23dB at any given frequency between 5MhZ and 1000MhZ.

B. Construction: Cable shall be constructed of a copper clad steel or solid copper center conductor, gas expanded cellular polyethylene dielectric, multiple aluminum braided shields, and an overall jacket. All cables shall have characteristic impedance of 75 Ohms.

C. Attenuation: Attenuation characteristics in decibels per 100 ft. at 20oC shall not deviate more than 10% from the following values:

FREQUENCY (MHz)	**RG-6**	**RG-11**	**PIII-500**
5	0.57	0.36	0.16
55	1.5	0.95	0.54
211	2.87	1.81	1.09
300	3.43	2.17	1.31

400	4.0	2.53	1.53
450	4.28	2.69	1.63
550	4.76	3.01	1.82
750	5.62	3.58	2.16
870	6.09	3.9	2.35
1000	6.54	4.23	2.53

D. RG-6 Cable: 18 AWG solid bare copper conductor. Four layers of shield, two aluminum foil-polyester tape aluminum foil, one 60% aluminum braid and one 40% aluminum braid. NEC article 820 compliant jacket suitable for the environment being installed.

E. RG-11 Cable: 14 AWG solid bare copper center conductor. Two layers of shield, one aluminum foil-polyester tape aluminum foil and one 60% aluminum braid. NEC article 820 compliant jacket suitable for the environment being installed.

F. PIII-500: 0.109 inch diameter copper clad center conductor: Solid aluminum tube swaged onto a high compression micro-cellular foam dielectric core. NEC article 820 compliant jacket suitable for the environment being installed.

G. Indoor Cables: The following table indicates the design selection for all CATV cables. Cables shall be selected according to the environment in which they will be installed:

CABLE TYPE	**GENERAL (CM)**	**RISER RATED**	**PLENUM RATED**
RG-6	Belden 5339Q5	Use Plenum rated cable	Belden 6339Q8
RG-11	Belden 1617A	Use Plenum rated cable	Belden 1617AP
PIII-500	Use Riser rated cable	CommScope P3 500 JCAR	CommScope P3 500 JCAP

H. Outdoor Cables: When coaxial cables are to be installed outdoors, or underground in conduit, they need to have a jacket with a water blocking compound.

I. RG-59 cable shall never be used for the distribution system.

J. For all fiber optic cables and connectors for broadband distribution see Specification Section 27 10 00 Structured Cabling System. All connectors for fiber optic cables shall be APC (Angled Polished Connectors) type connectors.

K. For all 4-pair category cable runs used for IPTV or video distribution, all requirements and specifications indicated in Specification Section 27 10 00 Structured Cabling System shall be followed.

2.5 CONNECTORS AND ADAPTER

A. Site Cable Connectors: All connectors shall be as recommended by the Cable manufacturer for the cable size and jacket of the cable.

B. Connectors for RG-6 Cables: All connectors for RG-6 cable shall be one-piece compression connectors with color coded sleeve. Design selection: Belden part number SNS1P6QS or equivalent.

C. Connectors for RG-11 Cables: All connectors for RG-11 cable shall be one-piece compression connectors with color coded sleeve. Design selection: Belden part number SNS1P11 or equivalent.

D. Connectors for PIII-500 Cables: All connectors for PIII-500 cable shall use a 5/8-inch three pin type connector. Design selection: Amphenol ACC-500-CHT10 or equivalent.

E. Adapters: The Installer shall provide all adapters to connect all different cables listed above to an F type connector or a 5/8-inch three pin connector, as required in the design to make complete connections. Design selection: Amphenol ACC series or equivalent.

F. Crimping: All connectors shall be installed using the connector manufacturer's recommended cutting, coring, and pin crimping tools.

2.6 SURGE SUPPRESSION

A. All coaxial cables entering or exiting a building (above or below ground) shall be surge protected as required by NEC article 820.

B. All surge suppression devices shall be grounded with an AWG-12 isolated wire to the closest electrical ground.

C. All surge suppression devices shall be UL 497 listed, gas tube suppression, power passing, and specifically designed for broadband network applications.

D. Design selection: TII in-line coaxial lighting surge protector part number 212FF757225-31.

2.7 IDENTIFICATION AND LABELING TAGS

A. The CATV Installer shall follow labeling materials indicated in Specification Section 27 00 10 Technology General Provisions.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. The CATV Installer shall follow all installation practices indicated in Specification Section 27 00 10 Technology General Provisions.

B. In Raceway: All cables shall be installed in raceways without kinks, dents, or abrasions. Specified pulling strength of cable shall not be exceeded.

C. All indoor cables shall have no splices at any points.

D. Terminal Locations: Cables at terminal locations shall be neatly formed using a bending form to prevent kinks or other discontinuities. Cables showing evidence of abuse or physical damage shall be replaced at the Installer's expense.

E. It is envisioned that television service will migrate into the overall telecommunications scheme for a given facility, therefore television distribution shall be accomplished via the following methods.

F. Distribution Topology: Broadband distribution points shall be located throughout the facility and all wiring shall be run back to the Telecommunication closet where the connection to the Broadband distribution backbone will take place.

G. The facility contains telecommunication rooms or associated closets, which shall be used for amplification and distribution equipment as well as all TRUNK/FEEDER & DROP cable terminations. Cabling used shall conform to the specifications as previously outlined, with the addition of CMP type cables for use in plenum rated areas if applicable, and environmental air circulation spaces, if required by the facility air distribution system.

H. All unused outputs of splitters, directional couples or distribution taps shall have a 75-ohm termination installed.

I. All unused cavities of the Toner Total Tap housing shall be filled with blank plates.

J. All equipment with a grounding lug shall be grounded as recommended by the equipment manufacturer to an acceptable grounding point as described by the NEC.

K. All amplifiers shall be used at the rated output. The Installer shall provide the required equalization and attenuation pads for all amplifiers to operate at the rated output at only 80% of the maximum gain control of the unit.

L. Cable and equipment identifiers shall be provided and shall follow a standard labeling system like TIA/EIA-606. The identification system chosen by the CATV Installer shall be submitted for approval to the A&E.

M. The Installer shall use attenuator or adjustment for fiber optic equipment to ensure proper budget levels are getting to each receiver.

3.2 INSTALLATION OF CONNECTORS

A. Provisions: All connectors shall be installed in strict accordance with the manufacturers' instructions.

B. Residue Removal: All dielectric residues shall be removed from surfaces of center conductors to insure proper electrical contact.

C. Preparation: Semi-rigid cables shall have jacket removed to a length of two inches from the cable end to allow proper seating of connectors without scoring of the aluminum sheath. A tubing cutter shall not be used for this purpose. All flooding compounds shall be removed from the connector location with a suitable solvent.

D. Connections: All connections including terminations and connections on flexible cables shall be wrench tightened to insure RFI integrity. Connectors at manhole or exterior pedestal tap locations and antennas shall be filled with Dow Corning #5 compound prior to wrench tightening.

E. Tooling: Cables shall be prepared to accept connectors using the manufacturer's recommended tooling.

F. Crimp Connections: Crimp type connections on flexible cables in manholes shall be made with a Hex crimp tool and encapsulated with flooded heat shrink tubing.

G. Heat Shrink Boot: All cables containing flooding compound shall be provided with a heat shrink boot at all termination points which covers the housing connector boss, body of the connector and extends not less than 12 inches along the cable jacket. Heat shrink boot shall be of the filled type.

H. Splices: Cable splices below grade or in other locations shall be made according to manufacturers' recommendations, tested, and covered with a filled heat shrink boot approximately 30 inches in length. Boot shall contain a resilient compound which melts as heat is applied and fills all voids between the shrink tube and cable jacket. Resin casts shall not be acceptable.

3.3 EQUIPMENT MOUNTING

A. Mounting: All remote terminal equipment (amplifiers, taps, couplers etc.) shall be neatly arranged and securely mounted. When installed above the ceiling, all devices need to be in accessible places. All accessories required for wall mounting equipment shall be provided when equipment is to be wall mounted.

B. Integrity: All equipment housing hardware including amplifiers shall be wrench tightened to insure full RFI integrity.

3.4 SYSTEM ADJUSTMENTS

A. Installation: System design drawings are based on estimated distances between devices. The Installer shall measure the exact cable footages between equipment locations and submit a revised drawing to the engineer for review containing the following.

1. Exact footage of each cable
2. Revised coupler and tap values
3. Revised equalizer and pad values

3.5 SYSTEM PERFORMANCE

A. General: Upon completion the system shall be adjusted, tested, and left in perfect operating condition.

B. Provisions: The system shall not exhibit any audible or visible components of hum, noise, or distortion.

C. Before the system acceptance test, the Installer shall test all outlets in the system and document the result in a spreadsheet or an automated test print out from the test equipment. This report is called Test Result Report (TRR). The TRR report shall include the following information:

1. Project name and location
2. Day test was done (if done in different days, the report shall be broken in sections by days the tests were done)

3. Name of the Installer that performed the test
4. Serial number of the tester used
5. For each outlet in the project the report shall include:
    a. Room number
    b. Room name
    c. Outlet number (with permanent label matching as-built drawings)
    d. Lowest channel - signal level (in dBmV)
    e. Mid bandwidth channel – signal level (in dBmV)
    f. Highest channel (as identified in part 1 of this specification) – signal level (in dBmV)
6. For each amplifier in the system the report shall include:
    a. Room number
    b. Room name
    c. Lowest channel - signal level (in dBmV, measured @ test port)
    d. Mid bandwidth channel – signal level (in dBmV, measured @ test port)
    e. Highest channel (as identified in part 1 of this specification) – signal level (in dBmV, measured @ test port)

D. All Fiber optic cables and UTP category cable shall be tested in accordance with Specification Section 27 10 00 Technology General Provisions.

3.6 SYSTEMS WARRANTY AND SERVICE

A. General: The CATV Installer shall follow all warranty and service requirements indicated in Specification Section 27 00 10 Technology General Provisions.

3.7 ENGINEER'S FINAL ACCEPTANCE TEST

A. General: The CATV Installer shall follow all test requirements indicated in Specification Section 27 00 10 Technology General Provisions

B. General: The Installer shall demonstrate the operation of the system to the Architect & Engineer (A&E) during the final inspection in the following manner:

1. Measure signal levels with a calibrated field strength meter at outlets and or amplifiers selected by the A&E. At a minimum 5% of all outlets will be tested. The readings of the meter shall be between 1.5 dBmV of the value documented in the TRR.
2. Observe picture quality at outlets selected by the Engineer using a television receiver.

C. If at least one measurement fails, the A&E can request to the Installer to test more outlets (beyond the 5% indicated previously) until the A&E is satisfied with the results. Any failures shall be corrected by the Installer at no additional cost to the Owner.

3.8 TEST EQUIPMENT REQUIRED

A. At a minimum during the acceptance test to the A&E the Installer shall have the following equipment:

1. TV Receiver: 17-inch minimum diagonal screen size color receiver in good working order.
2. Signal Meter: This signal meter needs to be the same tester used during the TRR.

B. Age and Calibration: Test equipment used in demonstrating system performance shall be less than six months old or bear the calibration seal of a recognized lab which is dated within six months of the date of acceptance test.

3.9 TRAINING AND INSTRUCTION

A. General: The CATV Installer shall follow all training requirements indicated in Specification Section 27 00 10 Technology General Provisions.

B. The training shall include the following topics:

1. How to make connectors part of this system with the provided tools.
2. How to balance the system with amplifiers at rated output.
3. A walk-through of the facility pointing out the location of all active and passive equipment of the system and showing the Owner the as-built drawings with matching labels for those pieces of equipment.
4. A complete training on the use of the test tools provided.

3.10 AS-BUILT DOCUMENTS AND CLOSE-OUT INFORMATION

A. General: The CATV Installer shall follow all as-built and closeout information requirements indicated in Specification Section 27 00 10 Technology General Provisions.

B. General: As-built drawings shall include the following information:

1. A block diagram of the entire system indicating all cable routing and lengths
2. Revised coupler and tap values for each cable drop
3. All cable types, active components, and passive components
4. All equalizing and attenuating pads used for each amplifier

5. All system settings
6. All brands and part number of all devices shall be indicated in the drawings
7. Location of each outlet and the unique label identifier of each outlet
8. High/low signal level measured at each amplifier test port

C. Additional information to be provided by the CATV Installer, as part of the closeout information:

1. A copy of the TRR signed approved by the A&E.

END OF SECTION 27 41 34