(This is a design guideline spec. It's the responsibility of the Design/Installation team to develop project specific specifications to meet the project requirements.)

SECTION 274133 MASTER ANTENNA TELEVISION SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the requirements for provision and installation of the Master Antenna Television (MATV) system components. This shall include directional couplers, feeder cable, drop cable and required accessories for a complete and operable system. System head-end components will be provided by others. Contractor shall coordinate with head-end provider for connection to and testing of the system.

B. All TV subscriptions and standards are by each end-use department. Project team shall verify with the end-user department for the specific MATV service required and provide the TVs, cabling, and raceway as required. All MATV service demarc and cable terminations shall not be located inside the MDF/IDF rooms.

C. Related Sections include the following:

1. Division 01
2. Section 270000 Communications
3. Section 270526 Grounding and Bonding for Communications Systems
4. Section 270528 Interior Pathways for Communications Systems
5. Section 270543 Exterior Pathway for Communications Systems
6. Section 270553 Identification for Communications Systems

1.2 REFERENCES

A. Refer to section 270000.

B. The publications listed within this specification form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

C. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

D. Conflicts
1. Between referenced requirements: Comply with the one establishing the more stringent requirements.
2. Between referenced requirements and contract documents: Comply with the one establishing the more stringent requirements.

E. Codes and Standards
1. Code of Federal Regulations (CFR) – 10CFR47, Part 76.605, "Signal quality for MATV." Federal Communications Commission (FCC), Washington, DC
2. Society for Cable Television Engineers (SCTE), Publications and industry standards.
3. National Cable Television Institute (NCTA) Practices for Measurements on Cable Television Systems
4. Underwriters Laboratories (UL) Cable Certification and Follow Up Program
5. National Electric Code (NEC), section 820
6. UL Testing Bulletin

1.3 QUALITY ASSURANCE

A. Refer to section 270000.

B. All components installed for this distribution system shall be industrial grade equipment designed for commercial TV distribution systems.

C. Contractor Qualifications
   1. The Contractor must adhere to the engineering, installation and testing procedures provided by the manufacturer and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
   2. Must provide three references for projects of equivalent scope, type and complexity of work completed within the last three years. The Contractor shall use only qualified installation personnel experienced in similar type installations.
   3. The Contractor shall possess the required license classification, performance history, and experience in installation of broadcast TV distribution systems. The Contractor shall submit written proof that the following experience requirements are being met.
   4. Hardware Manufacturer's Experience: All components shall be produced by manufacturers who have been regularly engaged in the production of TV coax cable distribution systems and components of the types to be installed for at least five years.

1.4 CONTRACTOR DUTIES

A. Perform all work; provide all products, systems integration, engineering, design work, and testing required for the project in order to ensure fully operative systems and proper installation of equipment.
B. Provide system documentation and submittals.
C. Provide warranty and maintenance support.
D. Provide calculations and analysis to support design and engineering decisions as specified in submittals.
E. Provide and pay for all labor, materials, and equipment. Pay required sales, gross receipts, and other taxes.
F. Secure and pay for plan check fees, permits, fees, and licenses necessary for execution of work as applicable for the project.
G. Provide required notices.
H. Comply with codes, ordinances, regulations, and other legal requirements of public authorities that bear on performance of work.
I. The Contractor shall perform pre-delivery testing, site testing, and adjustment of the completed MATV system. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
J. The Contractor shall calibrate and test all equipment, verify system operation, place the integrated system in service, and test the integrated system. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations, including written certification to the Project Manager that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.
K. All equipment shall be installed in a professional manner by a certified technician, in accordance with good construction and engineering practices. Test results and as-builts drawings shall be delivered to the Owner or upon completion of the project.

1.5 SUBMITTALS

A. Refer to section 270000.
B. Shop Drawings:
   1. System block diagram.
   2. Details of system equipment installed in the communications room racks and on walls, including wiring diagrams.
   3. Details of connections to power sources, including power supplies and grounding.
   4. Details of interconnection to signal transmission media.
C. Product Data: Submit cut-sheets including name of manufacturer, trade name, and model number of each component. Indicate related specification section number, specification paragraph numbers, and reference standards for each product.
D. Loss Calculations: Submit loss calculations for the entire system including tap values.
E. Record Drawings: Furnish CAD drawings of all installed cabling and equipment.

F. Contractor shall submit a testing plan that meets the requirements of paragraph 3.3 in this Section.
G. Contractor shall submit test results consisting of tabulated measurements of all ports on the active and passive system components as well as any final gain settings and attenuator values used to optimize the system.
H. Contractor shall submit Operation and Maintenance Manuals for the equipment provided under this project. The manuals shall be inclusive all documentation and software supplied with each product. Include the training syllabus and training materials to be provided for the training required under paragraph 3.4. Operations manuals shall be submitted for approval a minimum of 10 days before scheduled training.

1.6 MAINTENANCE AND SUPPORT

A. Base: The Contractor shall provide maintenance and support of all hardware and software associated with this system for the first year. The maintenance services to be provided by the Contractor shall include preventive, routine, and emergency maintenance services as defined below under optional maintenance and support.
B. Optional: The Contractor shall provide option pricing for maintenance and support for five years following the warranty period. The option pricing shall be given as a guaranteed maximum annual cost. This service is to include parts, labor, licenses, and all other Contractor costs required to keep the equipment operational. Pricing shall be provided for the following two levels of support:
    1. Twenty-four hour a day, seven day a week telephone support, plus eight hour on-site emergency support
    2. Twenty-four hour a day, seven day a week telephone support, plus two hour on-site emergency support
C. Preventive and Routine Maintenance: During the first year, preventative and routine maintenance services shall be provided in accordance with the provisions of the maintenance manual the Contractor issues for each component. Preventative maintenance services shall include inspection, test, necessary adjustment, lubrication, parts cleaning, and software upgrades. Routine maintenance services shall include scheduled overhauls as recommended by the equipment and software manufacturer.

1.7 WARRANTY

A. The warranty on all cabling and connecting hardware of the distribution system to this specification shall be for a period of not less than five years. The connecting hardware shall have a lifetime extended warranty against defects in material and workmanship. If items supplied as part of this project have longer warranties, Contractor shall supply longer warranty.
B. The warranty on all distribution electronics, including taps and passives of the distribution system to this specification shall be for a period of not less than one year. If items supplied as part of this project have longer warranties, Contractor shall supply longer warranty.
C. The warranty shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the specification include, but are not limited to, the following:
    1. CommScope/Arris
    2. Blonder Tongue

2.2 EQUIPMENT

A. Power Supply
   1. Wall mountable
   2. 60 V AC @ 3.5 A, max 8 A
B. Power Inserter
   1. Frequency range, 5 MHz to 1 GHz
   2. Shall be capable of passing 15A, 60/90 V AC, 50/60 Hz
   3. Insertion loss shall not be greater than
      a. 0.6 dB @ 5MHz
      b. 1.4 dB @ 1GHz
C. Bi-Directional Couplers
   1. Arris Regal series or submitted and Owner approved equivalent.
   2. Frequency range, 5 MHz to 1 GHz
   3. Output shall have a flat insertion loss of 8.5 dB on high loss leg. Low loss leg shall have an insertion loss not greater than:
      a. 1.7 dB @ 5 MHz
      b. 3.0 dB @ 1GHz
D. 8-Port Taps
   1. Arris Regal series *RMT 2000* or submitted and Owner approved equivalent.
   2. Frequency Range, 5MHz to 1GHz
E. Amplifiers
   1. Blonder Tongue BIDA *5800 series - BIDA 100A-30* (gain as required per system calculations) or equivalent.
   2. Minimum Frequency Gain: 30 dB
   3. Forward pass band from 5*4 – 862* MHz
   4. 60 and 90 V AC powering capability
   5. 15 ampere (steady state) and 25 ampere (surge survivability)

F. Performance Requirements
   1. The TV distribution system shall be capable of delivering TV channels 2 through 135.
   2. The TV distribution system shall be two-way compatible with the ability to transmit all frequencies between 5 and 40MHz from the wall plate back to the head-end.
   3. The forward signal level at each wall outlet shall have no greater than a 10dB tilt across the bandwidth of the distribution system, 54 to 862MHz. The signal level shall not fall below 3dBmV and shall not exceed 8dBmV.

2.3 COAX CABLING

A. Contractor is responsible for all hardware, connectors, tools, and test equipment of any kind necessary to accommodate the system installation, operation, testing, or maintenance.
B. All connecting hardware installed for this distribution system shall be industrial grade components designed for commercial TV systems and designed to be used with the installed cable.
C. The “F” connectors used for RG-6 or RG-11 drop cable shall be a one-piece connector that must be crimped on the cable with a hexagon style crimper.
   1. CommScope# 555645-5
D. All equipment associated with the system shall operate from 5 MHz to 1 GHz as a minimum.
E. Coaxial drop cable for lengths less than 150 feet shall be RG-6 plenum cable
F. RG6 Coax Cable Product
   1. CommScope # 2227V
   2. Owner approved equivalent.
G. Coaxial drop cable for lengths greater than 150 feet shall be RG-11 plenum cable.
H. RG11 Coax Cable Product
   1. CommScope # 2285V
   2. Owner approved equivalent.
I. Non-locking 75-Ohm terminators shall be installed on all unused ports on splitters, directional

couplers, and multi-port taps.

J. Coaxial trunk cable shall be provided from MDF and IDF rooms

K. Coax Trunk Cable Product
   1. CommScope # 2312K
   2. Owner approved equivalent.

L. Contractor is cautioned to exercise care in handling this 1/2 inch cable as it can be easily damaged. Install with wide-sweeping turns.

PART 3 – EXECUTION

3.1 GENERAL

A. Verify backboards are properly installed.

B. Verify cable pathways are properly installed.

C. Verify main grounding system is properly installed and tested.

3.2 INSTALLATION

A. Install work following drawings, manufacturer's instructions and approved submittal data.

B. The TV distribution system installation shall meet all applicable national and local codes pertaining to low voltage cable system installations.

C. The Contractor shall adhere to the installation schedule of the General Contractor and should attend all construction meetings scheduled by the General Contractor.

D. The installation will include coordination, testing and problem resolution with the system vendors.

E. The Contractor shall provide all test equipment necessary to properly install, maintain, and troubleshoot the system. Any equipment purchased for this contract shall become the property of the Owner upon completion of the project.

F. All cables shall be labeled in accordance with the Owner's standard numbering scheme and labeling standards.

G. Cable labels shall be placed in the following locations: on jack face plates, on cable inside back boxes, junction boxes, access points, on cable above the terminations in the communications rooms, and every fifty-feet when not in conduit. Conduits shall be labeled "COMMUNICATIONS" every fifty-feet and at the origination and destination.

3.3 LABELLING

A. Refer to section 270553.

3.4 GROUNDING AND BONDING

A. Refer to section 270526

3.5 ACCEPTANCE

A. Refer to section 270000

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Testing
   1. Coaxial Cable testing
      a. Testing of all coaxial cabling shall be performed prior to system startup. One hundred percent of the distribution and customer drop cable shall be tested for length, opens, shorts, and presence of AC voltage. The Contractor, at no charge to the Owner, shall correct all discrepancies. Complete end-to-end test results must be submitted to the Owner.
      b. At a minimum, the Owner or the Owner's Designated Representative shall randomly perform unannounced, on-site reviews during the installation. In addition, the Owner or the Owner's Designated Representative shall perform a final inspection and a complete review of the test results before the installation is accepted.

B. The Owner or the Owner's Designated Representative shall be given the opportunity to test the completed system for proper installation and operation. Any cable or component found

improperly installed, damaged, with loose connector, or with Radio Frequency Interference (RFI) leakage shall be repaired, and if necessary, replaced with new cable, connectors, and components at no cost to the Owner.

C. System Testing
   1. Upon completion of the installation, the Contractor shall test the signal strength using a signal strength meter at 55 MHz (channel 2) and 550 MHZ (channel 78) at the input and output of each system component and at the outputs of all taps. These test results shall be submitted to the Owner in Microsoft Excel 97 format, or ASCII, comma delimited files with fields in identical order. It shall also be documented on the as-built TV distribution system drawing.
   2. The television distribution system as a whole shall be tested in accordance with National Cable Television Association (NCTA) Recommended Procedures and Practices for Measurements on Cable Television Systems, 2nd Edition (or the most current edition), by the installer to provide the following:
      a. +3 dBmV minimum output at all taps for each channel.
      b. +12 dBmV maximum output at all taps for each channel.
      c. 20 dB minimum isolation between ports.
      d. Lines terminated in characteristic impedance.
      e. F-Type self-terminating connectors at all unused ports.
      f. A picture free of interference, ghosts and smear, with clear audio, on all channels and at all taps.
      g. An overall signal-to-noise ratio of 40 dB for a 6 Mhz band-width.
      h. Variations in ambient temperatures of -20 degrees F to +140 degrees F (except for converters) shall not cause more than +/- 1.0 dB change in outlet voltage.
      i. Amplifiers and system must be capable of handling both forward and reverse path.
      j. Conduct and document a Cumulative Leakage Index (CLI) check of the completed system once it is connected to the local TV signal. A copy of this report will be submitted to the Owner. The installer will repair all RF leaks.
      k. If the signal strength at the input and output of the system components is outside of the designed specifications, the Contractor shall make the necessary corrections to the system.

3.7 TRAINING

A. The manufacturer's authorized and factory trained personnel must provide up to eight hours of training at the Owner's designated site location.
B. The training may be waived, deleted or reduced in the number of hours only with Owner approval.
C. The training must include at a minimum:
   1. Preventive maintenance service techniques and schedules.
   2. Overall system concepts, capabilities and functions.
   3. Explanation of all control functions.
   4. Methods and means of troubleshooting and replacement of all distribution and drop wiring and devices.
D. Manuals, drawings and technical documentation must be used in training and shall be left with the Owner, or its designated representative at the completion of training for the Owner’s use in the future.
E. The use of proprietary equipment does not justify failure to provide technical documentation, such as programming information, electronic schematic drawings and technical description, as part of training and documentation.
F. Specialized equipment necessary to perform preventative maintenance and service, as used in the manufacture’s training program shall be provided by Contractor as a cost add-option to the owner.

END OF SECTION 274131