

**PART 1 - GENERAL**

**1.1 SECTION SUMMARY**

- A. Work covered by this document includes design, engineering, labor, material, products, guarantee, training and services for, and incidental to the complete installation of new and fully operating NFPA listed Master Antenna Television (TV) equipment and systems as detailed herein.
- B. Work shall be complete, complete, labeled, VA Central Office (VACO) tested and certified and ready for operation

**1.2 RELATED SECTIONS**

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 Volts and Below).
- C. Section 27 00 00, LOW VOLTAGE COMMUNICATION SYSTEMS AND REQUIREMENTS
- D. Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- E. Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.
- F. Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS.
- G. Section 27 52 23, NURSE CALL/CODE BLUE EQUIPMENT AND SYSTEMS.

**1.3 DEFINITIONS**

- A. Provide: Design, engineer, furnish, install, connect complete, test, certify and guarantee.
- B. Work: Materials furnished and completely installed.
- C. Review of contract drawings: A service by the engineer to reduce the possibility of materials being ordered which do not comply with contract documents. The engineer's review shall not relieve the Contractor of responsibility for dimensions or compliance with the contract documents. The reviewer's failure to detect an error does not constitute permission for the Contractor to proceed in error.
- D. Headquarters Technical Review, for National/VA communications and security, codes, frequency licensing, standards, guidelines compliance:
  - Office of Telecommunications
  - Special Communications Team (0050P2B)
  - 1335 East West Highway - 3rd Floor
  - Silver Spring, Maryland 20910
  - (O) 301-734-0350, (F) 301-734-0360

**1.4 REFERENCES**

A. The installation shall comply fully with all governing authorities, laws and ordinances, regulations, codes and standards, including, but not limited to:

1. United States Federal Law/Codes:

a. Departments of:

1) CFR, Title 15 - Department of Commerce, Under the Information Technology Management Reform Act (Public Law 104-106), the Secretary of Commerce approves standards and guidelines that are developed by the:

a) Chapter II, National Institute of Standards Technology (NIST - formerly the National Bureau of Standards). Under Section 5131 of the Information Technology Management Reform Act of 1996 and the Federal Information Security Management Act of 2002 (Public Law 107-347), NIST develops - Federal Information Processing Standards Publication (FIPS) 140-2-Security Requirements for Cryptographic Modules.

b) Chapter XXIII, National Telecommunications and Information Administration (NTIA - aka 'Red Book') Chapter 7.8/9 Federal communications Commission (FCC) Title 47 (CFR), Part 15, Radio Frequency Restriction of Use and Compliance in "Safety of Life" Functions and Locations.

2) CFR, Title 29, Department of Labor, Chapter XVII - Occupational Safety and Health Administration (OSHA), Part 1910 - Occupational Safety and Health Standard:

a) Subpart 7 - Definition and requirements for a National Recognized Testing Laboratory (NRTL - 15 Laboratory's, for complete list, contact

[http://www.osha.gov/dts/otpc/nrtl/faq\\_nrtl.html](http://www.osha.gov/dts/otpc/nrtl/faq_nrtl.html))

(1) Underwriter's Laboratories (UL):

468	Standard for Grounding and Bonding Equipment.
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- (2) Communications Certifications Laboratory (CCL): same tests as for UL.
  - (3) Intertek Testing Services NA, Inc. (ITSNA formerly Edison Testing Laboratory [ETL]): same tests as for UL.
  - b) Subpart 35, Compliance with NFPA 101 - Life Safety Code.
  - c) Subpart 36, Design and construction requirements for exit routes.
  - d) Subpart 268, Telecommunications.
  - e) Subpart 305, Wiring methods, components, and equipment for general use.
- 3) Public Law No. 100-527, Department of Veterans Affairs:
- a) Office of Telecommunications: Handbook 6100 - Telecommunications.
  - b) Office of Cyber and Information Security (OCIS):
    - (1) Handbook 6500 - Information Security Program.
    - (2) Wireless and Handheld Device Security Guideline Version 3.2, August 15, 2005.
  - c) Spectrum Management FCC and NTIA Radio Frequency Compliance and Licensing Program.
  - d) Office of Cyber and Information Security (OCIS):
    - (1) Handbook 6500 - Information Security Program.
    - (2) Wireless and Handheld Device Security Guideline Version 3.2, August 15, 2005.
- 4) Title 42, CFC, Department of Health, Chapter IV Health and Human Services, Subpart 1395(a)(b) Joint Commission on Accreditation of Healthcare Organizations (JCAHO) "a hospital that meets JCAHO accreditation is deemed to meet the Medicare conditions of Participation by meeting Federal Directives:" All guidelines for Life, Personal and Public Safety; and, Essential and Emergency Communications.
- 5) CFR, Title 47 - Telecommunications, in addition to FCC: Part 15 - Restrictions of use for Part 15 listed Radio Equipment in Safety of Life/Emergency Functions/Equipment/Locations (also see CFR, Title 15 - Department of Commerce, Chapter XXIII - NTIA):

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Part 73	Radio Broadcast Service,
Part 90	Rules and Regulations, Appendix C.
Form 854	Antenna Structure Registration.

2. National Codes:

- a. American Institute of Architects (AIA): Guidelines for Healthcare Facilities.
- b. American National Standards Institute/Electronic Industries Association/Telecommunications Industry Association (ANSI/EIA/TIA):

568-B	Commercial Building Telecommunications Wiring Standards:
569	Commercial Building Standard for Telecommunications Pathways and Spaces.
606	Administration Standard for the Telecommunications Infrastructure of Communications Buildings.
607	Commercial Building Grounding and Bonding Requirements for Telecommunications.
RS 27	Tools, Crimping, Solderless Wiring Devices, Recommended Procedures for User Certification.

- c. Institute of Electrical and Electronics Engineers (IEEE):

SO/TR 21730:2007	Use of mobile wireless communication and computing technology in healthcare facilities - Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices.
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- d. NFPA:

70	National Electrical Code (current date of issue) - Articles 517, 645 and 800.
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77	Recommended Practice on Static Electricity.
99	Healthcare Facilities.
101	Life Safety Code.

3. State Hospital Code(s).

4. Local Codes.

**1.5 QUALIFICATIONS**

- A. The OEM shall have had experience with three or more installations of systems of comparable size and complexity about type and design as specified herein. Each of these installations shall have performed satisfactorily for at least 1 year after final acceptance by the user. Include the names, locations and point of contact for these installations as a part of the submittal.
- B. The Contractor shall submit certified documentation that they have been an authorized distributor and service organization for the OEM for a minimum of 3 years. The Contractor shall be authorized by the OEM to pass thru the OEM's warranty of the installed equipment to VA. In addition, the OEM and Contractor shall accept complete responsibility for the design, installation, certification, operation, and physical support for the system. This documentation, along with the System Contractor and OEM certifications must be provided in writing as part of the Contractor's Technical submittal.
- C. The Contractor's Communications Technicians assigned to the system shall be fully trained, qualified, and certified by the OEM on the engineering, installation, operation, and testing of the system. The Contractor shall provide formal written evidence of current OEM certification(s) for the installer(s) as a part of the submittal or to the COTR before being allowed to commence work on the system.
- D. Applicable national, state and local licenses.
- E. Certificate of successful completion of OEM's installation/training school for installing technicians of the equipment being proposed.

**1.6 CODES AND PERMITS**

- A. Provide all necessary permits and schedule all inspections as identified in the contract's milestone chart, so that the system is proof of performance tested and ready for operation on a date directed by the Owner.

- B. The contractor is responsible to adhere to all codes described herein and associated contractual, state and local codes.

**1.7 SCHEDULING**

- A. It is the responsibility of the Contractor to coordinate all work with the other trades for scheduling, rough-in, and finishing all work specified. The owner will not be liable for any additional costs due to missed dates or poor coordination of the supplying contractor with other trades.

**1.8 REVIEW OF CONTRACT DRAWINGS AND EQUIPMENT DATA SUBMITTALS**

- A. Support all submittals with descriptive materials, i.e., catalog sheets, product data sheets, diagrams, and charts published by the manufacturer. These materials shall show conformance to specification and drawing requirements.
- B. Where multiple products are listed on a single cut-sheet, circle or highlight the one that you propose to use. Provide a complete and through equipment list of equipment expected to be installed in the system, with spares, as a part of the submittal. Special Communications (TVE-0050P3B - herein after referred to as [0050P3B]) will not review any submittal that does not have this list.
- C. Provide 4 copies to the PM for technical review. The PM will provide a copy to the offices identified in Paragraph 1.3.C and D, at a minimum for compliance review as described herein where each responsible individual(s) should respond to the PM within 10 days of receipt of their acceptance or rejection of the submittal(s).
- D. Equipment technical literature detailing the electrical and technical characteristics of each item of equipment to be furnished.
- E. Engineering drawings of the system, showing calculated signal levels at the Head End input and output, each input and output distribution point, and signal level at each telecommunications outlet.

**1.9 PROJECT RECORD DOCUMENTS (AS BUILTS)**

- A. Throughout progress of the work, maintain an accurate record of changes in Contract Documents. Upon completion of Work, transfer recorded changes to a set of Project Record Documents.
- B. The floor plans shall be marked in pen to include the following:
  - 1. All device locations with labels.
  - 2. Conduit locations.

3. Head-end equipment and specific location.
4. Wiring diagram.
5. Labeling and administration documentation.
6. Warranty certificate.
7. System test results.

**1.10 WARRANTIES AND GUARANTEE**

- A. The Contractor shall warrant the installation be free from defect in material and workmanship for a period of 1 year from the date of acceptance of the project by the owner. The Contractor shall agree to remedy covered defects within eight (8) hours of notification of major failures or within twenty-four (24) hours of notification for individual station related problems.
- B. Refer to Part 4 for applicable System Guarantee requirements.

**1.11 USE OF THE SITE**

- A. Use of the site shall be at the GC's direction.
- B. Coordinate with the GC for lay-down areas for product storage and administration areas.
- C. Coordinate work with the GC and their sub-contractors.
- D. Access to buildings wherein the work is performed shall be directed by the GC.

**1.12 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Store products in original containers.
- C. Coordinate with the GC for product storage. There may be little or no storage space available on site. Plan to potentially store materials off site.
- D. Do not install damaged products. Remove damaged products from the site and replaced with new product at no cost to the Owner.

**1.13 PROJECT CLOSEOUT**

- A. Prior to final inspection and acceptance of the work, remove all debris, rubbish, waste material, tools, construction equipment, machinery and surplus materials from the project site and thoroughly clean your work area.
- B. Before the project closeout date, the Contractor shall submit:
  1. Warranty certificate.

2. Evidence of compliance with requirements of governing authorities such as the Low Voltage Certificate of Inspection.
  3. Project record documents.
  4. Instruction manuals and software that is a part of the system.
- C. Contractor shall submit written notice that:
1. Contract Documents have been reviewed.
  2. Project has been inspected for compliance with contract.
  3. Work has been completed in accordance with the contract

**PART 2 - PRODUCTS AND FUNCTIONAL REQUIREMENTS**

**2.1 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS**

- A. Furnish and install a complete and fully operational master antenna TV signal distribution system. Include all amplifiers, power supplies, cables, outlets, attenuators, antennas, and all other parts necessary for the reception and distribution of the off-the-air TV signals.
- B. Coordinate features and select components to form an integrated system. Match components and interconnections for optimum performance of specified functions.
- C. Distribute cable channels to all TV outlets to permit simple connection of EIA standard high definition television (HDTV) receivers.
- D. Deliver at all outlets all HDTV monochrome and color television signals without introducing noticeable effect on picture and color fidelity or sound. System picture fidelity shall be equal to that received from the cable company and other modulated channels.
- E. Provide reception quality at each outlet equal to or better than that received in the area with individual antennas. Deliver at all television outlets a minimum +6.0 dBmv (2,000 microvolts across 75 Ohms) and maximum of +20 dBmv (20,000 microvolts) for each channel at each outlet.
- F. Equipment: Modular type using solid-state components, fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz.
- G. Meet all FCC requirements regarding low radiation and/or interference of RF signal(s). The system shall be designed to prevent direct pickup of signals from the building structure.

- H. Weather-Resistant Equipment: Listed and labeled by an OSHA certified National Recognized Testing Laboratory (NRTL - i.e. UL) for duty outdoors or in damp locations.

## **2.2 SYSTEM DESCRIPTION**

- A. Provide an extension of the existing MATV system to new TV outlets. The Contractor shall continually employ interfacing methods that are approved by the OEM and VA. At a minimum, an acceptable interfacing method requires not only a physical and mechanical connection, but also a matching of signal, voltage, and processing levels with regard to signal quality and impedance. The interface point must adhere to all standards described herein for the full separation of Critical Care and Life Safety systems.
- B. It is not acceptable to utilize the telephone cable system for the control of MATV signals and equipment. The System Contractor shall connect the system ensuring that all NFPA and Underwriters Laboratory, Inc. (UL) Critical Care and Life Safety Circuit and system separation guidelines are satisfied. The System Contractor is not allowed to make any connections to the Telephone System.
- C. All passive distribution equipment shall meet or exceed -80 dB radiation shielding specifications and be provided with screw type audio connectors.
- D. All trunk, branch, and interconnecting cables and unused equipment ports or taps shall be terminated with proper terminating resistors designed for RF, audio and digital cable systems without adapters.
- E. The system shall utilize microprocessor components for all signaling and programming circuits and functions. System program memory shall be non-volatile or protected from erasure from power outages for a minimum of 30 minutes.
- F. Plug-in connectors shall be provided to connect all equipment, except coaxial cables and RF transmission line interface points. Coaxial cable distribution points and RF transmission lines shall use coaxial cable connections recommended by the cable OEM and approved by the system OEM. Base band cable systems shall utilize barrier terminal screw type connectors, at a minimum. As an alternate, crimp type connectors installed with a ratchet type installation tool are acceptable provided the cable dress, pairs, shielding, grounding, connections and labeling

are the same as the barrier terminal strip connectors. Tape of any type, wire nuts or solder type connections are unacceptable and will not be approved.

- G. All equipment faceplates utilized in the system shall be stainless steel, anodized aluminum or UL approved cycolac plastic for the areas where provided.
- H. Noise filters and surge protectors shall be provided for each equipment interface cabinet, Head End cabinet, control console and local and remote ampler locations to insure protection from input primary AC power surges and to insure noise glitches are not induced into low voltage data circuits.
- I. Audio Level Processing: The use of telephone cable to distribute MATV signals, carrying system or sub-system AC or DC voltage is not acceptable and will not be approved. Additionally, each control location shall be provided with the equipment required to insure the system can produce its designed audio channel capacity at TV/speaker identified on the contract drawings.
- J. Contractor is responsible for pricing all accessories and miscellaneous equipment required to form a complete and operating system. Unless otherwise noted in this Part, equipment quantities shall be as indicated on the drawings.

### **2.3 MANUFACTURERS**

- A. The products specified shall be new, FCC and UL Listed, and produced by OEM manufacturer of record. An OEM of record shall be defined as a company whose main occupation is the manufacture for sale of the items of equipment supplied and which:
  - 1. Maintains a stock of replacement parts for the item submitted,
  - 2. Maintains engineering drawings, specifications, and operating manuals for the items submitted, and
  - 3. Has published and distributed descriptive literature and equipment specifications on the items of equipment submitted at least 30 days prior to the Invitation for Bid.
- B. Specifications contained herein as set forth in this document detail the salient operating and performance characteristics of equipment in order for VA to distinguish acceptable items of equipment from unacceptable items of equipment. When an item of equipment is offered

or furnished for which there is a specification contained herein, the item of equipment offered or furnished shall meet or exceed the specification for that item of equipment.

- C. The equipment items are the salient requirements of VA to provide an acceptable system described herein.

#### **2.4 PRODUCTS**

- A. Provide riser rated coaxial cable with a nominal characteristic impedance of 75 Ohms throughout the entire frequency spectrum utilized in this system. Each reel of cable shall be sweep-tested and return-loss tested over the entire frequency range from 50MHz to 750MHz by the manufacturer. Provide RG-6, RG-11 or appropriate minimum .500" Hardline Coaxial cable as required to achieve the specified signal level. However, all runs over 150' in length shall be RG-11 or .500".
- B. Line Splitters:
1. Provide low-radiation line splitters with a flat frequency response from 50MHz to 1,000MHz. Provide units of a hybrid design with a 75-ohm match on input and outputs and a VSWR no greater than 1.4:1.
  2. Two way line splitters shall have a signal loss of not more than 3.5dB at each output.
  3. Four way line splitters shall have a signal loss of not more than 7.2dB at each output.
  4. All unused splitter outputs shall be terminated with 75-Ohm terminations.
- C. HDTV Outlets:
1. Provide outlets at each location shown on the plans. Mount in electrical contractor provided 4" square, 2" deep minimum flush electrical boxes as indicated on plans.
  2. Provisions shall be incorporated in the network to prevent 60 Hz AC or DC feedback into the distribution lines.
  3. Outlets shall be designed to cover a frequency range of 10MHz to 1,000MHz. Insertion loss shall not exceed 1.0 db at any frequency within the designated frequency range for a 17dB isolation network. Outlets shall be back-matched from 10 to 1,000MHz. Outlets shall have one F-type connector on the front and two F-type connectors on the rear.
  4. The minimum isolation value between any two outlets shall be 24 db.

D. Television Receivers shall be provided separately by the Owner.

**PART 3 - EXECUTION**

**3.1 PROJECT MANAGEMENT**

- A. Assign a single project manager to this project who will serve as the point of contact for the Owner, the General Contractor, and the Engineer.
- B. The Contractor shall be proactive in scheduling work at the hospital, specifically the Contractor will initiate and maintain discussion with the general contractor regarding the schedule for ceiling cover up and install cables to meet that schedule.
- C. Contact the Office of Telecommunications, Special Communications Team (0050P3B) at (301) 734-0350 to have a VA Certified Telecommunications COTR assigned to the project for telecommunications review, equipment and system approval and co-ordination with VA's Spectrum Management and OCIS Teams.

**3.2 COORDINATION WITH OTHER TRADES**

- A. Coordinate with the cabling contractor the location of the faceplate and the faceplate opening for the MATV backbox.
- B. Coordinate with the cabling contractor the location of MATV equipment in the Telecommunications Closets.
- C. Before beginning work, verify the location, quantity, size and access for the following:
  - Junction boxes, wall boxes, wire troughs, conduit stubs and other related infrastructure for the systems.
  - System components installed by others.
  - Overhead supports and rigging hardware installed by others.
- D. Immediately notify the Owner, General Contractor and Consultant in writing of any discrepancies.

**3.3 INSTALLATION**

- A. General:
  - 1. Execute work in accordance with National, State and local codes, regulations and ordinances.
  - 2. Install work neatly, plumb and square and in a manner consistent with standard industry practice. Carefully protect work from dust, paint and moisture as dictated by site conditions. The Contractor

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HINES, ILLINOIS

SECTION 27 41 31

MASTER ANTENNA TELEVISION EQUIPMENT AND SYSTEMS

- will be fully responsible for protection of his work during the construction phase up until final acceptance by the Owner.
3. Install equipment according to OEM's recommendations. Provide any hardware, adaptors, brackets, rack mount kits or other accessories recommended by OEM for correct assembly and installation.
  4. Secure equipment firmly in place, including receptacles, speakers, equipment racks, system cables, etc:
    - a. All supports, mounts, fasteners, attachments and attachment points shall support their loads with a safety factor of at least 5:1.
    - b. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.
    - c. Any suspended equipment or associated hardware must be certified by the OEM for overhead suspension.
    - d. The Contractor is responsible for means and methods in the design, fabrication, installation and certification of any supports, mounts, fasteners and attachments.
  5. Finishes for any exposed work such as plates, racks, panels, speakers, etc. shall be approved by the Architect, Owner and 0050P3B.
  6. Coordinate cover plates with field conditions. Size and install cover plates as necessary to hide joints between back boxes and surrounding wall. Where cover plates are not fitted with connectors, provide grommeted holes in size and quantity required. Do not allow cable to leave or enter boxes without cover plates installed.
- B. Wiring Practice - in addition to the mandatory infrastructure requirements outlined in VA Construction Specification, Section 27 00 00, LOW VOLTAGE COMMUNICATIONS SYSTEM & REQUIREMENTS, the following additional practices shall be adhered to:
1. Comply with requirements for raceways and boxes specified in Division 26, Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.
  2. Execute all wiring in strict adherence to the National Electrical Code, applicable local building codes and standard industry practices.

3. Where raceway is to be EMT (conduit), wiring of differing classifications shall be run in separate conduit. Where raceway is to be an enclosure (rack, tray, wire trough, utility box) wiring of differing classifications, which share the same enclosure, shall be mechanically partitioned and separated by at least 4 inches. Where Wiring of differing classifications must cross, they shall cross perpendicular to one another.
4. Do not splice wiring anywhere along the entire length of the run. Make sure cables are fully insulated and shielded from each other and from the raceway for the entire length of the run.
5. Do not pull wire through any enclosure where a change of raceway alignment or direction occurs. Do not bend wires to less than radius recommended by manufacturer.
6. Replace the entire length of the run of any wire or cable that is damaged or abraided during installation. There are no acceptable methods of repairing damaged or abraided wiring.
7. Use wire pulling lubricants and pulling tensions as recommended by the OEM.
8. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
9. Do not use tape-based or glue-based cable anchors.
10. Ground shields and drain wires as indicated by the drawings.
11. Field wiring entering equipment racks shall be terminated as follows:
  - a. Provide ample service loops at harness break-outs and at plates, panels and equipment. Loops should be sufficient to allow plates, panels and equipment to be removed for service and inspection.
  - b. Line level and speaker level wiring may be terminated inside the equipment rack using specified terminal blocks (see "Products"). Provide 15 percent spare terminals inside each rack. Microphone level wiring may only be terminated at the equipment served.
  - c. If specified terminal blocks are not designed for rack mounting, utilize 3/4 inch plywood or 1/8 inch thick aluminum plates/blank panels as a mounting surface. Do not mount on the bottom of the rack.

- d. Employ permanent strain relief for any cable with an outside diameter of 1 inch or greater.
12. Use only balanced audio circuits unless noted otherwise
13. Make all connections as follows:
  - a. Make all connections using rosin-core solder or mechanical connectors appropriate to the application.
  - b. For crimp-type connections, use only tools that are specified by the manufacturer for the application.
  - c. Use only insulated spade lugs on screw terminals. Spade lugs shall be sized to fit the wire gauge. Do not exceed two lugs per terminal.
  - d. Wire nuts, electrical tape or "Scotch Lock" connections are not acceptable for any application.
- C. Cable Installation - In addition to the mandatory infrastructure requirements outlined in VA Construction Specification, Section 27 00 00, LOW VOLTAGE COMMUNICATIONS SYSTEM & REQUIREMENTS the following additional practices shall be adhered to:
  1. Support cable on maximum 4'-0" centers. Acceptable means of cable support are cable tray, j-hooks, and bridal rings. Velcro wrap cable bundles loosely to the means of support with plenum rated Velcro straps. Plastic tie wraps are not acceptable as a means to bundle cables.
  2. Run cables parallel to walls.
  3. Install maximum of 10 cables in a single row of J-hooks. Provide necessary rows of J-hooks as required by the number of cables.
  4. Do not lay cables on top of light fixtures, ceiling tiles, mechanical equipment, or ductwork. Maintain at least 2'-0" clearance from all shielded electrical apparatus.
  5. All cables shall be tested after the total installation is fully complete. All test results are to be documented. All cables shall pass acceptable test requirements and levels. Contractor shall remedy any cabling problems or defects in order to pass or comply with testing. This includes the re-pull of new cable as required at no additional cost to the Owner.
  6. Ends of cables shall be properly terminated on both ends per industry and OEM's recommendations.

7. Provide proper temporary protection of cable after pulling is complete before final dressing and terminations are complete. Do not leave cable lying on floor. Bundle and tie wrap up off of the floor until you are ready to terminate.
  8. Cover the end of the overall jacket with a 1 inch (minimum) length of transparent heat-shrink tubing. Cut unused insulated conductors 2 inches (minimum) past the heat-shrink, fold back over jacket and secure with cable-tie. Cut unused shield/drain wires 2 inches (minimum) past the Heatshrink and serve as indicated below.
  9. Cover shield/drain wires with heat-shrink tubing extending back to the overall jacket. Extend tubing 1/4 inch past the end of unused wires, fold back over jacket and secure with cable tie.
  10. For each solder-type connection, cover the bare wire and solder connection with heat-shrink tubing.
  11. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
  12. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
  13. Bundle, lace, and train conductors to terminal points without exceeding OEM's limitations on bending radii. Install lacing bars and distribution spools.
  14. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
- D. Labeling:
1. Clearly, consistently, logically and permanently mark switches, connectors, jacks, relays, receptacles and electronic and other equipment.
  2. Engrave and paint fill all receptacle panels using 1/8 inch (minimum) high lettering and contrasting paint.
  3. For rack-mounted equipment, use engraved Lamacoid labels with white 1/8 inch (minimum) high lettering on black background. Label the front and back of all rack-mounted equipment.
  4. Where multiple pieces of equipment reside in the same rack group, clearly and logically label each indicating to which room, channel, receptacle location, etc. they correspond.

5. Permanently label cables at each end, including intra-rack connections. Labels shall be covered by the same, transparent heat-shrink tubing covering the end of the overall jacket. Alternatively, computer generated labels of the type which include a clear protective wrap may be used.
6. Contractor's name shall appear no more than once on each continuous set of racks. The Contractor's name shall not appear on wall plates or portable equipment.
7. Ensure each OEM supplied equipment has permanently attached/marked the appropriate UL Labels/Marks for the service the equipment is performed. Equipment installed not bearing these UL marks will not be allowed to be part of the system. The Contractor shall bear all costs required to provide replacement equipment with approved UL marks.

### **3.5 PROTECTION OF NETWORK DEVICES**

Contractor shall protect network devices during unpacking and installation by wearing manufacturer approved electrostatic discharge (ESD) wrist straps tied to chassis ground. The wrist strap shall meet OSHA requirements for prevention of electrical shock, should technician encounter high voltage.

### **3.6 CUTTING AND PATCHING**

- A. It shall be the responsibility of the contractor to keep their work area clear of debris and clean area daily at completion of work.
- B. It shall be the responsibility of the contractor to patch and paint any wall or surface that has been disturbed by the execution of this work.
- C. The Contractor shall be responsible for providing any additional cutting, drilling, fitting or patching required that is not indicated as provided by others to complete the Work or to make its parts fit together properly.
- D. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The

Contractor shall not unreasonably withhold from the Owner or a separate Contractor, the Contractor's consent to cutting or otherwise altering the work.

- E. Where coring of existing (previously installed) concrete is specified or required, including coring indicated under unit prices, the location of such coring shall be clearly identified in the field and the location shall be approved by the Project Manager prior to commencement of coring work.

### **3.7 FIREPROOFING**

- A. Where MATV cables penetrate fire rated walls, floors and ceilings, fireproof the opening.
- B. Provide conduit sleeves (if not already provided by electrical contractor) for cables that penetrate fire rated walls. After the cabling installation is complete, install fire proofing material in and around all conduit sleeves and openings. Install fire proofing material thoroughly and neatly. Seal all floor and ceiling penetrations.
- C. Use only materials and methods that preserve the integrity of the fire stopping system and its rating.

### **3.8 GROUNDING**

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, commonmode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.
- C. Install grounding electrodes as specified in Division 26, Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- D. Do not use "3rd or 4th" wire internal electrical system conductors for ground.
- E. Do not connect system ground to the building's external lightning protection system.
- F. Do not "mix grounds" of different systems.

## **PART 4 - TESTING/GUARANTEE/TRAINING**

### **4.1 SYSTEM CLASSIFICATION**

The HDTV MATV System is FCC and NFPA listed. Therefore, the following testing and guaranty provisions are the minimum to be performed and provided by the contractor and Warranted by the OEM.

**4.2 PROOF OF PERFORMANCE TESTING**

A. Intermediate Testing:

1. After completion of 25 - 30 percent of the installation of a head end cabinet(s) and equipment, one wing of HDTV MATV outlets and prior to any further work, this portion of the system must be pretested, inspected, and certified. Each item of installed equipment shall be checked to ensure appropriate FCC listing and UL certification labels are affixed, NFPA, Emergency, Safety, and JCAHCO guidelines are followed, and proper installation practices are followed. The intermediate test shall include a full operational test.
2. The inspection and test will be conducted by a factory-certified contractor representative and witnessed by a Government Representative. The results of the inspection will be officially recorded by a local Government Representative and maintained on file by the COTR, until completion of the entire project. The results will be compared to the Acceptance Test results. An identical inspection may be conducted between the 65 - 75 percent of the system construction phase, at the direction of the COTR.

B. Acceptance Test:

1. After the system has been pre-tested and the Contractor has submitted the pretest results and certification to the COTR, then the Contractor shall schedule an acceptance test date and give the COTR 30 days written notice prior to the date the acceptance test is expected to begin. The system shall be tested in the presence of a Government Representative and an OEM certified representative. The system shall be tested utilizing the approved test equipment to certify proof of performance and FCC compliance. The test shall verify that the total system meets all the requirements of this specification. The notification of the acceptance test shall include the expected length (in time) of the test.
2. The acceptance test shall be performed on a "go-no-go" basis. Only those operator adjustments required to show proof of performance shall be allowed. The test shall demonstrate and verify that the installed system does comply with all requirements of this specification under operating conditions. The system shall be rated

as either acceptable or unacceptable at the conclusion of the test. Failure of any part of the system that precludes completion of system testing, and which cannot be repaired in 4 hours, shall be cause for terminating the acceptance test of the system. Repeated failures that result in a cumulative time of 8 hours to affect repairs shall cause the entire system to be declared unacceptable. Retesting of the entire system shall be rescheduled at the convenience of the Government.

C. Acceptance Test Procedure:

1. Physical and Mechanical Inspection:

- a. The VACO Government Representative will tour all major areas where the system is and all sub-systems are completely and properly installed to insure they are operationally ready for proof of performance testing. A system inventory including available spare parts will be taken at this time. Each item of installed equipment shall be checked to ensure appropriate UL certification labels are affixed.
- b. The system diagrams, record drawings, equipment manuals, Telecommunications Infrastructure Plant (TIP) Auto CAD Disks, intermediate, and pretest results shall be formally inventoried and reviewed.
- c. Failure of the system to meet the installation requirements of this specification shall be grounds for terminating all testing.

2. Operational Test:

- a. The distribution system shall be checked at each interface, junction, and distribution point, first, middle, and last leg to verify that the HDTV MATV video, audio and control signals meets all system performance standards.
- b. Each HDTV MATV outlet shall be functionally tested at the same time utilizing the Contractor's approved hospital grade TV receiver and Spectrum Analyzer.
- c. Once these tests have been completed, each installed sub-system function shall be tested as a unified, functioning and fully operating system.
- d. Individual Item Test: The VACO Government Representative will select individual items of equipment for detailed proof of

performance testing until 100percent of the system has been tested and found to meet the contents of this specification. Each item shall meet or exceed the minimum requirements of this document.

3. Test Conclusion:

- a. At the conclusion of the Acceptance Test, using the generated punch list (or discrepancy list) the VA and the Contractor shall jointly agree to the results of the test, and reschedule testing on deficiencies and shortages with the COTR. Any retesting to comply with these specifications will be done at the Contractor's expense.
- b. If the system is declared unacceptable without conditions, all rescheduled testing expenses will be borne by the Contractor.

D. Acceptable Test Equipment:

1. The test equipment shall furnished by the Contractor shall have a calibration tag of an acceptable calibration service dated not more than 12 months prior to the test. As part of the submittal, a test equipment list shall be furnished that includes the make and model number of the following type of equipment as a minimum:
  - a. Spectrum Analyzer.
  - b. Signal Level Meter.
  - c. Volt-Ohm Meter.
  - d. Sound Pressure Level (SPL) Meter.
  - e. Oscilloscope.

**4.3 SYSTEM GUARANTEE PERIOD OF SERVICE**

A. Contractor's Responsibility:

1. The Contractor shall guarantee that all provided material and equipment will be free from defects, workmanship and will remain so for a period of one year from date of final acceptance of the system by the VA. The Contractor shall provide OEM's equipment warranty documents, to the COTR (or Facility Contracting Officer if the Facility has taken possession of the building), that certifies each item of equipment installed conforms to OEM published specifications.
2. The Contractor's maintenance personnel shall have the ability to contact the Contractor and OEM for emergency maintenance and

logistic assistance, remote diagnostic testing, and assistance in resolving technical problems at any time. This contact capability shall be provided by the Contractor and OEM at no additional cost to the VA.

3. All Contractor maintenance and supervisor personnel shall be fully qualified by the OEM and must provide 2 copies of current and qualified OEM training certificates and OEM certification upon request.
4. Additionally, the Contractor shall accomplish the following minimum requirements during the Two Year Guarantee Period:
  - a. Response Time during the Two Year Guarantee Period:
    - 1) The COTR (or Facility Contracting Officer if the system has been turned over to the Facility) is the Contractor's only official reporting and contact official for MATV system trouble calls, during the guarantee period.
    - 2) A standard work week is considered 8:00 A.M. to 5:00 P.M. or as designated by the COTR (or Facility Contracting Officer), Monday through Friday exclusive of Federal Holidays.
    - 3) If a HDTV MATV component failure cannot be corrected within 6 hours (exclusive of the standard work time limits), the Contractor shall be responsible for providing alternate HDTV MATV equipment. The alternate equipment/system shall be operational within a maximum of 18 hours after the 6 hour trouble shooting time and restore the effected location operation to meet the system performance standards. If any sub-system or major system trouble cannot be corrected within one working day, the Contractor shall furnish and install compatible substitute equipment returning the system or sub-system to full operational capability, as described herein, until repairs are complete.
  - b. Required On-Site Visits during the One Year Guarantee Period:
    - 1) The Contractor shall visit, on-site, as necessary, during the guarantee period, to perform system preventive maintenance, equipment cleaning, and operational adjustments to maintain the system according the descriptions identified in this document.

- 2) The Contractor shall arrange all Facility visits with the COTR (or Facility Contracting Officer) prior to performing the required maintenance visits.
- 3) Preventive maintenance shall be performed by the Contractor in accordance with the OEM's recommended practice and service intervals during non-busy time agreed to by the COTR (or Facility Contracting Officer) and Contractor.
- 4) The preventive maintenance schedule, functions and reports shall be provided to and approved by the COTR (or Facility Contracting Officer).
- 5) The Contractor shall provide the COTR (or Facility Contracting Officer) a type written report itemizing each deficiency found and the corrective action performed during each required visit or official reported trouble call. The Contractor shall provide the COTR with sample copies of these reports for review and approval at the beginning of the Acceptance Test. The following reports are the minimum required:
  - a) The Contractor shall provide a monthly summary all equipment and sub-systems serviced during this guarantee period to COTR (or Facility Contracting Officer) by the fifth (5th) working day after the end of each month. The report shall clearly and concisely describe the services rendered, parts replaced and repairs performed. The report shall prescribe anticipated future needs of the equipment and systems for preventive and predictive maintenance.
  - b) The Contractor shall maintain a separate log entry for each item of equipment and each sub-system of the system. The log shall list dates and times of all scheduled, routine, and emergency calls. Each emergency call shall be described with details of the nature and causes of emergency steps taken to rectify the situation and specific recommendations to avoid such conditions in the future.
- 6) The COTR (or Facility Contracting Officer) shall convey to the Facility Engineering Officer, 2 copies of actual reports for evaluation.

- a) The COTR (or Facility Contracting Officer) shall ensure a copy of these reports is entered into the system's official acquisition documents.
- b) The Facility Chief Engineer shall ensure a copy of these reports is entered into the system's official technical record documents.

B. Work Not Included: Maintenance and repair service shall not include the performance of any work due to improper use; accidents; other vendor, contractor, or owner tampering or negligence, for which the Contractor is not directly responsible and does not control. The Contractor shall immediately notify the COTR or Facility Contracting Officer in writing upon the discovery of these incidents. The COTR or Facility Contracting Officer will investigate all reported incidents and render

**4.4 TRAINING**

- A. Provide thorough training of the owner's engineering and maintenance staff.
- B. Provide the following minimum training times and durations:
  - 1. 24 hours prior to opening

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