

SECTION 27 41 31
MASTER ANTENNA TELEVISION EQUIPMENT AND SYSTEMS

SPEC WRITER NOTES:

1. Edit this specification section between //____//, to fit project, or delete if not applicable.
2. Contact VA's AHJ, Spectrum Management and COMSEC Service (SMCS 0050P2H3), (202-461-5310), for all technical assistance.
3. Included throughout this specification are references to system's interface capability and various related features. System designer must verify availability of this system and coordinate associated requirements and subsequent interfaces.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies a complete and operating National Television Standards Committee (NTSC) High Definition (HDTV) Master Antenna Television (MATV) system, hardware and associated equipment for VA //Medical Center, // Out Patient Clinic, // Nursing Home Care Unit, // Domiciliary, // or_____// here-in-after referred to as the "facility".
- B. Provide complete system including antennae, antennae mounts, lighting protection, head-end equipment, RF amplification and distribution systems splitters, taps, cross-connection blocks including panels and associated hardware, telecommunication outlets (TCO), coaxial distribution wires, power supplies, cables, connectors, "patch" cables and internal communications system ground, required for reception and distribution of // cable // off-the-air HDTV // analog // signals.
 1. RF Service.
 2. Analog Video Service.
 3. Analog Audio Service.

1.2 RELATED WORK

- A. System Tests: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Submittals (including samples, test reports, certificates, and manufacturers' literature): Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Sealant and caulking materials and their application around conduit penetrations through building envelope to prevent moisture migration into building: Section 07 92 00, JOINT SEALANTS.

- D. Electrical conductors and cables in electrical systems rated 600 V and below: Section 26 05 21, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).
- E. Wiring devices: Section 26 27 26, WIRING DEVICES.
- F. Lightning protection system: Section 26 41 00, FACILITY LIGHTNING PROTECTION.
- G. General electrical requirements that are common to more than one section in Division 27: Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- H. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.
- I. Conduits for cables and wiring: Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS.
- J. Low voltage cabling system infrastructure: Section 27 10 00, CONTROL, COMMUNICATION AND SIGNAL WIRING.
- K. Voice and data cable distribution system and associated equipment: Section 27 15 00, COMMUNICATIONS STRUCTURED CABLING.
- L. Nurse-Call and Code Blue Communication Systems and associated equipment: Section 27 52 23, NURSE CALL AND CODE BLUE SYSTEMS.

1.3 COORDINATION

- A. //Coordinate with Facility Chief of Medical Media Production Service (MMPS) to install baseband analog RF, video, and audio interface cables and circuits from each TR to designated TCO locations // and as shown on drawings.//
- B. //Coordinate with Facility Chief of MMPS to establish circuits throughout facility and provide proper test equipment to ensure that //analog RF//, video, and audio cables meet each OEM's standard transmission requirements, and ensure cables carry //analog// video and audio transmissions at required speeds, frequencies, and fully loaded bandwidth.//

1.4 SUBMITTALS

- A. In addition to requirements of Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS, submit PDF electronic copies for each of the following:
 - 1. Provide site drawing showing system grounding electrode connections and routing of grounding electrode conductors.

2. Pictorial layout drawing of each antenna, mount, lead-in and lightning ground connections, antenna head end equipment room, Demarc Room, TR Equipment Room show termination cabinets, each distribution cabinet and rack, user TCO locations and wire management practices.
3. Engineering drawings of system, showing calculated signal levels at each input and output distribution point, used to determine proposed TCO values.
4. Calculated system layout drawing indicating cable types, amplifiers, taps, splitters, lengths of cable //in "Tree", or// "Bus" Topology // .
5. Anticipated signal level at each coaxial cable TCO jack.
6. RF Cabling Requirements/Column Explanation:

Column	Explanation
FLOOR	Identify floor by number (i.e. 1st, 2nd, etc.)
TR ROOM NUMBER	Identify room, by number, from which cabling will be installed
TO FLOOR TR	Identify building, by number or location, to which cabling will be installed
NUMBER OF CONDUCTORS	Identify the number of conductors in each run of RF cable
INSTALLATION METHOD	Identify the method of installation
NOTES	Identify note numbers for special features or equipment
BUILDING MTR	Identify building by number or title //

7. Analog Video (and Audio) Cabling Requirements/Column Explanation:

Column	Explanation
FROM BUILDING	Identify building, by number or location, from which cabling will be installed
TR ROOM NUMBER	Identify the room, by number, from which cabling will be installed
TO BUILDING IMR	Identifies building, by number or title, to which cabling will be installed
TR ROOM NUMBER	Identify the room, by number, to which cabling will be installed
NUMBER OF CONDUCTORS	Identify the number of conductors in each run of cable
INSTALLATION METHOD	Identify method of installation
NOTES	Identify a note number for special

Column	Explanation
	features or equipment
BUILDING MTR	Identifies the building by number or title

8. Antenna Signal Survey:

a. Submit RF signal survey from recognized industry source, derived mathematically from fixed information, showing radiated and received RF signals at project and approximation of signal levels expected using given antenna.

1) Record findings on a geographic map with facility residing in its center and outline coverage locations, radiating in a 360-degree pattern. Depict primary, secondary, marginal and out of range areas of operation by different colors for each frequency of operation.

2) Include longitude and latitude of facility along with elevation above mean sea level using a Geostationary System (GPS) portable device.

3) An on-site survey, using actual transmitting and receiving equipment of type contractor is submitting, is an acceptable alternative to recognized industry source.

9. List of test equipment required by Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

B. Certifications:

1. Submit certification from OEM that MATV installation supervisor and maintenance provider are authorized representatives of OEM. Include each individual's legal name, address and OEM credentials in the certification that includes the most recent approval date.

2. Submit pre-acceptance certification in accordance with test procedures.

C. Needs Assessment Report: Provide a summary report of the needs assessment meeting conducted with nursing manager of each unit, as required by this section.

D. Provide sample copy of report format to be used for trouble calls; obtain COR approval of sample report before beginning total system acceptance test.

1.5 WARRANTY

A. In addition to compliance with FAR clause 52.246-21 provide OEM warranty documents certifying each item of equipment conforms to specifications and OEM installation recommendations.

- B. //Warrant system picture fidelity equal to that received from cable provider //and other modulated channels.//

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Design Criteria:

1. Coordinate features to provide components forming an integrated system. Match components and interconnections for optimum performance of specified functions.
2. Provide system with capacity to increase quantity of TCOs by 40 percent above indicated without adding any internal or external components or main trunk cable conductors.
3. Distribute HDTV television signal to MATV TCOs to permit simple connection of A/53 ATSC Digital Television Standard Parts 1-6 HDTV receivers.
4. Deliver at MATV TCOs HDTV //Analog// television channel signals.
5. Provide reception quality at each MATV TCO exceeding that received in area with individual antennas. Deliver minimum +6.0 dBmv (2,000 microvolts across 75 Ohms) and maximum of +20 dBmv (20,000 microvolts) for each HDTV channel at each MATV TCO.
6. Only employ interfacing methods accepted by OEM and VACO's AHJ (SMCS 0050P2H3). Selected interface or interconnecting methods require physical and mechanical connections, matching signal, voltage, processing levels and impedance that provides described signal levels and quality.
7. Interface // telephone, // RED, // Nurse Call, // PA, // and _____ // systems with system only as accepted by AHJ (SMCS 0050P2H3).
8. Provide passive distribution equipment to meet or exceed -80 dB radiation shielding specifications // and provide screw type audio connectors//.
9. Terminate trunk, branch, and interconnecting cables and unused equipment ports or taps with terminating resistors designed for RF, audio, and digital cable systems without adapters.
10. Utilize microprocessor components for signaling and programming circuits and functions. Use non-volatile system program memory, or protected from erasure during power outages for a minimum of 24 hours.

11. Provide UPS for system (including each distribution cabinet/point) to allow normal operation and function in event of an AC power failure or during input power fluctuations for a minimum of 30 minutes.
 12. Use coaxial cable connections recommended by cable OEM and approved by equipment OEM for coaxial cable distribution points and RF transmission lines.
 - a. Utilize barrier terminal screw type connectors, minimum at base band cable systems.
 - b. Crimp type connectors installed with a ratchet type installation tool are acceptable alternative if cable dress, pairs, shielding, grounding, connections and labeling are same as barrier terminal strip connectors.
 - c. Tape of any type, wire nuts or solder type connections are not permitted.
 13. Utilizing LAN/WAN cable systems for control, management and distribution of equipment and distribution of MATV signals is not permitted. Connect system ensuring NFPA Critical Care and Life Safety Circuit separation guidelines are satisfied. Connections to Telephone and LAN/WAN systems are not permitted.
 14. Telephone cable to distribute MATV signals, carrying system or sub-system AC or DC voltage is not permitted.
 15. Audio Level Processing: Provide control location equipment to ensure system produces audio channel capacity identified on drawings at each TV/speaker.
 16. Provide weather-resistant equipment listed by National Recognized Testing Laboratory (NRTL) for installation outdoors or in damp locations.
- B. Performance Criteria:
1. RF Service:
 - a. "Off air" RF High Definition (HDTV) //or Analog // Television service// (considered to be at RF (below 900 MHz in frequency bandwidth). RF television systems require backbone coaxial cable, from antenna farm to antenna head end room, and to each TR and distribution coaxial cable to each HDTV outlet location.
 - b. Isolation (outlet-outlet): 14 dB.
 - c. Impedance: 75 Ohms, unbalanced.
 - d. Signal Level: 10 dBmV, +/- 5.0 dBmV.

- e. Bandwidth: Minimum 6.0 MHz per channel fully loaded.
- 2. Analog Video Service: Baseband below 100 MHz in frequency bandwidth.
 - a. Isolation (outlet-outlet): Minimum 24 dB.
 - b. Impedance: 75 Ohm, unbalanced.
 - c. Output Level: 1.0 V peak to peak (P-P), for 87.5 percent depth of Modulation (Mod).
 - d. Diff Gain: ± 1.0 dB at 87.5 percent Mod.
 - e. Diff Phase: ± 1.5 at 87.5 percent Mod.
 - f. Signal to Noise (S/N) ratio: Minimum 44 dB.
 - g. Hum Modulation: -55 dB.
 - h. Return Loss: Maximum -14 dB or 1.5 Voltage Standing Wave Ratio (VSWR).
 - i. Bandwidth: Minimum 6.0 MHz per channel, fully loaded.
- 3. Analog Audio Service: is baseband below 10 MHz in frequency bandwidth. Analog audio circuits require separate audio connectors and video connectors even though both are considered baseband signals. Each TCO has multiple 600 (or 120) Ohm BAL line pairs.

SPEC WRITER NOTE:

- 1. Analog audio circuit may be designated to one of the provided pairs of UTP or STP for each TCO and as shown on drawings, instead of providing a separate baseband audio run to TCO.
 - a. Impedance: 600 Ohm, BAL
 - b. Input Level: Minimum 59 mV RMS.
 - c. Output Level: 0 dBm.
 - d. S/N ratio: Minimum 55 dB.
 - e. Hum Modulation: Minimum -50 dB.
 - f. Return Loss: Maximum -14 dB (or 1.5 VSWR).
 - g. Isolation (outlet-outlet): Minimum 24 dB.
 - h. Frequency Bandwidth: Minimum 100 Hz - 10 KHz.
- C. Provide accessories and miscellaneous equipment for a complete and operating HDTV // analog // system.
- D. Equipment:
 - 1. Modular type rated for continuous duty.
 - 2. Provide NRTL Listed equipment by OEM that is a commercial business enterprise manufacturing items of equipment and which:
 - a. Maintains replacement parts for equipment in stock,
 - b. Maintains engineering drawings, specifications, and operating manuals for equipment.

c. Published and distributed descriptive literature and equipment specifications on equipment submitted 30 days prior to Invitation for Bid.

E. For protection from input power surges and to ensure noise is not induced into circuits, provide noise filters and surge protectors for each equipment interface, distribution and head end cabinet, control console, and local and remote amplifier locations. Provide lightning/surge suppression of the antenna farm and ground per NEC article 810.

F. Provide stainless steel, //anodized aluminum// or AHJ (SMCS 0050PO2H3) accepted faceplates.

2.2 ANTENNA EQUIPMENT (OR ANTENNA FARM)

A. Provide antennae and associated equipment to distribute the following over the air television channels to MATV distribution system:

SPEC WRITER NOTE:

1. Edit channels per local over the air broadcast station availability.

Virtual Channel	Physical RF Channel	Call Sign	Network
//4	48	WRC-TV	NBC //
//5	36	WTTG	Fox //
//7	7	WJLA-TV	ABC //
//9	9	WUSA	CBS //
//14	15	WFDC-DT	UNI //
//20	35	WDCA	MNT //
//26	27	WETA-TV	PBS //
//30	24	WNVC	ETV //
//			//
//			//
//			//

B. Provide heavy duty antennas and supports designed to withstand local wind loads and adverse environmental conditions.

1. Provide molded rubber weather boots //or thick coats of waterproofing compound// to protect connectors from moisture. Tape will not be allowed.

C. Antenna:

1. Provide ruggedized Broadband UHF antenna made of noncorrosive material cut to narrowest bands in which specified channels fall.
 2. Provide one spare UHF antenna per channel specified.
 3. Technical Characteristics:
 - a. Gain: 11 dB.
 - b. F/B Ratio: 20 dB.
 - c. VSWR: 1.5:1 Maximum.
 - d. Connectors: "F" or "N"
 - e. Impedance: 75 Ohm.
 - f. Wind Speed: Capable to withstand minimum 200 km/h (125 MPH) winds without damage along with 6.4 mm (1/4 inch) radial ice.
- D. Preamplifier:
1. Low noise UHF Broadband amplification.
 2. Enclosed in weatherproof aluminum housings.
 3. Capable of mounting on antenna mast.
 4. Operating temperature: minus 30 to plus 60 degrees Celsius (minus 20 to plus 140 degrees Fahrenheit).
 5. Integral NRTL labeled lightning surge protection.
 6. Provide one spare UHF antenna preamplifier.
 7. Technical Characteristics:
 - a. Response: ± 1.0 dB across 10 MHz.
 - b. Noise Figure: Maximum 6 dB.
 - c. Gain: Minimum 22 dB.
 - d. Return Loss: 14 dB.
 - e. Connectors: "F".
 - f. Impedance: 75 Ohm.
- E. Antenna Mast:
1. Material: Thick-walled hot dipped galvanized steel.
 2. Minimum Inside Diameter: 38 mm (1-1/2 inches).
 3. Lightning Protection: Provide clamp for bonding #4 AWG stranded copper conductor to earth ground.
 4. Wind Load: 200 km/h (125 MPH).
 5. Environmental Conditions: withstand 6.4 mm (1/4 inch) radial ice.
- F. Lightning Arrestor: Noncorrosive metal grounding block assembly bonding antenna coaxial cable shield to earth ground for lightning protection with #4 AWG stranded copper conductor.
- G. //Antenna Tower://

1. // Material: Heavy duty tower minimum 32 mm (1-1/4 inches) outside diameter hot dipped galvanized steel tubing built on an equilateral triangle design with cross bracing throughout. //
2. // Lightning protection: Provide clamp for #10 AWG stranded copper conductor bond to earth ground. //
3. // Wind load: 200 km/h (125 MPH). //
4. // Environmental conditions: Able to withstand 6.4 mm (1/4 inch) radial ice. //

2.3 HEAD END EQUIPMENT AND ROOM

A. RF Amplifier, Broadband:

1. Rack mount.
2. AGC controlled with adjustable gain.
3. NRTL listed for continuous operation with lightning protection.
4. No out of band channel interference (noise) output without signal input.
5. Provide integral aural carrier reducer (ACR).
 - a. Response: ± 1 dB across 6 MHz.
 - b. Noise Figure: Maximum 6 dB.
 - c. Output Capability: Minimum +60 dBmV.
 - d. Gain: Minimum 40 dB.
 - e. Skirt Sharpness: -25 dB ± 0 MHz (Channel Center).
 - f. AGC Range: Maximum 1 dB output change for ± 10 dB.
 - g. Return Loss: 14 dB.
 - h. Connectors: "F".
 - i. Impedance: 75 Ohm.

B. Channelized Agile Audio/Video Modulators:

1. Provide factory-assembled channelized audio/video modulator for each outbound local origination channel to create a line up from off-air // and cable feeds// for coaxial cable distribution.
2. Utilize triple output modulator to conserve rack space.
3. Provide Emergency Alert System (EAS) program switching so when EAS is invoked, all QAM and IP output programs are interrupted to display EAS message.
4. NRTL listed for continuous operation.
5. Technical Characteristics:
 - a. Channel Bandwidth: 6 MHz \pm dB
 - b. Noise Figure: Maximum 14 dB.
 - c. Conversion Gain: 6 dB.

- d. Spurious Outputs: -55 dB.
 - e. Oscillator Stability: ± 25 KHz.
 - f. Connectors: "F".
 - g. Impedance: 75 Ohm.
- C. Channel Processor:
- 1. Agile analog heterodyne processor to accept one Analog RF input (CATV sub-band channels T7-T13, CATV standard channels 2-135, VHF channels 2-13, and UHF channels 14-69) and deliver one Analog RF output on an unused channel (CATV standard channels 2-135) without causing interference.
 - 2. NRTL listed.
 - 3. Supports Closed Captioning (EIA-608).
 - 4. Rack mount.
 - 5. Technical Characteristics:
 - a. Response: ± 1.0 dB across 6 MHz
 - b. Noise Figure: VHF 9 dB Max. UHF 12 dB Max.
 - c. Oscillator Stability: ± 25 KHz
 - d. AGC: Maximum 1 dB output change for ± 10 dB input change.
 - e. Adjacent Video Carrier.
 - f. Out of band Products: -55 dB.
 - g. Rejection: 40 dB.
 - h. Output Capability: 42 dBmV
 - i. Gain: Minimum 40 dB.
 - j. Connectors: "F".
 - k. Impedance: 75 Ohm.
- D. Active Mixer/Combiner:
- 1. Provide one output from a minimum of 6 isolated inputs.
 - 2. Provide three spare inputs.
 - 3. Rack mount.
 - 4. Technical Characteristics:
 - a. Frequency Range: 50 - 300 MHz.
 - b. Gain: Minimum 15 dB.
 - c. Output: Minimum 52 dB.
 - d. Isolation: 25 dB.
 - e. Connectors: "F".
 - f. Impedance: 75 Ohm.
- E. Single Channel Bandpass Filter:
- 1. Permit adjacent channel operation.

2. Rack mount.
3. Technical Characteristics:
 - a. Insertion Loss: Maximum 8 dB.
 - b. Skirt Selectivity:
 - 1) Upper Adj; Picture Carrier: -30 dB
 - 2) Lower Adj Sound Carrier: -40 dB
 - c. Return Loss: 14 dB.
 - d. Bandpass: 6 MHz \pm 1 dB.
 - e. Connectors: "F".
 - f. Impedance: 75 Ohm.

F. Notch filters:

1. High 'Q' Trap.
2. Rack mount.
3. Technical Characteristics:
 - a. Signal Rejection: 40 dB.
 - b. Insertion Loss: Maximum 3 dB.
 - c. Connectors: "F".
 - d. Impedance: 75 Ohm.

2.4 DISTRIBUTION EQUIPMENT

SPEC WRITER NOTE:

1. Specifications contained herein detail salient operating and performance characteristics of equipment for system. If there is no specification indicated herein, for required equipment contact SMCS 0050P2H3, through COR, for official technical determination.//

A. Distribution Devices:

1. Distribution Amplifiers:
 - a. Description: Broadband, very low distortion, cable television system quality, HDTV distribution amplifier.
 - b. Characteristics:
 - 1) Frequency Range: 49MHz to 1,000MHz.
 - 2) Channel Loading: 150.
 - 3) Flatness: +/-0.75dB.
 - 4) Gain: 32dB.
 - 5) Output Level: +40dBmV.
 - 6) Gain Control Range: 10dB.
 - 7) Slope Control Range: 8dB.
 - 8) Plug in Equalizers: As needed.

- 9) Attenuator Options: As needed.
- 10) Programming: Minimum 35 HDTV channels.
- 11) Gain of the Preamplifier: 32dB, with an output level of 48dBmV for each HDTV channel processed.
- 12) Amplifier Module: Hybrid push-pull.
- 13) Gain and Slope Control Ranges: 8dB and 9dB, respectively.

B. Combiners:

- 1. Provide 8-port passive combiner for combining RF signals into one main trunk run for distribution to building locations.
- 2. Bandwidth of Combiner: 0 to 1,000 MHz.

C. Cable:

- 1. Provide RG-6, RG-11, or appropriate hardline minimum 13 mm (1/2 inch) coaxial cable to achieve specified signal level.
 - a. Provide RG-11 or 13 mm (1/2 inch) hardline coaxial cable for runs over 45.72 m (150 feet) in length.
 - b. Provide plenum //riser// rated coaxial cable with a nominal characteristic impedance of 75 Ohms throughout entire frequency spectrum utilized in this system.
- 2. Sweep-test and return-loss test each reel of cable, over frequency range 50 MHz to 750 MHz, at manufacturer prior to shipping.
- 3. Trunk Cable:
 - a. Description: 13 mm (1/2 inch), semi-rigid coax, riser rated.
 - b. Maximum Attenuation:
 - 1) 2.92 dB/100ft at 700 MHz.
 - 2) 3.78 dB/100ft at 1000 MHz.
 - 3) Impedance: 75 Ohm.
- 4. RG6 Cable:
 - a. Description: RG6 double shielded cable //CMR or// CMP Rated
 - b. Attenuation:
 - 1) 1.48 dB/100ft at 50 MHz.
 - 2) 7.45 dB/100ft at 1000 MHz.
 - 3) Impedance: 75 Ohm.
- 5. //General Purpose Analog RF:
 - a. Size:
 - 1) Minimum coaxial cable size RG-6 type (or equal).
 - 2) Increase size (i.e. RG-11, 13 mm (1/2 inch), 19 mm (3/4 inch), etc.) to meet system design signal level.
 - 3) Use for baseband signals as approved by OEM.

- b. Technical Characteristics:
 - 1) Impedance: 75 Ohm, unbalanced.
 - 2) Center Conductor: 20 AWG, solid or stranded copper, or copper plated steel or aluminum.
 - 3) Dielectric: Cellular polyethylene.
 - 4) Shield Coverage: 95 percent, copper braid.
 - 5) Connector Type: BNC or UHF.
 - 6) Attenuation:
 - a) Frequency 10 kHz: Maximum 0.20 dB/30.5 M (100 ft.)
 - b) Frequency 100 kHz: Maximum 0.22 dB/30.5 M (100 ft.)
 - c) Frequency 1 MHz: Maximum 0.25 dB/30.5 M (100 ft.)
 - d) Frequency 4.5 MHz: Maximum 0.85 dB/30.5 M (100 ft.)
 - e) Frequency 10 MHz: Maximum 1.40 dB/30.5 M (100 ft.)
 - f) Frequency 100 MHz: Maximum 5.00 dB/30.5 M (100 ft.)
- 6. RG11 Cable:
 - a. Description: RG11 cable //CMR or// CMP Rated.
 - b. Attenuation:
 - 1) 0.90 dB/100ft at 50 MHz.
 - 2) 5.04 dB/100ft at 1000 MHz.
 - 3) Impedance: 75 Ohm.
- D. Line Splitters:
 - 1. Provide low-radiation line splitters with a flat frequency response from 50 MHz to 1,000 MHz. 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. Provide two-way line splitters with signal loss of not more than 3.5 dB at each output.
 - 3. Provide four-way line splitters with signal loss of not more than 7.2 dB at each output.
 - 4. Terminate unused splitter outputs with 75-Ohm terminations.
- E. RF signal splitters:
 - 1. Frequency Range: 5MHz to 900MHz.
 - 2. Outputs: 2, 3, 4 and 8.
 - 3. Splitter Loss: less than 12 dB.
 - 4. RFI Shielding: 120 dB.
- F. HDTV Outlets:
 - 1. Provide HDTV outlets at each location shown. Install outlets in 10.2 cm (4 inch) square, 5.1 cm (2 inch) deep minimum flush electrical boxes.

2. Incorporate provisions in the network to prevent 60 Hz AC or DC feedback into distribution lines.
3. Outlets:
 - a. Frequency Range: 10 MHz to 900 MHz, minimum
 - b. Insertion Loss: less than 1.0 dB at any frequency within designated frequency range for a 17 dB isolation network.
 - c. Back-matched from 10 to 1,000 MHz.
 - d. One F-type //BNC or _____// connector on front and two F-type //BNC or _____// connectors on rear.
 - e. Minimum Isolation Value between any Two Outlets: 24 dB.
- G. Taps:
 1. Description: Directional coupler type taps.
 2. Rated for installation in TR or accessible area of cable tray.
 3. Frequency Range: 5 MHz to 900 MHz.
 4. Outputs: 2, 4 and 8.
- H. Wall plates and Bulkhead Connectors:
 1. Provide wall plates for termination of CATV signals at television sets.
 2. Impedance: 75 Ohms.
 3. Frequency Band: SUB/VHF/CATV-HDTV/UHF.
- I. Combiners, Traps, and Filters; and Passive Devices such as Splitters, Couplers, "Patch" Cables, or Devices:
 1. Use coaxial cable connections recommended by cable OEM and approved by system OEM for coaxial cable distribution points and RF transmission lines.
 - a. Utilize barrier terminal screw type connectors minimum at base-band cable systems.
 - b. Crimp type connectors installed with a ratchet type installation tool are an acceptable alternative if cable dress, pairs, shielding, grounding, connections and labeling are provided same as barrier terminal strip connectors.
 - c. Tape of any type, wire nuts, or solder type connections are not permitted.
 2. Analog RF terminating panels:
 - a. "Patch" Type:
 - 1) 48.26 cm (19 inches) EIA/ECA 310-E rack dimensions.
 - 2) Minimum 12 double female "F" connector rows.

- 3) Expansion capability of a maximum of 24 double row "F" slots that can be field activated.
 - 4) In a lockable cabinet or enclosure. //Stacking of "patch" panels is permitted if installation guidelines are met. //
3. "Patch" Cords:
- a. //Analog RF: //
 - 1) // Provide a connection cable for each TCO analog RF connector in system with 10 percent spares. Provide analog RF connection cable of length to connect analog RF instrument to TCO analog RF jack. //
 - 2) // Technical Characteristics: //
 - a) // Length: Minimum 1.8M (6 ft.). //
 - b) // Cable: Minimum flexible RG-6. //
 - c) // Connector: "F" male on each end. //
- J. //Analog Video: //
- 1. // Provide a connection cable for each TCO analog video jack in system with 10 percent spares. Provide analog video connection cable of length to connect analog video instrument to TCO analog RF jack. //
 - 2. // Technical Characteristics: //
 - a. // Length: Minimum 1.8M (6 ft.). //
 - b. // Cable: Minimum flexible RG-59/U. //
 - c. // Connector: BNC male on each end. //
- K. System Connectors:
- 1. Solderless (Forked Connector):
 - a. Crimp-on coupling for quick connect/disconnect of wires or cables.
 - b. Designed to fit wire or cable.
 - c. Insulated and color-coded connector barrel.
 - d. Technical Characteristics:
 - 1) Impedance: As required.
 - 2) Working Voltage: 500 V.
 - 2. Multipin:
 - a. Crimp-on coupling for quick connect/disconnect of wires or cables.
 - b. Designed to fit wire or cable.
 - c. Enclosed and shielded housing.
 - d. Secure to cable group by screw type compression sleeves.

- e. Technical Characteristics:
 - 1) Impedance: As required.
 - 2) Working Voltage: 500 V.
 - 3) Number of Pins: As required, Minimum 25 pairs.
- 3. //"BNC" Type:
 - a. Bayonet locking coupling for quick connect/disconnect of coaxial cable/terminations.
 - b. Crimp-on (twist on are acceptable) connector designed to fit coaxial cable.
 - c. Technical Characteristics:
 - 1) Impedance: 50 or 75 Ohms, unbalanced.
 - 2) Working Voltage: 500 V. //
- 4. "F" Type Connectors:
 - a. Coaxial cable connectors and connector inserts designed to provide maximum performance with cable to be used.
 - b. Hex type crimp or a "Snap and Seal" type connectors. Use Housing to housing (KS to KS) type or 90-degree type connectors where specified by OEM.
 - c. Screw type coupling for quick connect/disconnect of coaxial cable/terminations.
 - d. Crimp-on connector designed to fit coaxial cable with integral 12.7 mm (1/2 inch) ferrule.
 - e. Technical Characteristics:
 - 1) Impedance: 75 Ohms, unbalanced.
 - 2) Working Voltage: 500 V.
 - f. Coaxial cables connected with head end quality 360 degree F or BNC connectors as applicable, meeting or exceeding standard industry and cable manufacture's specifications.
- L. Terminators:
 - 1. Coaxial:
 - a. Description: 75-Ohm terminator.
 - b. Metal-housed precision types in frequency ranges selected. Screw-on type that has low VSWR when installed and proper impedance to terminate system unit or coaxial cable.
 - c. Technical Characteristics:
 - 1) Frequency: 0-1 GHz.
 - 2) Power Blocking: As required.
 - 3) Return Loss: 25 dB.

- 4) Connectors: Minimum "F", "BNC".
- 5) Impedance: 75 Ohms, unbalanced.
- 6) DC blocking.
- 7) Bandwidth: 50 MHz-890 MHz.

M. Mounting Strips and Blocks:

1. Barrier Strips for AC Power, and Control Cable or Wires:
 - a. Accommodate size and type of audio spade (or fork type) lugs used with insulating and separating strips between terminals for securing separate wires in an orderly fashion.
 - b. Provide each cable or wire end with an audio spade lug, connected to individual screw terminal on barrier strip.
 - c. Surface secured to a console, cabinet, rail, panel, etc.
 - d. 120 VAC power wires are not permitted to be connected to signal barrier strips.
2. Technical Characteristics:
 - a. Terminal Size: Minimum 6-32.
 - b. Terminal Count: Any combination.
 - c. Wire size: Minimum 20 AWG.
 - d. Voltage Handling: Minimum 100 V.
 - e. Protective Connector Cover: Required for Class II and 120 VAC power connections.

N. Coaxial Cable Kit: Coaxial connectors, cable tying straps, heat shrink tabbing, hangers, clamps, etc., required to accomplish neat and secure installation.

1. Solderless Connectors: Install crimp-on connector using a standard F connector crimping tool.
2. Cables: Connectors designed for specific size cable being used and installed with OEM's approved installation tool. Typical system cable connectors include; but, are not limited to F, N, BNC, etc.

O. Communication Ground System: provide this system to conform to Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS.

2.5 TOPOLOGY "TREE" //, OR "BUS" //

- A. //Provide Analog RF coaxial cable distribution system in a "home run" configuration from each associated riser TR to identified locations and as shown on drawings. //
- B. //Provide an analog RF coaxial cable trunk system. Provide a minimum of two coaxial cables between head end and each riser patch panel to comprise an individual circuit as designated and as shown on drawings.

Provide Additional analog RF coaxial cables as system design dictates and as shown on drawings. //

- C. //Connect analog RF coaxial trunk-line systems between each riser "bottom" row of "F" connectors and terminate on TR patch panel "top" row of "F" connectors. Provide minimum of six coaxial cables in riser trunk-line system. //
- D. //Connect analog RF coaxial cabling systems between each TR and terminate on patch panel "top" row of "F" connectors. Additionally terminate each horizontal distribution analog RF coaxial cable on "bottom" row of "F" connectors of same panel. //
- E. //Provide dedicated analog RF coaxial cables from "bottom" row of "F" connectors of appropriate TR patch panel where "input" connections were made, to each floor TCO in "home run" configuration and in quantity to accommodate TCO's served by TR distribution cable system. Provide analog RF coaxial cables for each TCO circuit and as shown on drawings. //
- F. // Connect one end of each coaxial RF cable to a female "F" connector at each TCO, and at other locations on drawings, and opposite end to a bottom row "F" connector on patch panel in TR serving the area. Contractor is not to "interconnect" backbone with coaxial RF distribution cables or provide active RF distribution equipment. //
- G. //Analog RF Service: Broadcast RF, or "off air television", analog service is RF below 900 MHz in frequency bandwidth. RF television circuits require a single coaxial cable plant from head end to each TR location.
 - 1. Isolation (outlet-outlet): 14 dB
 - 2. Impedance: 75 Ohms, Unbalanced.
 - 3. Signal Level: 10 dBmV + 5.0 dBmV.
 - 4. Bandwidth: 6.0 MHz per channel, fully loaded.//
- H. //Closed Circuit Analog Video Service:
 - 1. // Analog video service is baseband (below 100 mHz in frequency bandwidth).
 - 2. // Analog video circuits require a separate analog video from audio connector. //
 - 3. // Minimum operating parameters over each installed analog video circuit:
 - a. // Impedance: 75 Ohm, unbalanced. //

- b. // Output Level: 1.0 V peak to peak (P-P), for 87.5 percent depth of Modulation (Mod). //
 - c. // Diff Gain: ± 1 dB at 87.5 percent Mod. //
 - d. // Diff Phase: ± 1.5 at 87.5 percent Mod. //
 - e. // Signal to Noise (S/N) Ratio: Minimum 44 dB. //
 - f. // Hum Modulation: -55 dB. //
 - g. // Return Loss: Maximum -14 dB (or 1.5 Voltage Standing Wave Ratio VSWR). //
 - h. // Isolation (outlet-outlet): Minimum 24 dB. //
 - i. // Bandwidth: Minimum 6.0 MHz per channel, fully loaded. //
- I. //Closed Circuit Analog Audio Service: //
- 1. // Analog audio service is baseband (below 10 mHz in frequency bandwidth). //
 - 2. // Analog audio circuits require separate audio connectors and video connectors even though both are baseband signals.
 - 3. // Each TCO has multiple 600 (or 120) Ohm BAL line pairs, therefore analog audio circuits can be designated to one of the provided pairs of UTP //or STP// for each TCO.
 - 4. // Minimum operating parameters of analog audio circuit (NOT TELEPHONE VOICE): //
 - a. // Impedance: 600 Ohm, BAL. //
 - b. // Input Level: Minimum 59 mV RMS. //
 - c. // Output Level: 0 dBm. //
 - d. // S/N ratio: Minimum 55 dB. //
 - e. // Hum Modulation: Minimum -50 dB. //
 - f. // Return Loss: Maximum -14 dB (or 1.5 VSWR). //
 - g. // Isolation (outlet-outlet): Minimum 24 dB. //
 - h. // Frequency Bandwidth: Minimum 100 Hz - 10K Hz. //
- J. Interface analog RF "F", video "BNC", and audio "XL" jacks to appropriate patch panels in associated TR. Do not cross-connect analog cables in TRs to analog equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordinate with cabling trade contractor locations of faceplates and faceplate openings for MATV back boxes.
- B. Coordinate with cabling trade contractor locations of MATV equipment in the Telecommunications Rooms.

- C. Before beginning work, verify location, quantity, size and access for the following:
 - 1. Isolated ground AC power circuits required for equipment.
 - 2. Emergency and auxiliary AC power generator requirements.
 - 3. Pull boxes, wall boxes, wire troughs, conduit stubs and other related infrastructure for systems.
 - 4. System components provided by others.
 - 5. Overhead supports and rigging hardware installed by others.
- D. Immediately notify COR and General Contractor of discrepancies.
- E. //Needs Assessment:
 - 1. Provide a one-on-one meeting with nursing manager of each unit affected by installation of new HDTV MATV system.
 - 2. Review floor plans, educate nursing manager with functions of the equipment that is being provided, and gather details specific to individual units; coverage and priorities of calls; staffing patterns; and other pertinent details that affect system programming and training.//

3.2 INSTALLATION

- A. General:
 - 1. Install for ease of operation, maintenance, and testing.
 - 2. Install work neatly, plumb and square and in a manner consistent with standard industry practice.
 - 3. Install system to prevent direct pickup of signals from building structure and follow FCC requirements regarding low radiation or interference of RF signals.
 - 4. Protect work from dust, paint and moisture as dictated by site conditions.
 - 5. Contractor is responsible for protection of work during construction phase up until final acceptance by Government.
 - 6. 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.
 - 7. Secure equipment firmly in place, including equipment racks, system cables, etc:
 - a. Install supports, mounts, fasteners, attachments and attachment points to support their loads with a safety factor of 5:1 or better.

- b. Do not impose weight of equipment on supports provided for other trades or systems.
 - c. Suspended equipment or associated hardware must be certified by OEM for overhead suspension.
- 8. Locate overhead ceiling-mounted equipment as shown on drawings, with minor changes not to exceed 12 inches in any direction.
 - a. Mount transformers securely to brackets or enclosures using screws.
 - b. Adjust torsion springs as needed to securely support assembly.
 - 9. Install Analog RF coaxial cable distribution systems in a "home run" configuration from each associated riser TR to identified locations and as indicated on drawings.
 - 10. Coordinate finishes for any exposed work such as plates, racks, panels, speakers, etc. with design professional, Government and 0050P3B.
 - 11. Coordinate cover plates with field conditions. Size and install cover plates to cover spaces between back boxes and surrounding wall.
 - 12. Do not allow cable to leave or enter boxes without cover plates installed. Where cover plates are not fitted with connectors, provide grommeted holes in size and quantity required.
- B. Equipment Racks:
- 1. Fill unused equipment mounting spaces with blank panels or vent panels. Match color to equipment racks.
 - 2. Provide security covers for devices not requiring routine operator control.
 - 3. Follow manufacturer's recommendations regarding ventilation space between amplifiers. Provide adequate ventilation space between equipment for cooling. Provide vent panels and cooling fans for operation of equipment within OEM specified temperature limits.
 - 4. Provide insulated connections of electrical raceway from equipment racks.
 - 5. Provide continuous raceway and conduit for cable with no more than 40 percent fill between wire troughs and equipment racks. Ensure systems are mechanically separated from each other in wireway.
- C. Wiring Practice:

1. Comply with requirements for raceways and boxes specified in Division 26, Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.
2. Where raceway is conduit, install wiring of differing classifications in separate conduits. Where raceway is to be in an enclosure (e.g. rack, tray, wire trough, utility box, install wiring of differing classifications, sharing same enclosure, with mechanical partition and separate by at least 4 inches. Where Wiring of differing classifications must cross, cross wires perpendicular to one another.
3. Do not splice cabling anywhere along entire length of run. Ensure cables are insulated and shielded from each other and from the raceway for entire length of run.
4. 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.
5. Replace entire length of run of any wire or cable that is damaged or abraded during installation. There are no acceptable methods of repairing damaged or abraded wiring.
6. Use wire pulling lubricants suitable for cable jacket and do not exceed pulling tension recommended by OEM.
7. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
8. Do not use tape-based or glue-based cable anchors.
9. Bond shields and drain wires to ground.
10. Terminate field wiring entering equipment racks as follows:
 - a. Provide ample service loops at harness break-outs and at plates, panels and equipment. Loops must be of length to allow plates, panels and equipment to be removed for service and inspection.
 - b. Where terminal blocks are not designed for rack mounting, utilize 19 mm (3/4 inch) plywood or 3 mm (1/8 inch) thick aluminum plates/blank panels as a mounting surface. Do not mount on bottom of rack.
 - c. Employ permanent strain relief for any cable with an outside diameter of 25 mm (1 inch) or greater.
11. Make connections using rosin-core solder or mechanical connectors appropriate to application.

- a. For crimp-type connections, use only tools that are specified by manufacturer for the application.
 - b. Use only insulated spade lugs on screw terminals sized to fit wire gauge; do not exceed two lugs per terminal.
 - c. Twist-on wire connectors or electrical tape connections are not permitted for any application.
- D. Cable Installation:
1. Support cable on maximum 122 cm (4 feet) centers. Acceptable means of cable support are cable tray and conduit (EMT, Flexible Metallic Tubing, and Communications Raceway). Attach cable bundles loosely to cable trays with plenum rated hook and loop straps. Tie wraps are not permitted as a means to bundle.
 2. Run cables parallel to walls.
 3. Do not lay cables on top of luminaires, ceiling tiles, mechanical equipment, or ductwork. Maintain minimum 61 cm (2 feet) clearance from shielded electrical apparatus.
 4. Test cables after the total installation is complete. Test results must document cables pass test requirements and levels. Remedy cabling problems or defects to pass testing, including installation of new cable as required.
 5. Terminate ends of cables on both ends, per industry and OEM's recommendations.
 6. Provide proper temporary protection of cable after pulling is complete and until final dressing and terminations are complete. Do not leave cable lying on floor. Bundle and tie cables up off of the floor until ready to terminate.
 7. //Cover end of overall jacket with a minimum 25 mm (1 inch) length of transparent heat-shrink tubing. Cut unused insulated conductors minimum 51 mm (2 inches) past heat-shrink, fold back over jacket and secure with cable-tie. Cut unused shield/drain wires minimum 51 mm (2 inches) past heat shrink and serve as indicated below.//
 8. Cover shield/drain wires with heat-shrink tubing extending back to overall jacket. Extend tubing 6 mm (1/4 inch) past end of unused wires, fold back over jacket and secure with cable tie.
 9. For each solder-type connection, cover bare wire and solder connection with heat-shrink tubing.
 10. Terminate conductors; no cable can contain unterminated elements. Make terminations only at outlets and terminals.

11. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables cannot be spliced.
12. Bundle, lace, and train conductors to terminal points without exceeding OEM's limitations on bending radii. Install lacing bars and distribution spools.
13. Cold-Weather Installation: Bring cable to room temperature without using heat lamps before de-reeling.
14. Install cable without passing through structural members or in contact with pipes, ducts, or potentially damaging items.

E. Labeling:

1. Permanently label outlets, connectors, jacks, electronics and other equipment.
2. Engrave and paint fill patch panel labels using minimum 3 mm (1/8 inch) high lettering and contrasting paint.
3. For rack-mounted equipment, use engraved Lamacoid labels with white minimum 3 mm (1/8 inch) high lettering on black background. Label front and back of rack-mounted equipment.
4. Where multiple pieces of equipment reside in same rack group, label each indicating to which room, channel, outlet locations, etc. they correspond.
5. Permanently label cables at each end, including intra-rack connections. Cover labels by same, transparent heat-shrink tubing covering end of overall jacket. Alternatively, machine printed labels including a clear protective wrap can be used.
6. Label racks with contractor's name no more than once on each continuous set of racks; do not label wall plates or portable equipment with contractor's name.
7. Ensure each piece of OEM equipment has permanently attached NRTL Label indicating service the equipment is to perform. Equipment not bearing NRTL marks will not be permitted as part of system.

SPEC WRITER NOTE:

1. Check roof space for adequate antenna mounting space.

- F. Antenna Installation: Mount antennae on masts attached to building walls, penthouse walls or other solid parts of building free of all obstructions.

1. Fasten mounting brackets with lag bolts or expansion anchors 9.5 mm (3/8 inch) diameter. Attachments to mortar or grout joints not permitted.
 2. For building and penthouse walls, attach masts with three or more brackets spaced at no less than 450 mm (18 inch) intervals.
 3. Obtain approval from COR prior to installation of an antenna or mast directly on roof or penthouse.
 4. Do not install more than three antennas on a single mast. Install additional mast as required maintain proper spacing between masts and between antennas on each mast.
 5. Securely tighten mounting hardware, antenna hardware and terminals.
 6. Orient antennas to ensure optimum signal to noise ratio.
 7. Ensure assembly will survive winds of 200kph (125MPH).
- G. Protect HDTV //Analog// network devices during unpacking and installation by wearing electrostatic discharge (ESD) wrist straps tied to chassis ground for prevention of electrical shock.
- H. Cutting and Patching:
1. Keep work area clear of debris and clean area daily at completion of work.
 2. Patch and paint any wall or surface that has been disturbed by execution of this work.
 3. Provide any additional cutting, drilling, fitting or patching, not indicated as provided by others, to complete work or to make its parts fit together.
 4. Do not damage or endanger a portion of work of the Government or separate contractors by cutting, patching, excavation or otherwise altering such construction. Prior to cutting or otherwise altering such construction obtain written consent of COR and of such separate contractor. Do not unreasonably withhold from COR or a separate contractor, contractor's consent to cutting or otherwise altering MATV work.
 5. Where coring of in-place concrete is required, // including coring indicated under unit prices, // clearly identify location of such coring in the field and have location accepted by COR prior to commencement of coring.
- I. Fireproofing:
1. Where MATV cables penetrate rated walls, floors and ceilings, fireproof openings to restore rating.

2. Provide conduit sleeves for cables that penetrate rated walls.
3. After cabling installation is complete, install fire proofing material in and around conduit sleeves and openings to restore rating. Install fire proofing material thoroughly and neatly.
4. Seal floor and ceiling penetrations. Use only materials and methods that preserve the integrity of fire stopping system and its rating.

J. Grounding:

1. Ensure lightning protection system is in place per Section 26 41 00, FACILITY LIGHTNING PROTECTION. If not present, contact COR immediately for instructions.
2. Communication Ground: provide this system in accordance with Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS, and:
 - a. Bond cable shields and equipment to ground to eliminate shock hazard and to minimize ground loops, common mode 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. Do not connect system ground to building's external lightning protection system.
 - d. Do not "mix grounds" of different systems. Do not use electrical system conductors for ground.

K. Cleaning: Refer to Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.

3.3 FIELD QUALITY CONTROL

A. Tests:

1. Refer to Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
2. HDTV MATV System is NFPA listed; therefore, testing provisions are the minimum to be performed and provided by contractor and warranted by OEM.

B. Interim Inspection:

1. After completion of 25-30 percent of installation of head end cabinets and equipment, one wing of HDTV MATV outlets //and interconnection to corresponding Nurse Call (Code Blue) System // Patient Head Wall Units // and prior to any further work, this portion of system must be pretested, inspected, and certified.
2. Verify equipment provided adheres to installation requirements of this section.

3. Include a full operational test.
 4. Inspection and test must be conducted by a factory-certified contractor representative and witnessed by COR.
 5. Conduct an identical inspection between 65 and 75 percent of system construction phase, at direction of COR.
 6. Check each item of installed equipment to insure appropriate NRTL label.
 7. Confirm marking of cables, faceplates, patch panel connectors and patch cords.
 8. Perform inspection tests via continuity measurements on factory reels and provide results along with manufacturer certification for factory reel tests. Remove failed cable reels from project site upon test failure.
 9. Notify COR, in writing, of estimated date the contractor expects to be ready for interim inspection, at least 20 working days before requested inspection date so interim inspection does not affect system completion date.
 10. Provide results of interim inspection to COR. If major or multiple deficiencies are discovered, COR can require a second interim inspection before permitting system installation to continue.
 11. Do not proceed with installation until COR determination of additional inspection. In either case, re-inspection of deficiencies noted during interim inspections must be part of proof of performance test.
- C. Pretesting:
1. Upon completing installation of system, align, balance, and pretest entire system under full operating conditions.
 2. Pretesting Procedure:
 - a. During system pretest verify, utilizing accepted test equipment, system is operational and meets performance requirements.
 - b. Pretest and verify specification requirements are met and system functions are operational, no unwanted aural effects, such as signal distortion, noise pulses, glitches, audio hum, poling noise, etc. are present. At a minimum, pretest each of the following locations:
 - 1) Antennae.
 - 2) Lightning Grounds.
 - 3) Head-End.

- 4) Local and Remote Control Units/Enunciation Panels.
- 5) Networked locations.
- 6) System interface locations (i.e.PA, Nurse Call, etc.).
- 7) System trouble reporting.
- 8) UPS operation.
- 9) Primary and emergency AC power requirements.
- 10) Extra auxiliary generator requirements.

c. Provide recorded system pretest measurements and certification that system is ready for formal acceptance test to COR.

D. Acceptance Test:

1. After system has been pretested and contractor has submitted pretest results and certification to COR, schedule an acceptance test dates and give COR 30 days written notice prior to date acceptance test is expected to begin. Include expected duration of time for test with notification of acceptance test.
2. Test only in the presence of COR and AHJ (SMCS 0050P2H3).
3. Test utilizing test equipment to certify proof of performance.
4. Verify that total system meets requirements of this specification.

E. Verification Tests:

1. Test copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors, and between conductors and shield. Test cables after termination.
2. Perform same tests appropriate to each coaxial cable accepted for use in system.

F. Performance Testing: Test every video distribution outlet for clear picture and sound.

1. At each outlet with television, select each channel and view picture on television. Observe active channels. Verify picture is clear with no visual presence of interference of any kind and no audible variance in volume level between channels.
2. Perform tests utilizing signal level meter to determine values and record.

G. Total System Acceptance Test: Perform verification tests for copper cabling systems after complete video distribution system and workstation outlet are installed.

1. Acceptance tests are performed on a "go-no-go" basis.
2. Only perform operator adjustments required to show proof of performance.

3. Demonstrate and verify that installed system complies with requirements of specification under operating conditions.
4. Obtain rating of system as either acceptable or unacceptable from COR at conclusion of test.
5. Failure of any part of system that precludes completion of system testing, and which cannot be repaired in four hours, is cause for terminating acceptance test of system. Repeated failures that result in a cumulative time of eight hours to affect repairs can cause entire system to be declared unacceptable and require retest of entire system at the convenience of Government.

H. Acceptance Test Procedure:

1. Physical and Mechanical Inspection:
 - a. Coordinate COR tour of major areas where system and sub-systems are installed to ensure they are operationally ready for proof of performance testing. Provide system inventory including available spare parts for COR to verify and check each item of installed equipment has appropriate NRTL certification labels affixed during tour.
 - b. Formally inventory and review system diagrams, record drawings, equipment manuals, Telecommunications Infrastructure Plant (TIP) AutoCAD files, intermediate, and pretest results formally inventoried and reviewed.
 - c. Failure of system to meet installation requirements of this specification is grounds for terminating testing.
2. Operational Test:
 - a. After physical and mechanical inspection, verify //antennae//, head end terminating and control equipment meets performance requirements outlined herein. Utilize spectrum analyzer and signal level meter to accomplish this requirement.
 - b. Following // antennae and // head end equipment test, connect local // and remote // control unit to the head end equipment's output. Test tap to ensure there are no signal distortions such as intermodulation, data noise, popping sounds, erratic system functions, on any function.
 - c. Check distribution system at each interface, junction, and distribution point, first, middle, and last leg to verify that HDTV MATV video, audio and control signals meet system performance standards.

- d. Functionally test HDTV MATV outlets utilizing contractor's accepted hospital grade TV receiver and spectrum analyzer.
 - e. //Check red system and volume stepper switches to ensure proper operation of pillow speaker, volume stepper and red system.//
 - f. Once these tests have been completed, test each installed sub-system function as a unified, functioning and fully operating system.
 - g. Individual Item Test: COR can select individual items of equipment for detailed proof of performance testing until 100 percent of system has been tested and found to meet specification.
- I. Acceptable Test Equipment:
- 1. Utilize test equipment with calibration tag of an acceptable calibration service dated not more than 12 months prior to test. Furnish test equipment list that includes 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. Oscilloscope.
 - e. Pillow Speaker Test Set (Pillow Speaker with appropriate load and cross connections instead of the set is acceptable).
- J. Non-Conforming Work:
- 1. Government, OEM and contractor must agree to results of Acceptance Test, create consensus punch lists, and reschedule testing for technical deficiencies and equipment shortages.
 - 2. Any retests needed to reach agreement and validate results of punch lists, or to establish compliance with these specifications, are at contractor's expense.
 - 3. These requirements must be met for contract compliance and Government acceptance of system.

3.4 TRAINING

- A. Provide thorough training of facility's engineering and maintenance staff on operation, performance and preventative maintenance of system.
- B. Schedule training at convenience of facility's Chief Engineer.
- C. MATV system will not be accepted without completion of training.
- D. Provide the following training at locations provided by Government:

1. Minimum eight hours for system operation and performance no less than 48 hours prior to opening of facility.
2. Minimum eight hours for system preventative maintenance no less than 24 hours before opening of facility.

3.5 MAINTENANCE

- A. Accomplish the following minimum requirements during one year warranty period:
 1. Response Time:
 - a. Standard work week is 8:00 A.M. to 5:00 P.M., Monday through Friday exclusive of Federal holidays.
 - b. Respond and correct on-site trouble calls, during standard work week:
 - 1) Routine trouble call within one working day. Routine trouble is an inoperable system outlet.
 - 2) Emergency trouble call within six hours. Emergency trouble is an inoperable subsystem or distribution point.
- B. Provide report itemizing each deficiency found and corrective actions performed, to COR, for each trouble call.

- - - E N D - - -