SECTION 27 41 30 – MASTER ANTENNA TELEVISION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, and equipment for the complete installation of Work called for in the Contract Documents.

B. This section includes the minimum requirements for the extension of both the DFW and AA MATV system.

C. Included in this section are the minimum composition requirements and installation methods for the following:

1. Fiber Optic Nodes
2. Fiber Optic Patch Cords
3. Broadband RF Distribution Hubs
4. Broadband RF Splitters, Taps & Switches
5. Equalizers, Attenuators & Terminators
6. Coaxial Cabling, Terminations & Outlets

D. Fiber optic cabling and termination is provided under Section 27 13 00 – Communications Backbone Cabling.

1.2 DEFINITIONS AND TERMS

A. Trade association names and communications terminology are frequently abbreviated. The following acronyms or abbreviations may be referenced within this Section:

1.	ANSI	American National Standards Institute
2.	AWG	American Wire Gauge
3.	BICSI	Building Industry Consulting Service International
4.	CMR	Communications Riser Cable
5.	CMP	Communications Plenum Cable
6.	CR	Communications Room
7.	CUP	Central Utility Plant
8.	DBS	Direct Broadcast Satellite
9.	DCM	Design Criteria Manual
10.	DFW	The Dallas/Fort Worth International Airport
11.	DWDM	Dense Wave Division Multiplexer
12.	FCC	Federal Communications Commission
13.	IEEE	Institute of Electrical and Electronics Engineers
14.	ISO	International Standards Organization
15.	MATV	Master Antenna Television
16.	MCR	Main Communications Room
17.	MER	Main Equipment Room
18.	NEMA	National Electric Manufacturers Association
19.	NFPA	National Fire Protection Association
20.	OAR	Owner’s Authorized Representative
21.	SADS	Satellite Antenna Distribution System

22. STD Standard
23. STP Shielded Twisted Pair
24. TIA Telecommunications Industry Association
25. UL Underwriters Laboratories
26. UTP Unshielded Twisted Pair

1.3 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the OAR.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the OAR.

C. Strictly adhere to all BICSI and TIA recommended installation practices when installing MATV and DBS systems.

D. Contractor’s Qualifications:

1. Firms regularly engaged in the installation of distributed MATV and DBS systems and that have five (5) years of installation experience with systems similar to that required for this project.
2. Provide references to include client names, phone numbers and a summary of project details. These references will be checked, and the clients will be asked questions relative to the performance of your company.
3. Provide verification that installation personnel responsible have been properly trained to install the products described in this Section.
4. Provide full time project manager with a minimum of ten (10) years field experience in installation of communications systems and infrastructures. Project manager shall be assigned for the duration of the project and shall not be replaced without written consent from the OAR.

E. Manufacturer’s Qualifications:

1. Firms regularly engaged in manufacture of products of the types, ratings and capacities required for this project; whose products have been in satisfactory use in similar service for not less than five (5) years, with production capabilities per applicable NEMA standards.

F. Material and Work specified herein shall comply with the applicable requirements of:

1. NECA 1 – Standard Practice of Good Workmanship in Electrical Construction, 2015
2. ANSI/TIA-568.0-D – Generic Telecommunications Cabling for Customer Premises, 2015
3. ANSI/TIA-568.0-D-1 – Generic Telecommunications Cabling for Customer Premises – Addendum 1: Updated References, Accommodation of New Media Types, 2017
4. ANSI/TIA-568.1-D – Commercial Building Telecommunications Infrastructure Standard, 2015
5. ANSI/TIA-568.1-D-1 – Commercial Building Telecommunications Infrastructure Standard – Addendum 1: Updated References, Accommodation of New Media Types, 2018
6. ANSI/TIA-606-C – Administration Standard for Telecommunications Infrastructure, 2017
7. ANSI/TIA-607-D – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, 2019
8. NFPA 70 – National Electric Code, 2017

9. Title 47 CFR, Chapter I, Section 76.605 - Multichannel Video and Cable Television Service Technical Standards, FCC 1992
10. UL 13 – Standard for Safety for Power-Limited Circuit Cables
11. UL 444 – Standard for Safety for Communications Cable
12. DFW Airport Design Criteria Manual
13. Applicable codes and directives of authorities having jurisdiction

G. Work:

1. The Work shall be performed in compliance with the applicable manufacturer's installation instructions, Standards, and certifications listed herein, the Contract Documents, and governing codes and regulations of the authorities having jurisdiction.
2. The drawing and specification requirements govern where they exceed Code and Regulation requirements.
3. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
4. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

1.4 CONFLICTS

A. This installation shall be made in strict accordance with the Specifications, Drawings, any applicable codes, referenced publications and standards. In case of conflicts between the aforementioned, notify the OAR in writing prior to commencement of affected work.

1.5 SCHEDULING

A. The Contractor shall comply with all scheduling requests established by OAR, both prior to commencing Work, and during construction. The Contractor shall provide a detailed schedule of work to be performed.

1.6 REQUIREMENTS

A. All references to manufacturers, model numbers and other pertinent information herein are intended to establish standards of performance and quality of construction. The OAR must approve material submittal and substitutions in writing.

B. Verification that all the components specified and installed meet the criteria specified by the respective component manufacturer, supplier and designer is the responsibility of the Contractor.

C. All installation tools, special equipment and testing apparatus required to accomplish field connections and related work as described herein shall be furnished by the Contractor at no additional cost.

D. The requirements as given in this document are to be adhered to unless revised by the OAR in writing.

E. The Owner reserves the right to waive these requirements at any time.

1.7 SUBMITTALS

A. Comply with provisions of Division 01.

B. Comply with provisions of Section 27 05 00.

C. Produce Shop Drawings for ALL horizontal cabling, to include but not limited to, proposed routing and its location relative to building structure (columns, floor or ceiling) and its relationship to electrical, mechanical elements as well as any horizontal cables that may exceed 150’ in length (including service loops).

D. Provide product data for the following:

1. Product data consisting of manufacturers specifications for each type of product to be installed, all applicable certifications and elevation/plan documents supporting compliance with stated Specifications.
2. Manufacturer’s certificate of acceptance of the qualifications of the installing Contractor to install, test and maintain the manufacturer’s equipment.
3. Manufacturer’s installation specifications for coax cabling and optical fiber, indicating minimum bend radius and maximum pull tension.
4. Outline of administration labeling scheme for voice and data communications cabling and termination locations per ANSI/TIA-606 and DFW/DCM.
5. Proposed format of as-built documentation.

1.8 CONTRACTOR CLOSE OUT SUBMITTALS

A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements. The number of submittal sets required is the greater of either the requirements of Division 01 of the Project Manual, or a minimum of four (4) sets.

1. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues.
2. Test reports on all copper and optical fiber cables (electronic file format and hard copy).
3. As-built cable schedules with recorded cable routing and lengths of each designated run.
4. As built documentation of all cabling systems.
5. As built documentation of MER/TR modifications and associated cabinet elevations.
6. Laminated as-built drawing sheet of CR/TR service area representing each level, with a scale of not less than 1/8”, mounted on the wall of each TR.

B. Warranty and Maintenance:

1. Test Report Binder(s)
2. Record Drawings

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials factory-packaged in containers or reels and handle in accordance with manufacturer’s recommendations. Store in a clean, dry space and protect products from damaging fumes and traffic. Handle materials carefully to avoid damage.

B. Storage space on project site may be limited. Contractor shall coordinate delivery and arrange storage of materials and equipment with the OAR.

C. Components sensitive to damage in a harsh environment shall be stored off-site and delivered as needed.

D. Provide protective covering during construction to prevent damage or entrance of foreign matter.

E. Contractor is responsible for on-site security of tools, test equipment and materials.

F. Replace at no expense to Owner, product damaged during storage, handling or the course of construction.

1.10 PROJECT CONDITIONS

A. Verify conditions on the job site are applicable to this Work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install Work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the Work may be installed.

1.11 WARRANTY

A. Warrant labor and product to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics, following Contractor Warranty requirements defined in Division 01. Repair or replace defects occurring in labor or product within the Warranty period without charge.

B. All surplus parts and pieces to the installation shall be maintained as a spare parts inventory at the building site. Parts replaced during the warranty period shall have a warranty matching that of the original part from date of replacement.

PART 2 - PRODUCTS

2.1 GENERAL

A. The products specified in this document do not necessarily constitute the exhaustive list of products required to complete the statement of work. Except where described in the SUMMARY subpart of this document, the contractor is responsible for providing any other parts and materials needed to deliver a complete and working system.

2.2 ACCEPTABLE VENDORS AND MATERIALS

A. Subject to compliance with requirements, install products from the following manufacturers, except where noted:

1. Fiber Optic Conversion and Transport Products:
    a. Olson Technology
    b. Owner Approved Equivalent
2. Termination Components

a. Corning / Gilbert Engineering.

B. Part numbers are provided for reference purposes only; the contractor is responsible for complete material list and quantities.

2.3 MATV FIBER OPTIC SYSTEM

A. Fiber Optic Transmitter

1. Provide fiber optic transmitters at the DFW MATV head end and AA MATV head end as indicated within the drawing set.
2. The transmitter shall be a card-based platform for installation within a 3-RU chassis.
3. Where the existing MATV head end chassis is full, Contractor shall provide a new chassis.
4. The transmitter shall support optical wavelengths of 1310 nm.
5. The transmitter shall provide optical power levels as indicated within the drawing set.
6. The full forward bandwidth shall be 50 MHz to 1000 MHz
7. Transmitter shall simultaneously accommodate both analog and QAM signals.
8. The input connector shall be a 75 Ohm “F”-type RF connector.
9. The output connector shall be an SC/APC connector.
10. The transmitter shall include a 75 Ohm “F”-type RF connector test point.
11. The transmitter shall include high-impedance voltmeter test points.
12. Approved products (where “xx” = output power):

    a. Olson Technology LP-OT-xx
    b. Olson Technology LP-CH-16 LaserPlus Chassis
    c. Owner approved equivalent

B. Fiber Optic Splitter

1. Provide passive fiber optic splitters with appropriate numbers of outputs and signal ratios.
2. All connectors shall be SC/APC.
3. The split ratios shall be as described in the drawing set.
4. Provide a rack mount kit in each MCR or MER for splitters.
5. Approved products:

    a. Olson Technology OTCP-1x2-40-SA
    b. Olson Technology OTCP-1x6-00-SA
    c. Olson Technology OTCP-1x8-00-SA
    d. Olson Technology OTCP-1x12-00-SA
    e. Olson Technology OTCP-1x16-00-SA
    f. Olson Technology OTLL-RMKIT-1
    g. Owner approved equivalent

C. Fiber Optic Node

1. Provide a fiber optic node in each MCR/CR/TR indicated within the drawing set.
2. The node input shall support optical wavelengths of 1310 nm.
3. The node shall be capable of receiving levels of between -6 dBm and +3 dBm.
4. Node RF output shall provide stable +46 dBmV of signal.
5. The full forward bandwidth shall be 54 MHz to 1000 MHz
6. Node shall simultaneously accommodate both analog and QAM digital signals.
7. The input connector shall be an SC/APC connector.
8. The output connector shall be a 75 Ohm “F”-type RF connector.
9. Provide a 3 RU rack shelf for the node.
10. Approved products:

    a. Olson Technology OTPN-2000C

b. Owner approved equivalent

2.4 MATV DISTRIBUTION

A. AA MATV RF Distribution Hubs

1. Provide a rack mounted distribution hub where indicated and connected to the output of the fiber node in the closet.
2. The hub shall accommodate frequency ranges of between 54 and 860 MHz
3. The hub shall provide multiple RJ-45 outputs that distribute RF over Category 6 cable.
4. Hub shall provide power over the Category 6 outputs to power remote baluns.
5. Connection of an Ethernet device to the hub shall not result in damage to either device.
6. Provide input attenuation, as necessary to prevent the optical node from over-driving the hub.
7. Approved products:

    a. Z-Band Z-Distribution ZHC
    b. Owner approved equivalent

B. RF Filters

1. Provide a high-pass filter for each DFW MCR and CR for CNN distribution.
2. The filter shall drop channels 2-70 and 95-99, and pass channels 71-158.
3. Filter shall accommodate analog or digital programming.
4. The pass band shall be 504.3-1000 MHz
5. The stop band shall be 5-503.7 MHz
6. Pass band loss shall be less than 6 dB at the pass band edge.
7. Stop band rejection shall be a minimum 35 dB
8. The impedance shall be 75 ohms.
9. The input and output connectors shall be female "F" type.
10. Approved Products:

    a. Microwave Filter Digital Brickwall Highpass Filter, Model No. 18538
    b. Owner approved equivalent

C. RF Disconnect Switch

1. Provide an RF disconnect switch in each MCR/CR/TR for fire alarm integration.
2. The switch shall be located within the video signal flow such that upon activation of the fire alarm system then the video signal will be cut off.
3. The switch shall be equipped with "F" type input and output connectors.
4. The input and output connectors should be self-terminating, otherwise, any unused connectors are required to be terminated with 75-ohm RF terminators.
5. Switch shall have a screw terminal block control interface, capable of accepting a dry contact closure. The block shall accommodate 18 AWG wiring.
6. The switch shall be installed in a suitably sized NEMA 12 enclosure. The cover of the enclosure shall be painted white.
7. Contractor shall coordinate installation with the Fire Alarm Contractor. Fire Alarm Contractor shall provide an ACM output, conduit and wiring between the ACM and the RF switch and make the final connection between the ACM and the switch.
8. Acceptable products:

    a. Monroe Electronics Model 627A 2x1 switch.
    b. Owner approved equivalent.

D. AA MATV Baluns

1. Provide a balun at each AA MATV outlet.
2. Balun shall provide impedance matching from 100 ohms to 75 ohms and accommodate frequency ranges of between 54 and 860 MHz.
3. The balun shall have an RJ-45 jack and a male “F” connector.
4. Power shall be received from the Category 6 cable.
5. Include a Category 6 patch cord and a male “F” to male “F” coax patch cable.
6. Acceptable products:
    a. Z-Band Z-Balun QAM
    b. Owner approved equivalent.

2.5 SATELLITE ANTENNA DISTRIBUTION

A. L-Band Receiver

1. Provide optical L-Band receivers in each DFW MCR for receiving satellite signals from the Central Utility Plant.
2. Receiver shall be equipped with a PIN photo detector capable of receiving wavelengths between 1270 nm and 1610 nm.
3. Receiver shall be capable of accommodating input levels of between -15 dBm and +3 dBm.
4. The RF output shall have adjustable gain controls for fine tuning the signal level to the satellite distribution equipment.
5. The input connector shall be an SC/APC connector.
6. The output connector shall be a 75-ohm "F"-type RF connector.
7. Include a rack-mount chassis assembly in each MCR/CR for mounting the receivers, with two power supplies per chassis and an SNMP management agent.
8. Approved product combination:
    a. Olson Technology
        1) LP-OLAR-X4000-75-SA
        2) LP-CH-16B
        3) LP-PS-AC
        4) LP-CH-SNMP-1
    b. Owner approved equivalent

B. Fiber Optic Splitter

1. Provide passive fiber optic splitters with appropriate numbers of outputs and signal ratios.
2. All connectors shall be SC/APC.
3. The split ratios shall be as described in the drawing set.
4. Provide a rack mount kit in each MCR for splitters.
5. Approved products:
    a. Olson Technology OTCP-1x2-40-SA
    b. Olson Technology OTCP-1x6-00-SA
    c. Olson Technology OTCP-1x8-00-SA
    d. Olson Technology OTCP-1x12-00-SA
    e. Olson Technology OTCP-1x16-00-SA
    f. Olson Technology OTLL-RMKIT-1
    g. Owner approved equivalent

C. Wave Division Multiplexer

1. Provide a dense wave division multiplexer (DWDM) in each DFW MCR and CR to separate the individual satellite LNB signals.
2. The DWDM shall provide a demultiplexing function.

3. DWDM channels shall have a bandwidth of 200 GHz.
4. The DWDM channels shall be inclusive of ITU Channels 28-42.
5. The DWDM shall be equipped with SC/APC connectors.
6. Include a rack mount kit in each CR for DWDMS. Mount the DWDM in the MCRs with the SADS optical splitter.
7. Approved product combination:
    a. Olson Technology
        1) OT-DWDM-8-2-D-28-Z-SA
        2) OTLL-RMKIT-1
    b. Owner approved equivalent

D. Single Wire Multiswitches

1. Provide DirecTV multiswitches in each DFW MCR and CR to accommodate satellite television service.
2. Multiswitch to be equipped with 6 satellite LNB inputs.
3. Multiswitch shall be capable of providing 8 video streams for supporting up to 8 DirecTV tuners from one or two outputs.
4. Approved products:
    a. DirecTV SWM-8
    b. Owner approved equivalent

E. Multiswitch Chassis

1. Provide a chassis capable of mounting six 8-stream multiswitches.
2. Chassis to include three 24 VDC power supplies.
3. Approved products:
    a. DirecTV FMC-6
    b. Owner approved equivalent

F. Switching Receptacle

1. Provide a 5-20 duplex electrical receptacle with a 120-volt power cord input.
2. Receptacle shall include a contact closure for connection to a normally open relay on the Fire Alarm Control Panel.
3. The electrical outlet shall disconnect power to the 5-20 receptacles upon activation of the fire alarm’s relay, thereby shunting the SADS service.
4. Approved products:
    a. Middle Atlantic RLM-20-1CA
    b. Owner approved equivalent

2.6 CABLE AND CONNECTORS

A. Fiber Jumpers

1. Provide short fiber jumpers between devices, as required.
2. Jumpers shall be constructed of bend-improved 9/125µm (OS2) singlemode fiber.
3. Connectors shall be SC/APC on both ends.
4. Acceptable products:
    a. Corning 444401G2131001M 1m Jumper
    b. Corning 444401G2131005F 1.5m Jumper
    c. Corning 444401G2131002M 2m Jumper

d. Owner approved equivalent

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of electronics shall comply with project specifications and meet all applicable manufacturer's recommendations, local, city and national codes.

B. Coax cable terminations shall be made with connectors specifically designed for the cable being installed. Connectors shall only be crimped with the connector manufacturer's approved tooling and shall result in the connector being securely affixed to the end of the cable. Screw-on type connectors are absolutely forbidden.

C. Contractor shall coordinate with Owner regarding DFW fiber usage and connectivity to the MATV hub in the Central Utility Plant.

D. Contractor shall coordinate with

E. Support cabling per Section 27 05 28 of the specifications and label all cabling per Section 27 05 53.

3.2 ADJUSTING AND CLEANING

A. Field Adjustments: Set field-adjust television components for input signal levels, and output level.

B. The RF carrier levels of all channels shall be between 0 and +15 dBmV at each television outlet.

C. Touch-up scratched and marred surfaces to match original finishes; remove dirt and construction debris.

3.3 ACCEPTANCE

A. Acceptance will be withheld until the successful completion of the following:

1. Acceptance of all submittals.
2. Delivery of final documentation (including as-built documents)
3. Successful Testing.
4. Successful demonstration.

3.4 LABELING

A. The Contractor shall develop and submit for approval a labeling system consistent with that used on the DFW Airport Consolidated System.

B. All label printing will be machine generated using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and affixed six inches from the termination point on each end. (All labeling, and printing shall be the responsibility of the Contractor).

3.5 ASSET TAGGING

A. All equipment of greater than $2000 value, and otherwise as directed by OWNER, asset tagged in the DFW Airport Inventory System. Asset tags and inventory control sheet are to be obtained from OWNER. Signed, completed inventory control sheet detailing equipment description, location, serial number, label name, if any, and asset number assigned shall be included in as-built documents.

3.6 TESTING

A. Cabling: Test and certify that the cables and terminations have been properly installed as specified herein. Testing shall be coordinated with OWNER and OWNER shall be given opportunity to witness all testing.

1. Record OTDR results for all fiber routes used in the system.
2. Correct any anomalies in the fiber route, including, but not limited to:

    a. Fusion splices with high losses
    b. Terminations with high losses
    c. Bend radiuses that exceed the manufacturers specifications and/or create high losses.

B. Optical Signal Verification:

1. Measure and record the optical signal level at the input and output of each device in the system using a JDSU OLP-38, or equivalent handheld power meter, capable of handling the power levels produced by the system.

    a. Compare input levels with the known optical output level at the source, minus the known optical loss measured along the fiber route to the device. Correct any discrepancies found.
    b. Compare output levels with the measured input level to the device, minus the manufacturer's documented loss values for the device. Work with the device manufacturer to resolve any major discrepancies found.
    c. If it is found that the Owner's source signal is at issue, notify the Owner immediately so that the Owner may correct the problem.

C. MATV: Test and certify that the new components have been properly installed as specified herein.

1. Testing shall be coordinated with OWNER and OWNER shall be given opportunity to witness all testing. Test MATV System, including all described subsystems and components to the following minimum test requirements. Coordinate system testing with owner’s representative or his designee.
2. Optical System

    a. Record test point readings at the optical nodes with a digital multimeter, per the manufacturer's instructions.
    b. Compare these readings with the previously measured optical power level. Correct any discrepancies by cleaning and verifying the optical connection to the node.

3. RF System

    a. Measure and record the signal at each MATV outlet with a JDSU SDA-5000 tester.
    b. Identify each measurement report with the label number of the drop cable connected to the outlet.

        1) At a minimum, the report shall include the lowest active channel on the system and the highest active channel – usually CNN, located in the 70-75 range.

c. The video carrier signal on all channels of each outlet shall be between 0 dBmV and +15 dBmV for analog channels, and ±15 dBmV for digital channels.
d. The slope shall be as flat as possible at each outlet.

D. SADS: Test and certify the new components have been properly installed as specified herein.

1. Testing shall be coordinated with OWNER and OWNER shall be given opportunity to witness all testing. Test SADS System, including all described subsystems and components to the following minimum test requirements. Coordinate system testing with owner's representative or his designee.
2. Optical System

a. Record test point readings at the optical L-band receivers with a digital multimeter, per the manufacturer's instructions.
b. Compare these readings with the previously measured optical power level. Correct any discrepancies by cleaning and verifying the optical connection to the receiver.

3. Measure and record the RF signal at the input and output of each device in the system and at each outlet with a Birdog, or equivalent, SWM-compatible DBS signal meter.

a. The RF output of each Multiswitch shall be no less than -31 dBm, or 77.8 dBµV, per SWM channel.
b. The RF output at any SADS work area outlet shall be no less than -55 dBm, or 53.8 dBµV.
c. Compare input levels with the manufacturer's listed RF output level at the source, minus the known cable and connector losses to the device. Correct any discrepancies found.
d. Compare output levels with the measured input level, minus the manufacturer's documented loss values for the device. Work with the device manufacturer to resolve any major discrepancies found.
e. Measure and record the levels at the satellite receiver, where applicable.

E. Television Testing

1. Digital Channels: Check for a consistent picture that does not "pixelate" or break up.
2. Analog Channels: Check for the presence of noise in the video and audio.

F. Problem Correction

1. Any problems encountered during this test will be documented and brought to the attention of OWNER and corrected at the Contractor's expense. The Contractor shall promptly correct all problems encountered, providing field service personnel appropriately trained for the types of problems encountered in testing.

3.7 TEST REPORTS AND AS-BUILT DRAWINGS

A. Submit results of all test results (PDF file format and hard copy) and other required submittals to the OWNER or Owner's representative for review and final acceptance. Include schedule of installed equipment, description, locations installed, serial number and asset tag number XLS file format and hard copy).

B. The intent of this Section is to require complete drawing documentation of the MATV System for the purpose of system operation and maintenance during and after the warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification and repair of defective parts.

C. The Contractor shall provide four (4) complete drawing books, and four (4) copies in CD form in PDF format of all maintenance and operation manuals on the completed system. These manuals shall include basic wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily identified by going to the actual equipment and referring to this manual. It is required that everything in the system be neatly labeled and easily identifiable. Every terminal, wire, fiber, component or piece of equipment, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals. The Contractor shall provide one (1) set of all Drawings as reproducible, and where the Drawings are CAD generated, provide files in PDF format. Provide one (1) set of all schedules and tables in machine-readable text format.

D. Maintenance Manual Requirements: The maintenance manual requirement of this section is in addition to Shop Drawing requirements. Maintenance manuals and drawing sets shall be compiled after system fabrication and testing and shall incorporate any changes made after Shop Drawing submittal. The maintenance manuals and drawing books shall be permanently bound in hard plastic covers.

E. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this project shall be crossed out.

F. Drawing Books: All Drawings developed specifically for this project shall be reduced to 11" X 17", folded and bound with hard plastic covers. The Drawings shall be easily readable after reduction, even if this requires Drawings to be broken into multiple sheets. Under no circumstances shall text be smaller than 1/16-inch after reduction. Provide component identification and cross reference on the Drawings to allow the maintenance department to understand the function of each item (the block diagram), find the room where the device is mounted (Contract Document Plans), find its location in a rack (arrangement drawings), find how it is wired (wiring diagrams), and its detailed Specifications (vendor data sheets), and how to repair it (spare parts list). Include the following drawings as a minimum.

G. Functional Block Diagram: Provide an overall block diagram showing the major interconnections between subsystem components.

H. Arrangement Drawings: Provide Drawings showing the physical arrangement of all major system components.

I. Elevation Drawings: Provide elevation Drawings of all equipment racks showing the location of each component in the racks. Components in the racks shall be identified as in the functional block diagrams. Drawing shall show the routes of all cables connecting its components.

J. Wiring Diagrams: Provide wiring diagrams showing all interconnecting wiring. Wire identification on the diagrams shall agree with the wire markers installed on the equipment.

3.8 CLEANING

A. Upon completion of the installation, make all components free of any oil, grease, dust and debris.

3.9 ACCEPTANCE

A. Review test results and inspect installation with the Owner's Authorized Representative and obtain concurrence. Concurrence does not waive the responsibility of the Contractor to correct deficiencies.

END OF SECTION 27 41 30