SECTION 27 05 11
REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS

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 005OP2H3), (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.

1. GENERAL
	1. DESCRIPTION
		1. This section includes common requirements to communications installations and applies to all sections of Division 27 //and Division 28//.
		2. Provide completely functioning communications systems.
		3. Comply with VAAR 852.236.91 and FAR clause 52.236-21 in circumstance of a need for additional detail or conflict between drawings, specifications, reference standards or code.
	2. references
		1. Abbreviations and Acronyms
			1. Refer to http://www.cfm.va.gov/til/sdetail.asp for Division 00, ARCHITECTURAL ABBREVIATIONS.
			2. Additional Abbreviations and Acronyms:

|  |  |
| --- | --- |
| A | Ampere |
| AC | Alternating Current |
| AE | Architect and Engineer |
| AFF | Above Finished Floor |
| AHJ | Authority Having Jurisdiction |
| ANSI | American National Standards Institute |
| AWG | American Wire Gauge (refer to STP and UTP) |
| AWS | Advanced Wireless Services |
| BCT | Bonding Conductor for Telecommunications (also Telecommunications Bonding Conductor (TBC)) |
| BDA | Bi-Directional Amplifier |
| BICSI | Building Industry Consulting Service International |
| BIM | Building Information Modeling |
| BOM | Bill of Materials |
| BTU | British Thermal Units |
| BUCR | Back-up Computer Room |
| BTS | Base Transceiver Station |
| CAD | AutoCAD |
| CBOPC | Community Based Out Patient Clinic |
| CBC | Coupled Bonding Conductor |
| CBOC | Community Based Out Patient Clinic (refer to CBOPC, OPC, VAMC) |
| CCS | TIP's Cross Connection System (refer to VCCS and HCCS) |
| CFE | Contractor Furnished Equipment |
| CFM | US Department of Veterans Affairs Office of Construction and Facilities Management |
| CFR | Consolidated Federal Regulations |
| CIO | Communication Information Officer (Facility, VISN or Region) |
| cm | Centimeters |
| CO | Central Office |
| COR | Contracting Officer Representative |
| CPU | Central Processing Unit |
| CSU | Customer Service Unit |
| CUP | Conditional Use Permit(s) – Federal/GSA for VA |
| dB | Decibel |
| dBm | Decibel Measured |
| dBmV | Decibel per milli-Volt |
| DC | Direct Current |
| DEA | United States Drug Enforcement Administration |
| DSU | Data Service Unit |
| EBC | Equipment Bonding Conductor |
| ECC | Engineering Control Center (refer to DCR, EMCR) |
| EDGE | Enhanced Data (Rates) for GSM Evolution |
| EDM | Electrical Design Manual |
| EMCR | Emergency Management Control Room (refer to DCR, ECC) |
| EMI | Electromagnetic Interference (refer to RFI) |
| EMS | Emergency Medical Service |
| EMT | Electrical Metallic Tubing or thin wall conduit |
| ENTR | Utilities Entrance Location (refer to DEMARC, POTS, LEC) |
| EPBX | Electronic Digital Private Branch Exchange |
| ESR | Vendor’s Engineering Service Report |
| FA | Fire Alarm |
| FAR | Federal Acquisition Regulations in Chapter 1 of Title 48 of Code of Federal Regulations |
| FMS | VA’s Headquarters or Medical Center Facility’s Management Service |
| FR | Frequency (refer to RF) |
| FTS | Federal Telephone Service |
| GFE | Government Furnished Equipment |
| GPS | Global Positioning System |
| GRC | Galvanized Rigid Metal Conduit  |
| GSM | Global System (Station) for Mobile |
| HCCS | TIP’s Horizontal Cross Connection System (refer to CCS & VCCS) |
| HDPE | High Density Polyethylene Conduit |
| HDTV | Advanced Television Standards Committee High-Definition Digital Television |
| HEC | Head End Cabinets(refer to HEIC, PA) |
| HEIC | Head End Interface Cabinets(refer to HEC, PA) |
| HF | High Frequency (Radio Band; Re FR, RF, VHF & UHF) |
| HSPA | High Speed Packet Access |
| HZ | Hertz |
| IBT | Intersystem Bonding Termination (NEC 250.94) |
| IC | Intercom |
| ICRA | Infectious Control Risk Assessment |
| IDEN | Integrated Digital Enhanced Network |
| IDC | Insulation Displacement Contact |
| IDF | Intermediate Distribution Frame |
| ILSM | Interim Life Safety Measures |
| IMC | Rigid Intermediate Steel Conduit |
| IRM | Department of Veterans Affairs Office of Information Resources Management |
| ISDN | Integrated Services Digital Network |
| ISM | Industrial, Scientific, Medical |
| IWS | Intra-Building Wireless System |
| LAN | Local Area Network |
| LBS | Location Based Services, Leased Based Systems |
| LEC | Local Exchange Carrier (refer to DEMARC, PBX & POTS) |
| LED | Light Emitting Diode |
| LMR | Land Mobile Radio |
| LTE | Long Term Evolution, or 4G Standard for Wireless Data Communications Technology |
| M | Meter |
| MAS | Medical Administration Service |
| MATV | Master Antenna Television |
| MCR | Main Computer Room |
| MCOR | Main Computer Operators Room |
| MDF | Main Distribution Frame |
| MH | Manholes or Maintenance Holes |
| MHz | Megaherts (106 Hz) |
| mm | Millimeter |
| MOU | Memorandum of Understanding |
| MW | Microwave (RF Band, Equipment or Services) |
| NID | Network Interface Device (refer to DEMARC) |
| NEC | National Electric Code |
| NOR | Network Operations Room |
| NRTL | OSHA Nationally Recognized Testing Laboratory |
| NS | Nurse Stations |
| NTIA | U.S. Department of Commerce National Telecommunications and Information Administration |
| OEM | Original Equipment Manufacturer |
| OI&T | Office of Information and Technology |
| OPC | VA’s Outpatient Clinic (refer to CBOC, VAMC) |
| OSH | Department of Veterans Affairs Office of Occupational Safety and Health |
| OSHA | United States Department of Labor Occupational Safety and Health Administration |
| OTDR | Optical Time-Domain Reflectometer |
| PA | Public Address System (refer to HE, HEIC, RPEC) |
| PBX | Private Branch Exchange (refer to DEMARC, LEC, POTS) |
| PCR | Police Control Room (refer to SPCC, could be designated SCC) |
| PCS | Personal Communications Service (refer to UPCS) |
| PE | Professional Engineer |
| PM | Project Manager |
| PoE | Power over Ethernet |
| POTS | Plain Old Telephone Service (refer to DEMARC, LEC, PBX) |
| PSTN | Public Switched Telephone Network |
| PSRAS | Public Safety Radio Amplification Systems |
| PTS | Pay Telephone Station |
| PVC | Poly-Vinyl Chloride |
| PWR | Power (in Watts) |
| RAN | Radio Access Network |
| RBB | Rack Bonding Busbar |
| RE | Resident Engineer or Senior Resident Engineer |
| RF | Radio Frequency (refer to FR) |
| RFI | Radio Frequency Interference (refer to EMI) |
| RFID | RF Identification (Equipment, System or Personnel) |
| RMC | Rigid Metal Conduit |
| RMU | Rack Mounting Unit |
| RPEC | Radio Paging Equipment Cabinets(refer to HEC, HEIC, PA) |
| RTLS | Real Time Location Service or System |
| RUS | Rural Utilities Service |
| SCC | Security Control Console (refer to PCR, SPCC) |
| SMCS | Spectrum Management and Communications Security (COMSEC) |
| SFO | Solicitation for Offers |
| SME | Subject Matter Experts (refer to AHJ) |
| SMR | Specialized Mobile Radio |
| SMS | Security Management System |
| SNMP | Simple Network Management Protocol |
| SPCC | Security Police Control Center (refer to PCR, SMS) |
| STP | Shielded Balanced Twisted Pair (refer to UTP) |
| STR | Stacked Telecommunications Room |
| TAC | VA’s Technology Acquisition Center, Austin, Texas |
| TCO | Telecommunications Outlet |
| TER | Telephone Equipment Room |
| TGB | Telecommunications Grounding Busbar (also Secondary Bonding Busbar (SBB)) |
| TIP | Telecommunications Infrastructure Plant |
| TMGB | Telecommunications Main Grounding Busbar (also Primary Bonding Busbar (PBB)) |
| TMS | Traffic Management System |
| TOR | Telephone Operators Room |
| TP | Balanced Twisted Pair (refer to STP and UTP) |
| TR | Telecommunications Room (refer to STR) |
| TWP | Twisted Pair |
| UHF | Ultra High Frequency (Radio) |
| UMTS | Universal Mobile Telecommunications System |
| UPCS | Unlicensed Personal Communications Service (refer to PCS) |
| UPS | Uninterruptible Power Supply |
| USC | United States Code |
| UTP | Unshielded Balanced Twisted Pair (refer to TP and STP) |
| UV | Ultraviolet |
| V | Volts |
| VAAR | Veterans Affairs Acquisition Regulation |
| VACO | Veterans Affairs Central Office |
| VAMC | VA Medical Center (refer to CBOC, OPC, VACO) |
| VCCS | TIP’s Vertical Cross Connection System (refer to CCS and HCCS) |
| VHF | Very High Frequency (Radio) |
| VISN | Veterans Integrated Services Network (refers to geographical region) |
| VSWR | Voltage Standing Wave Radio |
| W | Watts |
| WEB | World Electronic Broadcast |
| WiMAX | Worldwide Interoperability (for MW Access) |
| WI-FI | Wireless Fidelity |
| WMTS | Wireless Medical Telemetry Service |
| WSP | Wireless Service Providers |

* + 1. Definitions:
			1. Access Floor: Pathway system of removable floor panels supported on adjustable pedestals to allow cable placement in area below.
			2. BNC Connector (BNC): United States Military Standard MIL-C-39012/21 bayonet-type coaxial connector with quick twist mating/unmating, and two lugs preventing accidental disconnection from pulling forces on cable.
			3. Bond: Permanent joining of metallic parts to form an electrically conductive path to ensure electrical continuity and capacity to safely conduct any currents likely to be imposed to earth ground.
			4. Bundled Microducts: All forms of jacketed microducts.
			5. Conduit: Includes all raceway types specified.
			6. Conveniently Accessible: Capable of being reached without use of ladders, or without climbing or crawling under or over obstacles such as, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
			7. Distributed (in house) Antenna System (DAS): An Emergency Radio Communications System installed for Emergency Responder (or first responders and Government personnel) use while inside facility to maintain contact with each respective control point; refer to Section 27 53 19, DISTRIBUTED RADIO ANTENNA (WITHIN BUILDING) EQUIPMENT AND SYSTEMS.
			8. DEMARC, Extended DMARC or ENTR: Service provider's main point of demarcation owned by LEC or service provider and establishes a physical point where service provider's responsibilities for service and maintenance end. This point is called NID, in data networks.
			9. Effectively Grounded: Intentionally bonded to earth through connections of low impedance having current carrying capacity to prevent buildup of currents and voltages resulting in hazard to equipment or persons.
			10. Electrical Supervision: Analyzing a system’s function and components (i.e. cable breaks / shorts, inoperative stations, lights, LEDs and states of change, from primary to backup) on a 24/7/365 basis; provide aural and visual emergency notification signals to minimum two remote designated or accepted monitoring stations.
			11. Electrostatic Interference (ESI) or Electrostatic Discharge Interference: Refer to EMI and RFI.
			12. Emergency Call Systems: Wall units (in parking garages and stairwells) and pedestal mounts (in parking lots) typically provided with a strobe, camera and two-way audio communication functions. //Additional units are typically provided in facility’s emergency room, designated nurses stations, director’s office, Disaster Control Center, SCC, ECC.//
			13. Project 25 (2014) (P25 (TIA-102 Series)): Set of standards for local, state and Federal public safety organizations and agencies digital LMR services. P25 is applicable to LMR equipment authorized or licensed under the US Department of Commerce National Telecommunications and Information Administration or FCC rules and regulations, and is a required standard capability for all LMR equipment and systems.
			14. Grounding Electrode Conductor: (GEC) Conductor connected to earth grounding electrode.
			15. Grounding Electrode System: Electrodes through which an effective connection to earth is established, including supplementary, communications system grounding electrodes and GEC.
			16. Grounding Equalizer or Backbone Bonding Conductor (BBC): Conductor that interconnects elements of telecommunications grounding infrastructure.
			17. Head End (HE): Equipment, hardware and software, or a master facility at originating point in a communications system designed for centralized communications control, signal processing, and distribution that acts as a common point of connection between equipment and devices connected to a network of interconnected equipment, possessing greatest authority for allowing information to be exchanged, with whom other equipment is subordinate.
			18. Microducts: All forms of air blown fiber pathways.
			19. Ohm: A unit of restive measurement.
			20. Received Signal Strength Indication (RSSI): A measurement of power present in a received RF signal.
			21. Service Provider Demarcation Point (SPDP): Not owned by LEC or service provider, but designated by Government as point within facility considered the DEMARC.
			22. Sound (SND): Changing air pressure to audible signals over given time span.
			23. System: Specific hardware, firmware, and software, functioning together as a unit, performing task for which it was designed.
			24. Telecommunications Bonding Backbone (TBB): Conductors of appropriate size (minimum 53.49 mm2 [1/0 AWG]) stranded copper wire, that connect to Grounding Electrode System and route to telecommunications main grounding busbar (TMGB) and circulate to interconnect various TGBs and other locations shown on drawings.
			25. Voice over Internet Protocol (VoIP): A telephone system in which voice signals are converted to packets and transmitted over LAN network using Transmission Control Protocol (TCP)/Internet Protocol (IP). VA’S VoIP is not listed or coded for life and public safety, critical, emergency or other protection functions. When VoIP system or equipment is provided instead of PBX system or equipment, each TR (STR) and DEMARC requires increased AC power provided to compensate for loss of PBX’s telephone instrument line power; and, to compensate for absence of PBX’s UPS capability.
			26. Wide Area Network (WAN): A digital network that transcends localized LANs within a given geographic location. VA’S WAN/LAN is not nationally listed or coded for life and public safety, critical, emergency or other safety functions.
	1. APPLICABLE PUBLICATIONS

SPEC WRITER NOTES:

1. Remove reference citations that do not apply to edited Division 27 specifications.

2. Verify and update dates indicated for remaining citations to most current and modify requirements impacted by changes.

3. Where deviations occur, contact appropriate AHJ identified herein for guidance and approvals before final project documents can be accepted by Government.

4. In the event of conflict or discrepancy between this section and requirements of any code, requirements stated herein govern unless local code requirement is more stringent and is furthermore not contrary to national code requirements. Identify portions of the section that exceed requirements and receive approval from AHJ and COR for acceptance.

* + 1. Applicability of Standards: Unless documents include more stringent requirements, applicable construction industry standards have same force and effect as if bound or copied directly into the documents to extent referenced. Such standards are made a part of these documents by reference.
			1. Each entity engaged in construction must be familiar with industry standards applicable to its construction activity.
			2. Obtain standards directly from publication source, where copies of standards are needed to perform a required construction activity.
		2. Government Codes, Standards and Executive Orders: Refer to http://www.cfm.va.gov/TIL/cPro.asp:
			1. Federal Communications Commission, (FCC) CFR, Title 47:

Part 15 Restrictions of use for Part 15 listed RF Equipment in Safety of Life Emergency Functions and Equipment Locations

Part 47 Chapter A, Paragraphs 6.1-6.23, Access to Telecommunications Service, Telecommunications Equipment and Customer Premises Equipment

Part 58 Television Broadcast Service

Part 73 Radio and Television Broadcast Rules

Part 90 Rules and Regulations, Appendix C

Form 854 Antenna Structure Registration

Chapter XXIII National Telecommunications and Information Administration (NTIA, P/O Commerce, Chapter XXIII) the ‘Red Book’– Chapters 7, 8 & 9 compliments CFR, Title 47, FCC Part 15, RF Restriction of Use and Compliance in “Safety of Life” Functions & Locations

* + - 1. US Department of Agriculture, (Title 7, USC, Chapter 55, Sections 2201, 2202 & 2203:RUS 1755 Telecommunications Standards and Specifications for Materials, Equipment and Construction:

RUS Bull 1751F-630 Design of Aerial Cable Plants

RUS Bull 1751F-640 Design of Buried Cable Plant, Physical Considerations

RUS Bull 1751F-643 Underground Plant Design

RUS Bull 1751F-815 Electrical Protection of Outside Plants,

RUS Bull 1753F-201 Acceptance Tests of Telecommunications Plants (PC-4)

RUS Bull 1753F-401 Splicing Copper and Fiber Optic Cables (PC-2)

RUS Bull 345-50 Trunk Carrier Systems (PE-60)

RUS Bull 345-65 Shield Bonding Connectors (PE-65)

RUS Bull 345-72 Filled Splice Closures (PE-74)

RUS Bull 345-83 Gas Tube Surge Arrestors (PE-80)

* + - 1. US Department of Commerce/National Institute of Standards Technology,(NIST):

FIPS PUB 1-1 Telecommunications Information Exchange

FIPS PUB 100/1 Interface between Data Terminal Equipment (DTE) Circuit Terminating Equipment for operation with Packet Switched Networks, or Between Two DTEs, by Dedicated Circuit

FIPS PUB 140/2 Telecommunications Information Security Algorithms

FIPS PUB 143 General Purpose 37 Position Interface between DTE and Data Circuit Terminating Equipment

FIPS 160/2 Electronic Data Interchange (EDI),

FIPS 175 Federal Building Standard for Telecommunications Pathway and Spaces

FIPS 191 Guideline for the Analysis of Local Area Network Security

FIPS 197 Advanced Encryption Standard (AES)

FIPS 199 Standards for Security Categorization of Federal Information and Information Systems

* + - 1. US Department of Defense, (DoD):

MIL-STD-188-110 Interoperability and Performance Standards for Data Modems

MIL-STD-188-114 Electrical Characteristics of Digital Interface Circuits

MIL-STD-188-115 Communications Timing and Synchronizations Subsystems

MIL-C-28883 Advanced Narrowband Digital Voice Terminals

MIL-C-39012/21 Connectors, Receptacle, Electrical, Coaxial, Radio Frequency, (Series BNC (Uncabled), Socket Contact, Jam Nut Mounted, Class 2)

* + - 1. US Department of Health and Human Services:

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy, Security and Breach Notification Rules

* + - 1. US Department of Justice:

2010 Americans with Disabilities Act Standards for Accessible Design (ADAAD).

* + - 1. US Department of Labor, (DoL) - Public Law 426-62 – CFR, Title 29, Part 1910, Chapter XVII - Occupational Safety and Health Administration (OSHA), Occupational Safety and Health Standards):

Subpart 7 Approved NRTLs; obtain a copy at https://www.osha.gov/dts/otpca/nrtl/nrtllist.html

Subpart 35 Compliance with NFPA 101, Life Safety Code

Subpart 36 Design and Construction Requirements for Exit Routes

Subpart 268 Telecommunications

Subpart 305 Wiring Methods, Components, and Equipment for General Use

Subpart 508 Americans with Disabilities Act Accessibility Guidelines; technical requirement for accessibility to buildings and facilities by individuals with disabilities

* + - 1. US Department of Transportation, (DoT):
				1. Public Law 85-625, CFR, Title 49, Part 1, Subpart C – Federal Aviation Administration (FAA):AC 110/460-ID & AC 707 / 460-2E – Advisory Circulars Standards for Construction of Antenna Towers, and 7450 and 7460-2 – Antenna Construction Registration Forms.
			2. US Department of Veterans Affairs (VA): Office of Telecommunications (OI&T), MP-6, PART VIII, TELECOMMUNICATIONS, CHAPTER 5, AUDIO, RADIO AND TELEVISION (and COMSEC) COMMUNICATIONS SYSTEMS: Spectrum Management and COMSEC Service (SMCS), AHJ for:
				1. CoG, “Continuance of Government” communications guidelines and compliance.
				2. COMSEC,“VA wide coordination and control of security classified communication assets.”
				3. COOP, “Continuance of Operations” emergency communications guidelines and compliance.
				4. FAA, FCC, and US Department of Commerce National Telecommunications and Information Administration, “VA wide RF Co-ordination, Compliance and Licensing.”
				5. Handbook 6100 – Telecommunications: Cyber and Information Security Office of Cyber and Information Security, and Handbook 6500 – Information Security Program.
				6. Low Voltage Special Communications Systems “Design, Engineering, Construction Contract Specifications and Drawings Conformity, Proof of Performance Testing, VA Compliance and Life Safety Certifications for CFM and VA Facility Low Voltage Special Communications Projects (except Fire Alarm, Telephone and Data Systems).”
				7. SATCOM, “Satellite Communications” guidelines and compliance, and Security and Law Enforcement Systems – “Coordinates the Design, Engineering, Construction Contract Specifications and Drawings Conformity, Proof of Performance Testing, VA Compliance, DEA and Public Safety Certification(s) for CFM and VA Facility Security Low Voltage Special Communications and Physical Security Projects.
				8. VHA’s National Center for Patient Safety – Veterans Health Administration (VHA) Warning System, Failure of Medical Alarm Systems using Paging Technology to Notify Clinical Staff, July 2004.
				9. VA’s CEOSH, concurrence with warning identified in VA Directive 7700.
				10. Wireless and Handheld Devices, “Guidelines and Compliance,”
				11. Office of Security and Law Enforcement: VA Directive 0730 and Health Special Presidential Directive (HSPD)-12.
		1. NRTL Standards: Refer to https://www.osha.gov/laws-regs/regulations/standardnumber/1926
			1. Canadian Standards Association (CSA); same tests as presented by UL
			2. Communications Certifications Laboratory (CEL); same tests as presented by UL.
			3. Intertek Testing Services NA, Inc., (ITSNA), formerly Edison Testing Laboratory (ETL) same tests as presented by UL).
			4. Underwriters Laboratory (UL):

1-2005 Flexible Metal Conduit

5-2011 Surface Metal Raceway and Fittings

6-2007 Rigid Metal Conduit

44-010 Thermoset-Insulated Wires and Cables

50-1995 Enclosures for Electrical Equipment

65-2010 Wired Cabinets

83-2008 Thermoplastic-Insulated Wires and Cables

96-2005 Lightning Protection Components

96A-2007 Installation Requirements for Lightning Protection Systems

360-2013 Liquid-Tight Flexible Steel Conduit

444-2008 Communications Cables

467-2013 Grounding and Bonding Equipment

486A-486B-2013 Wire Connectors

486C-2013 Splicing Wire Connectors

486D-2005 Sealed Wire Connector Systems

486E-2009 Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

493-2007 Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable

497/497A/497B/497C

497D/497E Protectors for Paired Conductors/Communications Circuits/Data Communications and Fire Alarm Circuits/coaxial circuits/voltage protections/Antenna Lead In

510-2005 Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape

514A-2013 Metallic Outlet Boxes

514B-2012 Fittings for Cable and Conduit

514C-1996 Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers

651-2011 Schedule 40 and 80 Rigid PVC Conduit

651A-2011 Type EB and A Rigid PVC Conduit and HDPE Conduit

797-2007 Electrical Metallic Tubing

884-2011 Underfloor Raceways and Fittings

1069-2007 Hospital Signaling and Nurse Call Equipment

1242-2006 Intermediate Metal Conduit

1449-2006 Standard for Transient Voltage Surge Suppressors

1479-2003 Fire Tests of Through-Penetration Fire Stops

1480-2003 Speaker Standards for Fire Alarm, Emergency, Commercial and Professional use

1666-2007 Standard for Wire/Cable Vertical (Riser) Tray Flame Tests

1685-2007 Vertical Tray Fire Protection and Smoke Release Test for Electrical and Fiber Optic Cables

1861-2012 Communication Circuit Accessories

1863-2013 Standard for Safety, communications Circuits Accessories

1865-2007 Standard for Safety for Vertical-Tray Fire Protection and Smoke-Release Test for Electrical and Optical-Fiber Cables

2024-2011 Standard for Optical Fiber Raceways

2024-2014 Standard for Cable Routing Assemblies and Communications Raceways

2196-2001 Standard for Test of Fire Resistive Cable

60950-1 ed. 2-2014 Information Technology Equipment Safety

* + 1. Industry Standards:
			1. Advanced Television Systems Committee (ATSC):

A/53 Part 1: 2013 ATSC Digital Television Standard, Part 1, Digital Television System

A/53 Part 2: 2011 ATSC Digital Television Standard, Part 2, RF/Transmission System Characteristics

A/53 Part 3: 2013 ATSC Digital Television Standard, Part 3, Service Multiplex and Transport System Characteristics

A/53 Part 4: 2009 ATSC Digital Television Standard, Part 4, MPEG-2 Video System Characteristics

A/53 Part 5: 2014 ATSC Digital Television Standard, Part 5, AC-3 Audio System Characteristics

A/53 Part 6: 2014 ATSC digital Television Standard, Part 6, Enhanced AC-3 Audio System Characteristics

* + - 1. American Institute of Architects (AIA): 2006 Guidelines for Design & Construction of Health Care Facilities.
			2. American Society of Mechanical Engineers (ASME):

A17.1 (2013) Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices

17.3 (2011) Safety Code for Existing Elevators and Escalators

17.4 (2009) Guide for Emergency Personnel

17.5 (2011) Elevator and Escalator Electrical Equipment

* + - 1. American Society for Testing and Materials (ASTM):

B1 (2001) Standard Specification for Hard-Drawn Copper Wire

B8 (2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

D1557 (2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft3 (2,700 kN-m/m3)

D2301 (2004) Standard Specification for Vinyl Chloride Plastic Pressure Sensitive Electrical Insulating Tape

B258-02 (2008) Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors

[D709-01(2007) Standard Specification for Laminated Thermosetting Materials](http://www.astm.org/DATABASE.CART/HISTORICAL/D709-01R07.htm)

D4566 (2008) Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable

* + - 1. American Telephone and Telegraph Corporation (AT&T) - Obtain following AT&T Publications at https://ebiznet.sbc.com/sbcnebs/

ATT-TP-76200 (2013) Network Equipment and Power Grounding, Environmental, and Physical Design Requirements

ATT-TP-76300(2012) Merged AT&T Affiliate Companies Installation Requirements

ATT-TP-76305 (2013) Common Systems Cable and Wire Installation and Removal Requirements - Cable Racks and Raceways

ATT-TP-76306 (2009) Electrostatic Discharge Control

ATT-TP-76400 (2012) Detail Engineering Requirements

ATT-TP-76402 (2013) AT&T Raised Access Floor Engineering and Installation Requirements

ATT-TP-76405 (2011) Technical Requirements for Supplemental Cooling Systems in Network Equipment Environments

ATT-TP-76416 (2011) Grounding and Bonding Requirements for Network Facilities

ATT-TP-76440 (2005) Ethernet Specification

ATT-TP-76450 (2013) Common Systems Equipment Interconnection Standards for AT&T Network Equipment Spaces

ATT-TP-76461 (2008) Fiber Optic Cleaning

ATT-TP-76900 (2010) AT&T Installation Testing Requirement

ATT-TP-76911 (1999) AT&T LEC Technical Publication Notice

* + - 1. British Standards Institution (BSI):

BS EN 50109-2 Hand Crimping Tools - Tools for The Crimp Termination of Electric Cables and Wires for Low Frequency and Radio Frequency Applications – All Parts & Sections. October 1997

* + - 1. Building Industry Consulting Service International(BICSI):

ANSI/BICSI 002-2011 Data Center Design and Implementation Best Practices

ANSI/BICSI 004-2012 Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities

ANSI/NECA/BICSI

568-2006 Standard for Installing Commercial Building Telecommunications Cabling

NECA/BICSI 607-2011 Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

ANSI/BICSI 005-2013 Electronic Safety and Security (ESS) System Design and Implementation Best Practices

* + - 1. Electronic Components Assemblies and Materials Association,(ECA).

ECA EIA/RS-270 (1973)Tools, Crimping, Solderless Wiring Devices – Recommended Procedures for User Certification

EIA/ECA 310-E (2005) Cabinets, and Associated Equipment

* + - 1. Facility Guidelines Institute: 2010 Guidelines for Design and Construction of Health Care Facilities.
			2. Insulated Cable Engineers Association (ICEA):

ANSI/ICEA

S-80-576-2002 Category 1 & 2 Individually Unshielded Twisted-Pair Indoor Cables for Use in Communications Wiring Systems

ANSI/ICEA

S-84-608-2010 Telecommunications Cable, Filled Polyolefin Insulated Copper Conductor, S-87-640(2011) Optical Fiber Outside Plant Communications Cable

ANSI/ICEA

S-90-661-2012 Category 3, 5, & 5e Individually Unshielded Twisted-Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems

S-98-688 (2012) Broadband Twisted Pair Cable Aircore, Polyolefin Insulated, Copper Conductors

S-99-689 (2012) Broadband Twisted Pair Cable Filled, Polyolefin Insulated, Copper Conductors

ICEA S-102-700

(2004) Category 6 Individually Unshielded Twisted Pair Indoor Cables (With or Without an Overall Shield) for use in Communications Wiring Systems Technical Requirements

* + - 1. Institute of Electrical and Electronics Engineers (IEEE):

ISSN 0739-5175 March-April 2008 Engineering in Medicine and Biology Magazine, IEEE (Volume: 27, Issue:2) Medical Grade-Mission Critical-Wireless Networks

IEEE C2-2012 National Electrical Safety Code (NESC)

C62.41.2-2002/

Cor 1-2012 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits 4)

C62.45-2002 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits

81-2012 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System

100-1992 IEEE the New IEEE Standards Dictionary of Electrical and Electronics Terms

602-2007 IEEE Recommended Practice for Electric Systems in Health Care Facilities

1100-2005 IEEE Recommended Practice for Powering and Grounding Electronic Equipment

* + - 1. International Code Council:

AC193 (2014) Mechanical Anchors in Concrete Elements

* + - 1. International Organization for Standardization (ISO):

ISO/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

* + - 1. National Electrical Manufacturers Association (NEMA):

NEMA 250 (2008) Enclosures for Electrical Equipment (1,000V Maximum)

ANSI C62.61 (1993) American National Standard for Gas Tube Surge Arresters on Wire Line Telephone Circuits

ANSI/NEMA FB 1 (2012)Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing EMT) and Cable

ANSI/NEMA OS 1 (2009)Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA SB 19 (R2007) NEMA Installation Guide for Nurse Call Systems

TC 3 (2004) Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

NEMA VE 2 (2006) Cable Tray Installation Guidelines

* + - 1. National Fire Protection Association (NFPA):

70E-2015 Standard for Electrical Safety in the Workplace

70-2014 National Electrical Code (NEC)

72-2013 National Fire Alarm Code

75-2013 Standard for the Fire Protection of Information Technological Equipment

76-2012 Recommended Practice for the Fire Protection of Telecommunications Facilities

77-2014 Recommended Practice on Static Electricity

90A-2015 Standard for the Installation of Air Conditioning and Ventilating Systems

99-2015 Health Care Facilities Code

101-2015 Life Safety Code

241 Safeguarding construction, alternation and Demolition Operations

255-2006 Standard Method of Test of Surface Burning Characteristics of Building Materials

262 - 2011 Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces

780-2014 Standard for the Installation of Lightning Protection Systems

1221-2013 Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems

5000-2015 Building Construction and Safety Code

* + - 1. Society for Protective Coatings (SSPC):

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

* + - 1. Society of Cable Telecommunications Engineers (SCTE):

ANSI/SCTE 15 2006 Specification for Trunk, Feeder and Distribution Coaxial Cable

* + - 1. Telecommunications Industry Association (TIA):

TIA-120 Series Telecommunications Land Mobile communications (APCO/Project 25) (January 2014)

TIA TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems (2004)

TIA-155 Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBASE-T (2010)

TIA TSB-162-A Telecommunications Cabling Guidelines for Wireless Access Points (2013)

TIA-222-G Structural Standard for Antenna Supporting Structures and Antennas (2014)

TIA/EIA-423-B Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits (2012)

TIA-455-C General Requirements for Standard Test Procedures for Optical Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components (August 2014)

TIA-455-53-A FOTP-53 Attenuation by Substitution Measurements for Multimode Graded-Index Optical Fibers in Fiber Assemblies (Long Length) (September 2001)

TIA-455-61-A FOTP-61 Measurement of Fiber of Cable Attenuation Using an OTDR (July 2003)

TIA-472D000-B Fiber Optic Communications Cable for Outside Plant Use (July 2007)

ANSI/TIA-492-B 62.5-µ Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers (November 2009)

ANSI/TIA-492AAAB-A 50-um Core Diameter/125-um Cladding Diameter Class IA Graded-Index Multimode Optically Optimized American Standard Fibers (November 2009

TIA-492CAAA Detail Specification for Class IVa Dispersion- Unshifted Single-Mode Optical Fibers (September 2002)

TIA-492E000 Sectional Specification for Class IVd Nonzero- Dispersion Single-Mode Optical Fibers for the 1,550 nm Window (September 2002)

TIA-526-7-B Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7 (December 2008)

TIA-526.14-A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant – SFSTP-14 (August 1998)

TIA-568 Revision/Edition: C Commercial Building Telecommunications Cabling Standard Set: (TIA-568-C.0-2 Generic Telecommunications Cabling for Customer Premises (2012), TIA-568-C.1-1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements (2012), TIA-568-C.2 Commercial Building Telecommunications Cabling Standard—Part 2: Balanced Twisted Pair Cabling Components (2009), TIA-568-C.3-1 Optical Fiber Cabling Components Standard, (2011) AND TIA-568-C.4 Broadband Coaxial Cabling and Components Standard (2011) with addendums and erratas

TIA-569 Revision/Edition C Telecommunications Pathways and Spaces (March 2013)

TIA-574 Position Non-Synchronous Interface between Data Terminal equipment and Data Circuit Terminating Equipment Employing Serial Binary Interchange (May 2003)

TIA/EIA-590-A Standard for Physical Location and Protection of Below Ground Fiber Optic Cable Plant (July 2001)

TIA-598-D Optical Fiber Cable Color Coding (January 2005)

TIA-604-10-B Fiber Optic Connector Intermateablility Standard (August 2008)

ANSI/TIA-606-B Administration Standard for Telecommunications Infrastructure (2012)

TIA-607-B Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises (January 2013)

TIA-613 High Speed Serial Interface for Data Terminal Equipment and Data Circuit Terminal Equipment (September 2005)

ANSI/TIA-758-B Customer-owned Outside Plant Telecommunications Infrastructure Standard (April 2012)

ANSI/TIA-854 A Full Duplex Ethernet Specification for 1000 Mb/s (1000BASE-TX) Operating over Category 6 Balanced Twisted-Pair Cabling (2001)

ANSI/TIA-862-A Building Automation Systems Cabling Standard (April 2011)

TIA-942-A Telecommunications Infrastructure Standard for Data Centers (March 2014)

TIA-1152 Requirements for Field Testing Instruments and Measurements for Balanced Twisted Pair Cabling (September 2009)

TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard (July 2010)

* 1. SINGULAR NUMBER
		1. Where any device or part of equipment is referred in singular number (such as " rack"), reference applies to as many such devices as are required to complete installation.
	2. Related Work
		1. Specification Order of Precedence: FAR Clause 52.236-21, VAAR Clause 852.236-71.
			1. Field Cutting and Patching: Section 09 91 00, PAINTING.
			2. Additional submittal requirements: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
			3. Availability and source of references and standards specified in applicable publications: Section 01 42 19, REFERENCE STANDARDS.
			4. Control of environmental pollution and damage for air, water, and land resources: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
			5. Requirements for non-hazardous building construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
			6. General requirements and procedures to comply with various federal mandates and U.S. Department of Veterans Affairs (VA) policies for sustainable design: Section 01 81 13,SUSTAINABLE DESIGN REQUIREMENTS.
			7. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction: Section 07 84 00, FIRESTOPPING.
			8. Sealant and caulking materials and their application: Section 07 92 00, JOINT SEALANTS.
			9. General electrical requirements that are common to more than one section of Division 26: Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
			10. 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).
			11. Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
			12. Conduit and boxes: Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.
			13. Wiring devices: Section 26 27 26, WIRING DEVICES.
			14. Underground ducts, raceways, precast manholes and pull boxes: Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION.
			15. Lightning protection: Section 26 41 00, FACILITY LIGHTNING PROTECTION.
			16. General requirements common to more than one section in Division 28: Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.
			17. Conductors and cables for electronic safety and security systems: Section 28 05 13, CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY.
			18. Low impedance path to ground for electronic safety and security system ground fault currents: Section 28 05 26, GROUNDING AND BONDING FOR SECURITY SYSTEMS.
			19. Conduits and partitioned telecommunications raceways for Electronic Safety and Security systems: Section 28 05 28.33, CONDUITS AND BACK BOXES FOR ELECTRONIC SAFETY AND SECURITY.
			20. Physical Access Control System field-installed controllers connected by data transmission network: Section 28 13 00, PHYSICAL ACCESS DETECTION.
			21. Detection and screening systems: Section 28 13 53, SECURITY ACCESS DETECTION.
			22. Intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions: Section 28 16 11, INTRUSION DETECTION EQUIPMENT AND SYSTEMS.
			23. Video surveillance system cameras, data transmission wiring, and control stations with associated equipment: Section 28 23 00, VIDEO SURVEILLANCE EQUIPMENT AND SYSTEMS.
			24. Duress-panic alarms, emergency phones or call boxes, intercom systems, data transmission wiring and associated equipment: Section 28 26 00, ELECTRONIC PERSONAL PROTECTION EQUIPMENT AND SYSTEMS.
			25. Alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, and wiring: Section 28 31 00, FIRE DETECTION AND ALARM.
			26. Emergency Call telephones, intercom systems, with blue strobe light and equipment: Section 28 52 31, SECURITY EMERGENCY CALL/DURESS ALARM/COMMUNICATIONS SYSTEM AND EQUIPMENT.
	3. ADMINISTRATIVE REQUIREMENTS
		1. Assign a single communications project manager to serve as point of contact for Government, contractor, and design professional.
		2. Be proactive in scheduling work.
			1. Use of premises is restricted at times directed by COR.
			2. Movement of materials: Unload materials and equipment delivered to site. //Pay costs for rigging, hoisting, lowering and moving equipment on and around site, in building or on roof.//
			3. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
			4. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of Work. // Plan for large equipment requiring positioning prior to closing in building. //
			5. Coordinate connection of materials, equipment, and systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies; provide required connection for each service.
			6. Initiate and maintain discussion regarding schedule for ceiling construction and install cables to meet that schedule.
		3. Contact the Office of Telecommunications, Special Communications Team (005OP2H3) (202)461-5310 to have a Government-accepted Telecommunications COR assigned to project for telecommunications review, equipment and system approval and coordination with other VA personnel.
		4. Communications Project Manager Responsibilities:
			1. Assume responsibility for overall telecommunications system integration and coordination of work among trades, subcontractors, and authorized system installers.
			2. Coordinate with related work indicated on drawings or specified.
			3. Manage work related to telecommunications system installation in a manner approved by manufacturer.
	4. SUBMITTALS
		1. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
		2. Provide parts list including quantity of spare parts.
		3. Provide manufacturer product information. Government reserves the right to require a list of installations where products have been in operation.
		4. Provide Source Quality Control Submittal:
			1. Submit written certification from OEM indicating that proposed supervisor of installation and proposed provider of warranty maintenance are authorized representatives of OEM. Include individual's legal name, contact information and OEM credentials in certification.
			2. Submit written certification from OEM that wiring and connection diagrams meet Government Life Safety Guidelines, NFPA, NEC, NRTL, these specifications, and Joint Commission requirements and instructions, requirements, recommendations, and guidance set forth by OEM for the proper performance of system.
			3. Pre-acceptance Certification: Certification in accordance with procedure outlined in Section 01 00 00, GENERAL REQUIREMENTS and specific Division 27 qualification documentation.
		5. Installer Qualifications: Submit three installations of similar size and complexity furnished and installed by installer; include:
			1. Installation location and name.
			2. Owner’s name and contact information including, address, telephone and email.
			3. Date of project start and date of final acceptance.
			4. System project number.
			5. Three paragraph description of each system related to this project; include function, operation, and installation.
		6. Provide delegated design submittals (e.g. seismic support design).
		7. Submittals are required for all equipment anchors and supports. Include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion,) associated with equipment or conduit. Anchors and supports to resist seismic load based on seismic design categories per section 4.0 of VA seismic design requirements H-18-8 dated August, 2013.
		8. Test Equipment List:
			1. Supply test equipment of accuracy better than parameters to be tested.
			2. Submit test equipment list including make and model number:
				1. ANSI/TIA-1152 Level IIIe // IV// twisted pair cabling test instrument.
				2. Fiber optic insertion loss power meter with light source.
				3. Optical time domain reflectometer (OTDR).
				4. Volt-Ohm meter.
				5. Digital camera.
				6. //Bit Error Test Set (BERT).//
				7. //Signal level meter.//
				8. //Time domain reflectometer (TDR) with strip chart recorder (Data and Optical Measuring)//.
				9. //Spectrum analyzer.//
				10. //Color video monitor with audio capability.//
				11. //Video waveform monitor.//
				12. //Video vector scope.//
				13. //100 MHz oscilloscope with video adapters.//
			3. Supply only test equipment with a calibration tag from Government-accepted calibration service dated not more than 12 months prior to test.
			4. Provide sample test and evaluation reports.
		9. Submittal Drawings:
			1. Telecommunications Space Plans/Elevations: Provide enlarged floor plans of telecommunication spaces indicating layout of equipment and devices, including receptacles and grounding provisions. Submit detailed plan views and elevations of telecommunication spaces showing racks, termination blocks, and cable paths. Include following rooms:
				1. Telecommunications rooms.
				2. Building Entrance Facility/Demarcation rooms.
				3. Server rooms/Data Center.
				4. Equipment rooms.
				5. Antenna Head End rooms.
			2. Logical Drawings: Provide logical riser or schematic drawings for all systems.
				1. Provide riser diagrams systems and interconnection drawings for equipment assemblies; show termination points and identify wiring connections.
			3. Access Panel Schedule on Submittal Drawings: Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment.
		10. Provide sustainable design submittals.
		11. Furnish electronic certified test reports to COR prior to final inspection and not more than 90 days after completion of tests.
	5. CLOSEOUT SUBMITTALS
		1. Provide following closeout submittals prior to project closeout date:
			1. Warranty certificate.
			2. Evidence of compliance with requirements such as low voltage certificate of inspection.
			3. Project record documents.
			4. Instruction manuals and software that are a part of system.
		2. Maintenance and Operation Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
			1. Prepare a manual for each system and equipment specified.
			2. Furnish on portable storage drive in PDF format or equivalent accepted by COR.
			3. Furnish complete manual as specified in specification section, fifteen days prior to performance of systems or equipment test.
			4. Furnish remaining manuals prior to final completion.
			5. Identify storage drive "MAINTENANCE AND OPERATION MANUAL" and system name.
			6. Include name, contact information and emergency service numbers of each subcontractor installing system or equipment and local representatives for system or equipment.
			7. Provide a Table of Contents and assemble files to conform to Table of Contents.
			8. Operation and Maintenance Data includes:
				1. Approved shop drawing for each item of equipment.
				2. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of equipment.
				3. A control sequence describing start-up, operation, and shutdown.
				4. Description of function of each principal item of equipment.
				5. Installation and maintenance instructions.
				6. Safety precautions.
				7. Diagrams and illustrations.
				8. Test Results and testing methods.
				9. Performance data.
				10. Pictorial "exploded" parts list with part numbers. Emphasis to be placed on use of special tools and instruments. Indicate sources of supply, recommended spare parts, and name of servicing organization.
				11. Warranty documentation indicating end date and equipment protected under warranty.
				12. Appendix; list qualified permanent servicing organizations for support of equipment, including addresses and certified personnel qualifications.
		3. Record Wiring Diagrams:
			1. Red Line Drawings: Keep one E size 91.44 cm x 121.92 cm (36 inches x 48 inches) set of floor plans, on site during work hours, showing installation progress marked and backbone cable labels noted. Make these drawings available for examination during construction meetings or field inspections.
			2. General Drawing Specifications: Detail and elevation drawings to be D size 61 cm x 91.44 cm (24 inches x 36 inches) with a minimum scale of 0.635 cm = 30.48 cm (1/4 inch = 12 inches). ER, TR and other enlarged detail floor plan drawings to be D size 61 cm x 91.44 cm (24” x 36”) with a minimum scale of 0.635 cm = 30.48 cm (1/4 inch = 12 inches). Building composite floor plan drawings to be D size 61 cm x 91.44 cm (24 inches x 36 inches) with a minimum scale of 3.175 mm = 30.48 cm (1/8 inch = 1’ 0 inch).
			3. Building Composite Floor Plans: Provide building floor plans showing work area outlet locations and configuration, types of jacks, distance for each cable, and cable routing locations.
			4. Floor plans to include:
				1. Final room numbers and actual backbone cabling and pathway locations and labeling.
				2. Inputs and outputs of equipment identified according to labels installed on cables and equipment
				3. Device locations with labels.
				4. Conduit.
				5. Head-end equipment.
				6. Wiring diagram.
				7. Labeling and administration documentation.
			5. Submit Record Wiring Diagrams within five business days after final cable testing.
			6. Deliver Record Wiring Diagrams as CAD files in .dwg // or // .dgn // .rvt // formats as determined by COR.
			7. Deliver four complete sets of electronic record wiring diagrams to COR on portable storage drive.
		4. Service Qualifications: Submit name and contact information of service organizations providing service to this installation within // four // eight // hours of receipt of notification service is needed.
	6. MAINTENANCE MATERIAL SUBMITTALS
		1. After approval and prior to installation, furnish COR with the following:
			1. A 300 mm (12 inch) length of each type and size of wire and cable along with tag from coils of reels from which samples were taken.
			2. One coupling, bushing and termination fitting for each type of conduit.
			3. Samples of each hanger, clamp and supports for conduit and pathways.
			4. Duct sealing compound.
	7. qUALITY aSSURANCE
		1. Manufacturer’s Qualifications: Manufacturer must produce, as a principal product, the equipment and material specified for this project, and have manufactured item for at least three years.
		2. Product and System Qualification:
			1. OEM must have three installations of equipment submitted presently in operation of similar size and type as this project, that have continuously operated for a minimum of three years.
			2. Government reserves the right to require a list of installations where products have been in operation before approval.
			3. Authorized representative of OEM must be responsible for design, satisfactory operation of installed system, and certification.
		3. Trade Contractor Qualifications: Trade contractor must have completed three or more installations of similar systems of comparable size and complexity with regards to coordinating, engineering, testing, certifying, supervising, training, and documentation. Identify these installations as a part of submittal.
		4. System Supplier Qualifications: System supplier must be authorized by OEM to warranty installed equipment.
		5. Telecommunications technicians assigned to system must be trained, and certified by OEM on installation and testing of system; provide written evidence of current OEM certifications for installers.

SPEC WRITER NOTE:

1. Use 4 hours for metropolitan areas and 8 hours for rural areas, in the following paragraph.

* + 1. Manufactured Products:
			1. Comply with FAR clause 52.236-5 for material and workmanship.
			2. When more than one unit of same class of equipment is required, units must be product of a single manufacturer.
			3. Equipment Assemblies and Components:
				1. Components of an assembled unit need not be products of same manufacturer.
				2. Manufacturers of equipment assemblies, which include components made by others, to assume complete responsibility for final assembled unit.
				3. Provide compatible components for assembly and intended service.
				4. Constituent parts which are similar must be product of a single manufacturer.
			4. Identify factory wiring on equipment being furnished and on wiring diagrams.
		2. Testing Agencies: Government reserves the option of witnessing factory tests. Notify COR minimum 15 working days prior to manufacturer performing the factory tests.
			1. When equipment fails to meet factory test and re-inspection is required, contractor is liable for additional expenses, including expenses of Government.
	1. Delivery, Storage, and Handling
		1. Delivery and Acceptance Requirements:
			1. Government's approval of submittals must be obtained for equipment and material before delivery to job site.
			2. Deliver and store materials to job site in OEM's original unopened containers, clearly labeled with OEM's name and equipment catalog numbers, model and serial identification numbers for COR to inventory cable, patch panels, and related equipment.
		2. Storage and Handling Requirements:
			1. Equipment and materials must be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
				1. Store and protect equipment in a manner that precludes damage or loss, including theft.
				2. Protect painted surfaces with factory installed removable heavy kraft paper, sheet vinyl or equivalent.
				3. Protect enclosures, equipment, controls, controllers, circuit protective devices, and other like items, against entry of foreign matter during installation; vacuum clean both inside and outside before testing and operating.
		3. Coordinate storage.
	2. FIELD CONDITIONS
		1. Where variations from documents are requested in accordance with GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, connecting work and related components must include additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.
		2. A contract adjustment or additional time will not be granted because of field conditions pursuant to FAR 52.236-2 and FAR 52.236-3; a contract adjustment or additional time will not be granted for additional work required for complete and usable construction and systems pursuant to FAR 52.246-12.
	3. WARRANTY
		1. Comply with FAR clause 52.246-21//.//, except as follows://
			1. // Warranty material and equipment to be free from defects, workmanship, and remain so for a period of one year for Emergency Systems from date of final acceptance of system by Government; provide OEM’s equipment warranty document to COR. //
			2. // Government maintenance personnel must have ability to contact OEM for emergency maintenance and logistic assistance, remote diagnostic testing, and assistance in resolving technical problems at any time; contractor and OEM must provide this capability.//
1. products
	1. PERFORMANCE AND DESIGN CRITERIA
		1. Provide communications spaces and pathways conforming to TIA 569, at a minimum.
		2. // In cases of renovations in historic or otherwise restrictive buildings, where it has been determined as impossible to follow above stated guidelines, exceptions must not modify maximum distances set forth in TIA 568 and 569; and exceptions must not in any way effect performance of entire TIP system. //
		3. // Modification to administrative issues requires written approvals from COR with concurrence from SMCS 005OP2H3, OEM, contractor, and local authorities. //
	2. EQUIPMENT IDENTIFICATION
		1. Provide laminated black phenolic resin with a white core nameplates with minimum 6 mm (1/4 inch) high engraved lettering.
		2. Nameplates furnished by manufacturer as standard catalog items, unless other method of identification is indicated.
	3. Underground warning tape
		1. Underground Warning: Standard 4-Mil polyethylene 76 mm (3 inch) wide tape detectable type; red with black letters imprinted with “CAUTION BURIED ELECTRIC LINE BELOW”, orange with black letters imprinted with “CAUTION BURIED TELEPHONE LINE BELOW” or orange with black letters imprinted with “CAUTION BURIED FIBER OPTIC LINE BELOW”, as applicable.
	4. WIRE LUBRICATING COMPOUND
		1. Provide non-hardening or forming adhesive coating cable lubricants suitable for cable jacket material and raceway.
	5. FIREPROOFING TAPE
		1. Provide flexible, conformable fabric tape of organic composition and coated one side with flame-retardant elastomer.
		2. Tape must be self-extinguishing and cannot support combustion; arc-proof and fireproof.
		3. Tape cannot deteriorate when subjected to water, gases, salt water, sewage, or fungus; and tape must be resistant to sunlight and ultraviolet light.
		4. Application must withstand a 200-ampere arc for minimum 30 seconds.
		5. Securing Tape: Glass cloth electrical tape minimum 0.18 mm (7 mils) thick and 19 mm (3/4 inch) wide.

SPEC WRITER NOTE:

1. Refer to specific Division 27 and 28 sections for system specific equipment required by system.

* 1. UNDERGROUND CABLES
		1. Provide buried closure suitable for enclosing a straight, butt, and branch splice in a container into which can be poured an encapsulating compound.
		2. Provide closure of adequate strength to protect splice and maintain cable shield electrical continuity in buried environment.
		3. Provide re-enterable encapsulating compound maintaining chemical stability of closure.
		4. Provide filled splice cases in accordance with RUS Bull 345-72.
		5. Provide gel filled cable meeting requirements of ICEA S-99-689 and //RUS 1755.390// //RUS 1755.890//.
		6. In Vault or Manhole:
			1. Provide underground closure suitable to house a straight, butt, and branch splice in a protective housing into which can be poured an encapsulating compound
			2. Closure must be suitable thermoplastic, thermo-set, or stainless steel material supplying structural strength to pass mechanical and electrical requirements in a vault or maintenance hole (manhole) environment.
		7. Re-Enterable Encapsulating Compound: Product maintaining chemical stability of closure.
		8. Provide gel-filled splice cases in accordance with RUS Bull 345-72.
	2. AERIAL (ABOVEGROUND) ENCLOSURES
		1. Provide aboveground enclosures constructed of //minimum 2.108 mm (14 gauge) steel // ultraviolet resistant PVC // and acceptable for // pole // stake // mounting in accordance with RUS 1755.
		2. Size enclosures and install marker.
		3. Secure covers to prevent unauthorized entry.
		4. Provide gel filled cable meeting requirements of //ICEA S-99-689// //ICEA S-98-688//, and RUS 1755.390; except, Figure 8 distribution wire suitable for aerial installation with:
			1. 26,700 N (6,000 pound); or
			2. 6,000 pound Class A galvanized steel; or
			3. 26,700 N (6,000 pound) aluminum-clad steel strand.
	3. TEMPORARY //\_\_\_\_\_// TIP PATHS (overhead tracks, road/path bridges, etc.)
		1. Provide for copper, fiber optic, RF, coaxial and designated electronic system cables to maintain facility communications service during construction and install so as to not present a pedestrian and traffic (including construction) safety hazard.
		2. //\_\_\_\_\_// TIP temporary cable installations are not required to meet industry standards; but each must be reviewed and accepted, in writing, by COR with concurrences from SMCS 005OP2H3, OI&T and facility safety officer, prior to installation.
			1. Be responsible for work associated with each temporary //\_\_\_\_\_// TIP path installation, required by system design and its removal when determined no longer necessary.
			2. Survey outside //\_\_\_\_\_// TIP locations usually encountered, including roads, driveways, marked paths, high traffic passage ways or personnel walkways, and provide COR with a plan for temporary paths.
	4. ACCESS PANELS
		1. Panels: 304 mm x 304 mm (12 inches by 12 inches)// \_\_\_\_\_\_ //, or size allowed by location to provide optimum access to equipment for maintenance and service.
		2. Provide access panels and doors as required to allow service of materials and equipment that require inspection, replacement, repair or service.
		3. //Provide access panels where items installed require access and are concealed in floor, wall, furred space or above ceiling; ceilings consisting of lay-in or removable splined tiles do not require access panels.//
		4. Provide access panels with same fire rating classification as surface penetrated.
1. EXECUTION
	1. Preparation
		1. Penetrations and Sleeves:
			1. Lay out penetration and sleeve openings in advance, to permit provision in work.
			2. Set sleeves in forms before concrete is poured.
			3. Set sleeves prior to installation of structure for passage of pipes, conduit, ducts, etc.
			4. Provide sleeves and packing materials at penetrations of foundations, walls, slabs, partitions, and floors.
			5. Make sleeves that penetrate outside walls, basement slabs, footings, and beams waterproof.
			6. Fill slots, sleeves and other openings in floors or walls if not used.
				1. Fill spaces in openings after installation of conduit or cable.
				2. Provide fill for floor penetrations to prevent passage of water, smoke, fire, and fumes.
				3. Provide fire resistant fill in rated floors and walls, to prevent passage of air, smoke and fumes.
			7. Install sleeves through floors watertight and extend minimum 50.8 mm (2 inches) above floor surface.
			8. Match and set sleeves flush with adjoining floor, ceiling, and wall finishes where raceways passing through openings are exposed in finished rooms.
			9. Annular space between conduit and sleeve must be minimum 6 mm (1/4 inch).
			10. Do not provide sleeves for slabs-on-grade, unless specified or indicated otherwise.
			11. Comply with requirements for firestopping, for sleeves through rated fire walls and smoke partitions.
			12. Do not support piping risers or conduit on sleeves.
			13. Identify unused sleeves and slots for future installation.
			14. Provide core drilling if walls are poured or otherwise constructed without sleeves and wall penetration is required; do not penetrate structural members.
		2. Core Drilling:
			1. Avoid core drilling whenever possible.
			2. Coordinate openings with other trades and utilities, and prevent damage to structural reinforcement.
			3. Investigate existing conditions in vicinity of required opening prior to coring, including an x-ray of floor if determined necessary by competent person or COR.
			4. Protect areas from damage.
		3. Verification of In-Place Conditions:
			1. Verify location, use and status of all material, equipment, and utilities that are specified, indicated, or determined necessary for removal.
				1. Verify materials, equipment, and utilities to be removed are inactive, not required, or in use after completion of project.
				2. Replace with equivalent any material, equipment and utilities that were removed by contractor that are required to be left in place.
			2. Existing Utilities: Do not interrupt utilities serving facilities occupied by Government or others unless permitted under following conditions and then only after arranging to provide temporary utility services, according to requirements indicated:
				1. Notify COR in writing at least 14 days in advance of proposed utility interruptions.
				2. Do not proceed with utility interruptions without Government’s written permission.
		4. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs for floor, wall and ceiling mounting of equipment as required.
		5. Provide steel supports and hardware for installation of hangers, anchors, guides, and other support hardware.
		6. Obtain and analyze catalog data, weights, and other pertinent data required for coordination of equipment support provisions and installation.
		7. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would void warranty.
	2. Installation - GENERAL
		1. Coordinate systems, equipment, and materials installation with other building components.
		2. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings.
		3. Conform to VAAR 852.236.91 arrangements indicated, recognizing that work may be shown in diagrammatic form or have been impracticable to detail all items because of variances in manufacturers’ methods of achieving specified results.
		4. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed in both exposed and un-exposed spaces.
		5. Install equipment according to manufacturers' written instructions.
		6. Install wiring and cabling between equipment and related devices.
		7. Install cabling, wiring, and equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum interference of adjacent other installations.
		8. Provide access panel or doors where units are concealed behind finished surfaces.
		9. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for wiring, cabling, and equipment installations.
		10. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom and access for service and maintenance as possible.
		11. Install systems, materials, and equipment giving priority to systems required to be installed at a specified slope.
		12. Avoid interference with structure and with work or other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of COR and code requirements.
		13. Install equipment and cabling to distribute equipment loads on building structural members provided for equipment support under other sections; install and support roof-mounted equipment on structural steel or roof curbs as appropriate.
		14. Provide supplementary or miscellaneous items, appurtenances, devices and materials for a complete installation.
	3. EQUIPMENT INSTALLATION
		1. Locate equipment as close as practical to locations shown on drawings.
		2. Note locations of equipment requiring access on record drawings.
		3. Access and Access Panels: Verify access panel locations and construction with COR.
		4. Inaccessible Equipment:
			1. Where Government determines that contractor has installed equipment not conveniently accessible for operation and maintenance, equipment must be removed and reinstalled as directed and without additional cost to Government.
			2. Refer to Section 27 11 00, TELECOMMUNICATIONS ROOM FITTINGS for communication equipment cabinet assembly.
			3. Refer to Section 27 11 00, TELECOMMUNICATIONS ROOM FITTINGS for equipment labeling.
	4. EQUIPMENT IDENTIFICATION
		1. Install an identification sign which clearly indicates information required for use and maintenance of equipment.
		2. Secure identification signs with screws.
	5. CUTTING AND PATCHING
		1. Perform cutting and patching according to contract general requirements and as follows:
			1. Remove samples of installed work as specified for testing.
			2. // Perform cutting, fitting, and patching of equipment and materials required to uncover existing infrastructure in order to provide access for correction of improperly installed existing or new work. //
			3. Remove and replace defective work.
			4. Remove and replace non-conforming work.
		2. // Cut, remove, and legally dispose of selected equipment, components, and materials, including removal of material, equipment, devices, and other items indicated to be removed and items made obsolete by new work. //
		3. Provide and maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.
		4. Protect adjacent installations during cutting and patching operations.
		5. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
		6. Patch finished surfaces and building components using new materials specified for original installation and experienced installers.
	6. Field Quality Control
		1. Provide work according to VAAR 852.236.91 and FAR clause 52.236-5.
		2. Provide minimum clearances and work required for compliance with NFPA 70, National Electrical Code (NEC), and manufacturers' instructions; comply with additional requirements indicated for access and clearances.
		3. Verify all field conditions and dimensions that affect selection and provision of materials and equipment, and provide any disassembly, reassembly, relocation, demolition, cutting and patching required to provide work specified or indicated, including relocation and reinstallation of existing wiring and equipment.
			1. Protect facility, equipment, and wiring from damage.
		4. Submit written notice that:
			1. Project has been inspected for compliance with documents.
			2. Work has been completed in accordance with documents.
		5. Non-Conforming Work: Conduct project acceptance inspections, final completion inspections, substantial completion inspections, and acceptance testing and demonstrations after verification of system operation and completeness by Contractor.
		6. For project acceptance inspections, final completion inspections, substantial completion inspections, and testing/demonstrations that require more than one site visit by COR or design professional to verify project compliance for same material or equipment, Government reserves right to obtain compensation from contractor to defray cost of additional site visits that result from project construction or testing deficiencies and incompleteness, incorrect information, or non-compliance with project provisions.
			1. COR will notify contractor, of hourly rates and travel expenses for additional site visits, and will issue an invoice to Contractor for additional site visits.
			2. Contractor is not be eligible for extensions of project schedule or additional charges resulting from additional site visits that result from project construction or testing deficiencies/incompleteness, incorrect information, or non-compliance with Project provisions.
		7. Tests:
			1. Interim inspection is required at approximately 50 percent of installation.
			2. Request inspection ten working days prior to interim inspection start date by notifying COR in writing; this inspection must verify equipment and system being provided adheres to installation, mechanical and technical requirements of construction documents.
			3. Inspection to be conducted by OEM and factory-certified contractor representative, and witnessed by COR, facility and SMCS 0050P2H3 representatives.
			4. Check each item of installed equipment to ensure appropriate NRTL listing labels and markings are fixed in place.
			5. Verify cabling terminations in DEMARC, MCR, TER, SCC, ECC, TRs and head end rooms, workstation locations and TCO adhere to color code for // T568B // T568A // pin assignments and cabling connections are in compliance with TIA standards.
			6. Visually confirm minimum // Category 5e // Category 6 //\_\_\_\_\_ // cable marking at TCOs, CCSs locations, patch cords and origination locations.
			7. Review entire communications circulating ground system, each TGB and grounding connection, grounding electrode and outside lightning protection system.
			8. Review cable tray, conduit and path/wire way installation practice.
			9. OEM and contractor to perform:
				1. Fiber optical cable field inspection tests via attenuation measurements on factory reels; provide results along with OEM certification for factory reel tests.

SPEC WRITER NOTES:

1. TIA-568-C.0 and addendum, TIA-568-C.0-2, provide requirements for testing installed optical fiber cabling systems.

2. Optical loss testing is defined therein as Tier 1 testing, while Optical Time Domain Reflectometry (OTDR) testing is Tier 2.

3. Tier 2 is an optional test and not recommended for installations containing branching devices and isolators.

* + - * 1. Coaxial cable field inspection tests via attenuation measurements on factory reels; provide results along with OEM certification for factory reel tests.
				2. Baseband cable field inspection tests via attenuation measurements on factory reels and provide results along with OEM certification for factory reel tests.
			1. Relocate failed cable reels to a secured location for inventory, as directed by COR, and then remove from project site within two working days; provide COR with written confirmation of defective cable reels removal from project site.
			2. Provide results of interim inspections to COR.
			3. If major or multiple deficiencies are discovered, additional interim inspections could be required until deficiencies are corrected, before permitting further system installation.
				1. Additional inspections are scheduled at direction of COR.
				2. Re-inspection of deficiencies noted during interim inspections, must be part of system’s Final Acceptance Proof of Performance Test.
				3. The interim inspection cannot affect the system’s completion date unless directed by COR.
			4. Facility COR will ensure test documents become a part of system’s official documentation package.
		1. Pretesting: Re-align, re-balance, sweep, re-adjust and clean entire system and leave system working for a “break-in” period, upon completing installation of system and prior to Final Acceptance Proof of Performance Test. System RF transmitting equipment must not be connected to keying or control lines during “break-in” period.
			1. Pretesting Procedure:
				1. Verify systems are fully operational and meet performance requirements, utilizing accepted test equipment and spectrum analyzer.
				2. Pretest and verify system functions and performance requirements conform to construction documents and, that no unwanted physical, aural and electronic effects, such as signal distortion, noise pulses, glitches, audio hum, poling noise are present.
			2. Measure and record signal, aural and control carrier levels of each DAS RF, voice and data channel, at each of the following minimum points in system:

SPEC WRITER NOTE:

1. Edit list to project.

* + - * 1. Utility provider entrance.
				2. Buried conduit duct locations.
				3. Maintenance Holes (Manholes) and hand holes.
				4. ENTR or DEMARC.
				5. PBX interconnections.
				6. MCR interconnections.
				7. MCOR interconnections.
				8. TER interconnections.
				9. TOR interconnections.
				10. Control room interconnections.
				11. TR interconnections.
				12. System interfaces in locations listed herein.
				13. HE interconnections.
				14. Antenna (outside and inside) interconnections.
				15. System and lightning ground interconnections.
				16. Communications circulating ground system.
				17. UPS areas.
				18. Emergency generator interconnections.
				19. Each general floor areas.
				20. Others as required by AHJ (SMCS 005OP2H3).
			1. Provide recorded system pretest measurements and certification that the system is ready for formal acceptance test to COR.
		1. Acceptance Test:
			1. Schedule an acceptance test date after system has been pretested, and pretest results and certification submitted to COR.
			2. Give COR fifteen working days written notice prior to date test is expected to begin; include expected duration of time for test in notification.
			3. Test in the presence of the following:
				1. COR.
				2. OEM representatives.
				3. VACO:

CFM representative.

AHJ–SMCS 005OP2H3, (202)461-5310.

* + - * 1. VISN–CIO, Network Officer and VISN representatives.
				2. Facility:

FMS Service Chief, Bio-Medical Engineering and facility representatives.

OI&T Service Chief and OI&T representatives.

Safety Officer, Police Chief and facility safety representatives.

* + - * 1. Local Community Safety Personnel:

Fire Marshal representative.

Disaster Coordinator representative.

EMS Representatives: Police, Sherriff, City, County or State representatives.

* + - 1. Test system utilizing accepted test equipment to certify proof of performance and Life and Public Safety compliance, FCC, NRTL, NFPA and OSHA compliance.
				1. Rate system as acceptable or unacceptable at conclusion of test; make only minor adjustments and connections required to show proof of performance.

Demonstrate and verify that system complies with performance requirements under operating conditions.

Failure of any part of system that precludes completion of system testing, and which cannot be repaired within four hours, terminates acceptance test of that portion of system.

Repeated failures that result in a cumulative time of eight hours to affect repairs is cause for entire system to be declared unacceptable.

If system is declared unacceptable, retesting must be rescheduled at convenience of Government and costs borne by the contractor.

* + 1. Acceptance Test Procedure:
			1. Physical and Mechanical Inspection: The test team representatives must tour major areas to determine system and sub-systems are completely and properly installed and are ready for acceptance testing.
			2. A system inventory including available spare parts must be taken at this time.
			3. Each item of installed equipment must be re-checked to ensure appropriate NRTL (i.e. UL) certification listing labels are affixed.
			4. Confirm that deficiencies reported during Interim Inspections and Pretesting are corrected prior to start of Acceptance Test.
			5. Inventory system diagrams, record drawings, equipment manuals, pretest results.
			6. Failure of system to meet installation requirements of specifications is grounds for terminating testing and to schedule re-testing.
		2. Operational Test:

SPEC WRITER NOTES:

1. Refer to specific Division 27 and 28 sections for procedures to address the system.

* + - 1. Individual Item Test: VACO AHJ representative (SMCS 005OP2H3) may select individual items of // DAS //\_\_\_\_\_// equipment for detailed proof of performance testing until 100 percent of system has been tested and found to meet requirements of the construction documents.
			2. Government’s Condition of Acceptance of System Language:
				1. Without Acceptance: Until system fully meets conditions of construction documents, system’s ownership, use, operation and warranty commences at Government’s final acceptance date.
				2. With Conditional Acceptance: Stating conditions that need to be addressed by contractor or OEM and stating system’s use and operation to commence immediately while its warranty commences only at Government’s agreed final extended acceptance date.
				3. With Full Acceptance: Stating system’s ownership, use, operation and warranty to immediately commence at Government’s agreed to date of final acceptance.
		1. Acceptance Test Conclusion: Reschedule testing on deficiencies and shortages with COR, after COR and SMCS AHJ jointly agree to results of the test, using the generated punch list or discrepancy list. Perform retesting to comply with these specifications at contractor's expense.
		2. Proof of Performance Certification:
			1. If system is declared acceptable, AHJ (SMCS 005OP2H3) provides COR notice stating system processes to required operating standards and functions and is Government accepted for use by facility.
			2. Validate items with COR needing to be provided to complete project contract (i.e. charts & diagrams, manuals, spare parts, system warranty documents executed, etc.). Once items have been provided, COR contacts FMS service chief to turn over system from CFM oversight for beneficial use by facility.
			3. If system is declared unacceptable without conditions, rescheduled testing expenses are to be borne by contractor.
	1. cleaning
		1. Remove debris, rubbish, waste material, tools, construction equipment, machinery and surplus materials from project site and clean work area, prior to final inspection and acceptance of work.
		2. Put building and premises in neat and clean condition.
		3. Remove debris on a daily basis.
		4. Remove unused material, during progress of work.
		5. Perform cleaning and washing required to provide acceptable appearance and operation of equipment to satisfaction of COR.
		6. Clean exterior surface of all equipment, including concrete residue, dirt, and paint residue, after completion of project.
		7. Perform final cleaning prior to project acceptance by COR.
		8. Remove paint splatters and other spots, dirt, and debris; touch up scratches and mars of finish to match original finish.
		9. Clean devices internally using methods and materials recommended by manufacturer.
		10. Tighten wiring connectors, terminals, bus joints, and mountings, to include lugs, screws and bolts according to equipment manufacturer’s published torque tightening values for equipment connectors. In absence of published connection or terminal torque values, comply with torque values specified in UL 486A-486B.
	2. TRAINING

SPEC WRITER NOTE:

1. Refer to specific Division 27 and 28 sections for system specific training required.

* + 1. Provide training in accordance with subsection, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.
		2. Provide training for equipment or system as required in each associated specification.
		3. Develop and submit training schedule for approval by COR, at least 30 days prior to planned training.
	1. Protection
		1. Protection of Fireproofing:
			1. Install clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed, if possible, prior to start of spray fireproofing work.
			2. Install conduits and other items that would interfere with proper application of fireproofing after completion of spray fire proofing work.
			3. Patch and repair fireproofing damaged due to cutting or course of work must be performed by installer of fireproofing and paid for by trade responsible for damage.
		2. Maintain equipment and systems until final acceptance.
		3. Ensure adequate protection of equipment and material during installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.

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