	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
14.	National Electrical N	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
15.	National Fire Protec	tion 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
16.	Society for Protectiv	ve Coatings (SSPC):
	SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
17.	Society of Cable Tele	ecommunications Engineers (SCTE):
	ANSI/SCTE 15 2006	Specification for Trunk, Feeder and
		Distribution Coaxial Cable
18.	Telecommunications In	ndustry 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) ТІА-472D000-В 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)

1.4 SINGULAR NUMBER

A. 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.

1.5 RELATED WORK

- A. 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.
 - 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 CONSTRUCTION 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.
 - 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 19, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.
 - 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. General requirements common to more than one section in Division 28: Section 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY.

- 15. Physical Access Control System field-installed controllers connected by data transmission network: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM.
- 16. Intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions: Section 28 16 00, INTRUSION DETECTION SYSTEM.
- 17. Video surveillance system cameras, data transmission wiring, and control stations with associated equipment: Section 28 23 00, VIDEO SURVEILLANCE.
- 18. 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.

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Assign a single communications project manager to serve as point of contact for Government, contractor, and design professional.
- B. Be proactive in scheduling work.
 - 1. Use of premises is restricted at times directed by COR.
 - 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.
 - Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 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.
- C. Contact the Office of Telecommunications, Special Communications Team (0050P2H3) (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.

- D. Communications Project Manager Responsibilities:
 - 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.
 - Manage work related to telecommunications system installation in a manner approved by manufacturer.

1.7 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Provide parts list including quantity of spare parts.
- C. Provide manufacturer product information. Government reserves the right to require a list of installations where products have been in operation.
- D. Provide Source Quality Control Submittal:
 - 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.
- E. Installer Qualifications: Submit three installations of similar size and complexity furnished and installed by installer; include:
 - 1. Installation location and name.
 - 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.
- F. Provide delegated design submittals (e.g. seismic support design).

- G. 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.
- H. Test Equipment List:
 - Supply test equipment of accuracy better than parameters to be tested.
 - 2. Submit test equipment list including make and model number:
 - a. ANSI/TIA-1152 Level IIIe twisted pair cabling test instrument.
 - b. Fiber optic insertion loss power meter with light source.
 - c. Optical time domain reflectometer (OTDR).
 - d. Volt-Ohm meter.
 - e. Digital camera.
 - f. Signal level meter.
 - g. Time domain reflectometer (TDR) with strip chart recorder (Data and Optical Measuring).
 - 3. Supply only test equipment with a calibration tag from Governmentaccepted calibration service dated not more than 12 months prior to test.
 - 4. Provide sample test and evaluation reports.
- I. Submittal Drawings:
 - 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:
 - a. Telecommunications rooms.
 - Logical Drawings: Provide logical riser or schematic drawings for all systems.
 - a. 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.
- J. Provide sustainable design submittals.
- K. Furnish electronic certified test reports to COR prior to final inspection and not more than 90 days after completion of tests.

1.8 CLOSEOUT SUBMITTALS

- A. 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.
- B. 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.
 - Include name, contact information and emergency service numbers of each subcontractor installing system or equipment and local representatives for system or equipment.
 - Provide a Table of Contents and assemble files to conform to Table of Contents.
 - 8. Operation and Maintenance Data includes:
 - a. Approved shop drawing for each item of equipment.
 - b. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of equipment.
 - c. A control sequence describing start-up, operation, and shutdown.
 - d. Description of function of each principal item of equipment.
 - e. Installation and maintenance instructions.
 - f. Safety precautions.
 - g. Diagrams and illustrations.
 - h. Test Results and testing methods.

- i. Performance data.
- j. 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.
- k. Warranty documentation indicating end date and equipment protected under warranty.
- Appendix; list qualified permanent servicing organizations for support of equipment, including addresses and certified personnel qualifications.
- C. Record Wiring Diagrams:
 - 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:
 - a. Final room numbers and actual backbone cabling and pathway locations and labeling.
 - b. Inputs and outputs of equipment identified according to labels installed on cables and equipment.
 - c. Device locations with labels.
 - d. Conduit.
 - e. Head-end equipment.
 - f. Wiring diagram.
 - g. Labeling and administration documentation.

- 5. Submit Record Wiring Diagrams within five business days after final cable testing.
- Deliver Record Wiring Diagrams as CAD files in .dwg or .dgn or .rvt formats as determined by COR.
- Deliver four complete sets of electronic record wiring diagrams to COR on portable storage drive.
- D. Service Qualifications: Submit name and contact information of service organizations providing service to this installation within four hours of receipt of notification service is needed.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. 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.
 - 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.

1.10 QUALITY ASSURANCE

- A. 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.
- B. Product and System Qualification:
 - 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.
- C. 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.
- D. System Supplier Qualifications: System supplier must be authorized by OEM to warranty installed equipment.

- E. 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.
- F. Manufactured Products:
 - 1. Comply with FAR clause 52.236-5 for material and workmanship.
 - 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:
 - a. Components of an assembled unit need not be products of same manufacturer.
 - b. Manufacturers of equipment assemblies, which include components made by others, to assume complete responsibility for final assembled unit.
 - c. Provide compatible components for assembly and intended service.
 - d. Constituent parts which are similar must be product of a single manufacturer.
 - Identify factory wiring on equipment being furnished and on wiring diagrams.
- G. Testing Agencies: Government reserves the option of witnessing factory tests. Notify COR minimum 15 working days prior to manufacturer performing the factory tests.
 - When equipment fails to meet factory test and re-inspection is required, contractor is liable for additional expenses, including expenses of Government.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Government's approval of submittals must be obtained for equipment and material before delivery to job site.
 - 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.
- B. Storage and Handling Requirements:
 - Equipment and materials must be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:
 - a. Store and protect equipment in a manner that precludes damage or loss, including theft.

- b. Protect painted surfaces with factory installed removable heavy kraft paper, sheet vinyl or equivalent.
- c. 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.
- C. Coordinate storage.

1.12 FIELD CONDITIONS

- A. 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.
- B. 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.

1.13 WARRANTY

A. Comply with FAR clause 52.246-21

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Provide communications spaces and pathways conforming to TIA 569, at a minimum.

2.2 EQUIPMENT IDENTIFICATION

- A. Provide laminated black phenolic resin with a white core nameplates with minimum 6 mm (1/4 inch) high engraved lettering.
- B. Nameplates furnished by manufacturer as standard catalog items unless other method of identification is indicated.

2.3 UNDERGROUND WARNING TAPE: - NOT USED

2.4 WIRE LUBRICATING COMPOUND

A. Provide non-hardening or forming adhesive coating cable lubricants suitable for cable jacket material and raceway.

- 2.5 FIREPROOFING TAPE: NOT USED
- 2.6 UNDERGROUND CABLES: NOT USED
- 2.7 AERIAL (ABOVEGROUND) ENCLOSURES: NOT USED
- 2.8 TEMPORARY TIP PATHS (OVERHEAD TRACKS, ROAD/PATH BRIDGES, ETC.): NOT USED

2.9 ACCESS PANELS

- A. 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.
- B. Provide access panels and doors as required to allow service of materials and equipment that require inspection, replacement, repair, or service.
- C. 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.
- D. Provide access panels with same fire rating classification as surface penetrated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Penetrations and Sleeves:
 - Lay out penetration and sleeve openings in advance, to permit provision in work.
 - 2. Set sleeves in forms before concrete is poured.
 - Set sleeves prior to installation of structure for passage of pipes, conduit, ducts, etc.
 - 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.
 - Fill slots, sleeves and other openings in floors or walls if not used.
 - a. Fill spaces in openings after installation of conduit or cable.
 - b. Provide fill for floor penetrations to prevent passage of water, smoke, fire, and fumes.
 - c. Provide fire resistant fill in rated floors and walls, to prevent passage of air, smoke, and fumes.
 - Install sleeves through floors watertight and extend minimum 50.8 mm (2 inches) above floor surface.

- 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).
- 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.
- B. Core Drilling:
 - 1. Avoid core drilling whenever possible.
 - 2. Coordinate openings with other trades and utilities and prevent damage to structural reinforcement.
 - 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.
- C. Verification of In-Place Conditions:
 - Verify location, use and status of all material, equipment, and utilities that are specified, indicated, or determined necessary for removal.
 - a. Verify materials, equipment, and utilities to be removed are inactive, not required, or in use after completion of project.
 - b. Replace with equivalent any material, equipment and utilities that were removed by contractor that are required to be left in place.
 - 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:
 - a. Notify COR in writing at least 14 days in advance of proposed utility interruptions.

- b. Do not proceed with utility interruptions without Government's written permission.
- D. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs for floor, wall and ceiling mounting of equipment as required.
- E. Provide steel supports and hardware for installation of hangers, anchors, guides, and other support hardware.
- F. Obtain and analyze catalog data, weights, and other pertinent data required for coordination of equipment support provisions and installation.
- G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would void warranty.

3.2 INSTALLATION - GENERAL

- A. Coordinate systems, equipment, and materials installation with other building components.
- B. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings.
- C. 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.
- D. 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.
- E. Install equipment according to manufacturers' written instructions.
- F. Install wiring and cabling between equipment and related devices.
- G. 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.
- H. Provide access panel or doors where units are concealed behind finished surfaces.
- I. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for wiring, cabling, and equipment installations.
- J. 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.

- K. Install systems, materials, and equipment giving priority to systems required to be installed at a specified slope.
- L. 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.
- M. 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.
- N. Provide supplementary or miscellaneous items, appurtenances, devices, and materials for a complete installation.

3.3 EQUIPMENT INSTALLATION

- A. Locate equipment as close as practical to locations shown on drawings.
- B. Note locations of equipment requiring access on record drawings.
- C. Access and Access Panels: Verify access panel locations and construction with COR.
- D. Inaccessible Equipment:
 - 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, COMMUNICATIONS EQUIPMENT ROOM FITTINGS for communication equipment cabinet assembly.
 - 3. Refer to Section 27 11 00, COMMUNICATIONS EQUIPMENT ROOM FITTINGS for equipment labeling.

3.4 EQUIPMENT IDENTIFICATION

- A. Install an identification sign which clearly indicates information required for use and maintenance of equipment.
- B. Secure identification signs with screws.

3.5 CUTTING AND PATCHING

- A. Perform cutting and patching according to contract general requirements and as follows:
 - 1. Remove samples of installed work as specified for testing.
 - 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.

- B. 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.
- C. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- D. Protect adjacent installations during cutting and patching operations.
- E. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- F. Patch finished surfaces and building components using new materials specified for original installation and experienced installers.

3.6 FIELD QUALITY CONTROL

- A. Provide work according to VAAR 852.236.91 and FAR clause 52.236-5.
- B. 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.
- C. 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.

- D. Submit written notice that:
 - 1. Project has been inspected for compliance with documents.
 - 2. Work has been completed in accordance with documents.
- E. 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.
- F. 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 noncompliance with project provisions.

- 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 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.
- G. Tests:
 - Interim inspection is required at approximately 50 percent of installation.
 - 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.
 - 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 T568A pin assignments and cabling connections are in compliance with TIA standards.
 - Visually confirm minimum Category 6 cable marking at TCOs, CCSs locations, patch cords and origination locations.
 - 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:
 - a. Fiber optical cable field inspection tests via attenuation measurements on factory reels; provide results along with OEM certification for factory reel tests.
 - b. Coaxial cable field inspection tests via attenuation measurements on factory reels; provide results along with OEM certification for factory reel tests.

- c. Baseband cable field inspection tests via attenuation measurements on factory reels and provide results along with OEM certification for factory reel tests.
- 10. 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.
- 11. Provide results of interim inspections to COR.
- 12. If major or multiple deficiencies are discovered, additional interim inspections could be required until deficiencies are corrected, before permitting further system installation.
 - a. Additional inspections are scheduled at direction of COR.
 - Re-inspection of deficiencies noted during interim inspections, must be part of system's Final Acceptance Proof of Performance Test.
 - c. The interim inspection cannot affect the system's completion date unless directed by COR.
- Facility COR will ensure test documents become a part of system's official documentation package.
- H. 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:
 - a. Verify systems are fully operational and meet performance requirements, utilizing accepted test equipment and spectrum analyzer.
 - b. 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.
 - 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:
 - a. ENTR or DEMARC.
 - b. PBX interconnections.
 - c. MCR interconnections.

- d. TR interconnections.
- e. System interfaces in locations listed herein.
- f. Communications circulating ground system.
- g. Each general floor areas.
- h. Others as required by AHJ (SMCS 0050P2H3).
- 3. Provide recorded system pretest measurements and certification that the system is ready for formal acceptance test to COR.
- I. Acceptance Test:
 - Schedule an acceptance test date after system has been pretested, and pretest results and certification submitted to COR.
 - 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:
 - a. COR.
 - b. OEM representatives.
 - c. VACO:
 - 1) CFM representative.
 - 2) AHJ-SMCS 0050P2H3, (202)461-5310.
 - d. VISN-CIO, Network Officer and VISN representatives.
 - e. Facility:
 - 1) FMS Service Chief, Bio-Medical Engineering, and facility representatives.
 - 2) OI&T Service Chief and OI&T representatives.
 - Safety Officer, Police Chief, and facility safety representatives.
 - f. Local Community Safety Personnel:
 - 1) Fire Marshal representative.
 - 2) Disaster Coordinator representative.
 - 3) EMS Representatives: Police, Sherriff, City, County or State representatives.
 - Test system utilizing accepted test equipment to certify proof of performance and Life and Public Safety compliance, FCC, NRTL, NFPA and OSHA compliance.
 - a. Rate system as acceptable or unacceptable at conclusion of test; make only minor adjustments and connections required to show proof of performance.

- 1) 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.
- J. Acceptance Test Procedure:
 - 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.
 - Inventory system diagrams, record drawings, equipment manuals, pretest results.
 - Failure of system to meet installation requirements of specifications is grounds for terminating testing and to schedule re-testing.
- K. Operational Test:
 - Individual Item Test: VACO AHJ representative (SMCS 0050P2H3) may select individual items of 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:
 - a. Without Acceptance: Until the system fully meets conditions of construction documents, system's ownership, use, operation, and warranty commences at Government's final acceptance date.
 - b. 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.

- c. With Full Acceptance: Stating system's ownership, use, operation, and warranty to immediately commence at Government's agreed to date of final acceptance.
- L. 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.
- M. Proof of Performance Certification:
 - If the system is declared acceptable, AHJ (SMCS 0050P2H3) 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 the system is declared unacceptable without conditions, rescheduled testing expenses are to be borne by contractor.

3.7 CLEANING

- A. 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.
- B. Put the building and premises in neat and clean condition.
- C. Remove debris on a daily basis.
- D. Remove unused material during progress of work.
- E. Perform cleaning and washing required to provide acceptable appearance and operation of equipment to satisfaction of COR.
- F. Clean exterior surface of all equipment, including concrete residue, dirt, and paint residue, after completion of project.
- G. Perform final cleaning prior to project acceptance by COR.
- H. Remove paint splatters and other spots, dirt, and debris; touch up scratches and mars of finish to match original finish.
- I. Clean devices internally using methods and materials recommended by manufacturer.
- J. 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.

3.8 TRAINING

- A. Provide training in accordance with subsection, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.
- B. Provide training for equipment or system as required in each associated specification.
- C. Develop and submit training schedule for approval by COR, at least 30 days prior to planned training.

3.9 PROTECTION

- A. Protection of Fireproofing:
 - Install clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed, if possible, prior to start of spray fireproofing work.
 - Install conduits and other items that would interfere with proper application of fireproofing after completion of spray fire proofing work.
 - 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.
- B. Maintain equipment and systems until final acceptance.
- C. 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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