

SPECIAL SPECIFICATION
SECTION 25130S
INTERIOR TELECOMMUNICATIONS PATHWAYS

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SPECIAL SPECIFICATION
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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Section Includes: Material and installation of raceway system for intra-building telecommunication cabling at Sandia National Laboratories, New Mexico (SNL/NM).
- B. Drawings shall delineate intra-building cable system by locations of Main Distribution Room (MDR), Intermediate Distribution Room (IDR), user outlets, and rack frame and cabinet locations.

Raceway and cable routing shown on Drawings are not intended to show all support or mounting hardware, or raceway bends, kicks, offsets, and couplings.

- C. Project may contain both Red - Sandia Classified Network (SCN), and Black – Sandia Restricted Network (SRN) and Sandia Open Network (SON) systems.

Red systems require special security procedures. Contact the MESA Protected Transmission System (PTS) Coordinator through the Sandia Designated Representative (SDR) for information supplementing this specification. All work performed on Red Systems shall comply with United States Department of Energy (DOE) requirements, which may or may not be explicitly indicated or noted in the Contract documents.

- D. Project may have Contractor-furnished material and/or Sandia-furnished material (SFM) as detailed in Statement of Work and/or elsewhere in Contract documents.
- E. All or part of Work may be included in Project, as stated in Contract documents.
- F. Related Sections: Refer to the following sections for related work.
1. Division 1, Section “Descriptive Submittals.”
 2. Division 1, Section “Environment, Safety and Health for construction and Maintenance Service Contracts.”
 3. Division 9, Section “Painting.”
 4. Division 25, Section “Administration Requirements.”

5. Division 25, Section “Quality Assurance and Documentation.”
6. Division 25, Section “Telecommunications Equipment Rooms”
7. Division 25, Section “Main Distribution Frames and Service Entrances.”
8. Division 25, Section “Exterior Telecommunications Pathways”
9. Division 25, Section “Telecommunications Cabling.”

1.02 REFERENCES

- A. Electronics Industries Association/Telecommunications Industries Association (EIA/TIA)
 - 568A Commercial Building Telecommunications Cabling Standard
 - TSB-67 Technical Service Bulletin (Cable Testing/Tester)
- B. National Fire Protection Association (NFPA)
 - 70 National Electrical Code (NEC)
- C. Occupational Safety and Health Administration (OSHA)
 - 29 CFR Part 1910 Permit-Required Confined Spaces for General Industry; Final Rule
- D. American National Standards Institute (ANSI)
- E. National Electrical Manufacturer’s Association (NEMA)
 - FB1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
- F. Underwriter’s Laboratories, Inc. (UL)
 - 6 Rigid Metal Conduit
 - 50 Enclosures for Electrical Equipment
 - 797 Electrical Metallic Tubing
 - 1242 Intermediate Metal Conduit
- G. American Society for Testing and Materials (ASTM)
 - A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

H. Supplementary References: Publications listed below are not referenced in this specification. Publications are listed as they contain design and technical criteria that are pertinent to Project. Commencement of work shall indicate a working familiarity on the part of the Contractor with each of these standards.

1. Building Industry Consulting Service International (BICSI)

Telecommunications Distribution Methods Manual

LAN and Internetworking Design Manual

Telecommunications Cabling Installation Manual

2. Electronics Industries Association/Telecommunications Industries Association (EIA/TIA)

568-B.1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements

569-A Commercial Building Standard for Telecommunications Pathways and Spaces

570 Residential and Light Commercial Telecommunications Wiring Standard

3. National Electrical Manufacturer's Association (NEMA)

VE1-1998 Metal Cable Tray Systems

VE2-2000 Cable Tray Installation Guidelines

1.03 DEFINITIONS

A. Intra-Building Cable: Network Cable within building.

B. Inter-Building Cable: Network Cable between buildings.

1.04 SUBMITTALS

A. General: Submit materials descriptions, catalog cuts, shop drawings, and/or samples in accordance with conditions of Contract documents and Division 1, Section "Descriptive Submittals." Refer to Contract documents for additional requirements.

B. As-Built Drawings: Submit dated as-built drawings for review with SDR at two-week intervals, beginning at Project start date, or as specified elsewhere in Contract documents.

1. Call attention to entry by circling affected area.

2. If as-built work is not complete, Contractor will be so advised by SDR, and Contractor shall complete work as required.

1.05 QUALITY ASSURANCE

- A. Material and installation shall meet requirements of NFPA 70.
- B. Material, when applicable, shall be approved by a Nationally Recognized Testing Laboratory (NRTL).
- C. Monitor and maintain quality control over manufacturers, suppliers, subcontractors, work force, site conditions, products, and services to ensure Work is of specified quality.
- D. Workmanship: Install material and equipment in neat and workmanlike manner, in accordance with NEC Section 800-6.

Specified requirements represent minimum acceptable quality for Work. Comply with industry standards except when more stringent requirements are specified herein, and tolerances indicate higher standards or more precise workmanship.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide equipment necessary to handle, transport, and deliver materials, including SFM, from storage site to work area.
- B. Store components in original wrappings, and protect from dirt, weather and construction work traffic.
- C. Coordinate with SDR at least three days in advance for pick up of SFM. Emergency supply situations will be handled by the SDR on a case-by-case basis.
- D. Thoroughly inspect materials for damage before taking custody, including SFM. Inform SDR within one workday if SFM are found to be damaged. Failure to do so may result in material replacement at Contractor's expense as determined by SDR.
- E. Return unused SFM with an inventory to SDR immediately after product usage is complete.

1.07 WARRANTY

Contractor shall supply a warranty as specified in Division 25, Section "Quality Assurance and Documentation."

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide products that are new and currently in production.
- B. Do not use materials and equipment that have been removed from existing premises, except as specifically and expressly permitted by Contract documents or SDR.

- C. Products will be specified by industry standard names, unless specifically noted otherwise.
- D. Devices and equipment submitted for approval shall be used for the purpose intended. No deviation from SNL requirements and standards shall be permitted.

2.02 CONDUIT AND TUBING

- A. Rigid Steel Conduit: Material shall comply with UL 6. Rigid, threaded, thick-wall, zinc-coated on the outside and either zinc-coated or coated with an approved corrosion-resistant coating on the inside.
- B. Rigid Aluminum Conduit: Not permitted.
- C. Intermediate Metal Conduit (IMC): Material shall comply with UL 1242. Rigid, threaded, light weight steel, zinc-coated on the outside and either zinc-coated or coated with an approved corrosion-resistant coating on the inside.
- D. Electrical Metallic Tubing (EMT): Material shall comply with UL 797. Mild steel, zinc-coated on the outside and either zinc-coated or coated with an approved corrosion-resistant coating on the inside.
- E. Fittings and Conduit Bodies: Material shall comply with NEMA FB2.
- F. Expansion Fittings: Malleable iron, hot-dipped galvanized with factory installed packing and a grounding ring.

2.03 OUTLET, JUNCTION/PULL BOXES

- A. Outlet Boxes
 - 1. Only zinc-coated or cadmium-plated sheet-steel boxes, of a class to satisfy the conditions for each outlet, shall be used in concealed work.
 - 2. Boxes mounted on the outside of the building walls shall be cast construction, with threaded hubs and gasketed covers.
 - 3. Switch, telephone, and receptacle outlet boxes shall not be less than 4 inches square, fitted with appropriate plaster rings, where necessary to set flush within the finished surface.
 - 4. Outlet boxes for exposed work shall not be less than 4 inches square with appropriate covers for surface work. "Handy" boxes may be utilized in accordance with the NEC requirements. Cut-in boxes are allowed to be installed for non-exposed work.
 - 5. Fixture outlet boxes on ceilings shall not be smaller than 4-inch octagonal type.
 - a. Fixture outlet boxes in concrete ceilings shall be of the 4-inch octagonal type, set flush with the finished surface.
 - b. Fixture outlet boxes in plaster or other similar type ceilings shall be fitted with open covers (plaster rings) set to come flush with the finished surface.

6. Each box containing an equipment grounding conductor serving motors, lighting, fixtures, or receptacles shall be provided with a grounding terminal.

NOTE: The grounding terminal shall be green colored.

7. A device plate shall be provided for each outlet to suit the device installed.
 - a. All outlet cover plates on unfinished walls or any surface mounted plates shall be of zinc-coated sheet metal, having rounded or beveled edges.
 - b. Unless otherwise indicated, all plates on finished walls shall be of ivory metal.
 - c. Screws shall be of metal with counter sunk heads with a finish to match the finish of the plate.
 - d. The use of sectional device plates are not permitted.

B. Distribution/Pull Boxes

1. Distribution/pullboxes shall be constructed of zinc-coated sheet steel and shall conform to the requirements of UL 50.
2. Doors shall have a suitable primer coat and a finish coat of a color to match distribution/pullbox.
2. Each box shall be constructed with interior dimensions not less than those indicated on Drawings.
2. Cabinet trim shall be fitted with hinged door and flush latch.

2.04 CABLE TRAY

Cable tray in MDR and IDRs shall be galvanized sheet steel trough type, complying with ASTM A653. Tray shall be ventilated bottom, size as delineated on drawings. Chalfant Series 6, or approved equal.

2.05 PLENUM-RATED CABLING PATHWAYS

Plenum-rated cabling pathways shall be as specified in Division 25, Section "Telecommunications Cabling."

2.06 INTRA-BUILDING TELECOMMUNICATION CABLING AND TERMINATION COMPONENTS

Refer to Division 25, Section "Telecommunications Cabling" for cabling placement and termination requirements. Refer to Division 25, Section "Quality Assurance and Documentation" for termination testing and documentation requirements.

2.07 LABELS

Refer to Division 25, Section “Administration Requirements” for labeling requirements.

PART 3 - EXECUTION

3.01 GENERAL

- A. Consult with SDR to verify areas that are confined spaces as defined in OSHA 29 CFR Parts 1910, requiring special permits for access. Comply with requirements of OSHA 29 CFR Part 1910, Section 146 when working in permit-required confined spaces.
- B. Locations of hazardous materials areas are shown on Drawings.
1. Avoid disturbance of hazardous materials in making acceptable modifications of raceway routing and other work.
 2. Do not mount conduit, hangers, and other accessories on surface materials known to contain asbestos or other hazardous materials without written authorization from SDR outlining method of installation.
 3. If hazardous materials or conditions not shown on Drawings are encountered, stop work immediately and vacate area. Take the following actions:
 - a. Immediately notify SDR of condition encountered.
 - b. Do not enter area or work in area until receiving written authorization from SDR.
- C. Do not install damaged or defective components.
1. If SFM are found to be defective, immediately report problem to SDR and provide documentation with sufficient engineering data to confirm defect.
 2. Contractor shall receive replacement SFM materials only after defective materials have been returned to SDR and defect has been confirmed.
 3. If SFM are rendered unusable due to Contractor error or improper installation as determined by SDR, materials shall be replaced at Contractor’s expense.
- D. Conduit entrances into IDR or Main Distribution Room (MDR) shall be perpendicular to cable tray (and/or ceiling).
- Do not use horizontal conduit entrances, unless pre-approved by SDR in writing. Special measures to protect cabling must be undertaken in this case, at the direction of SDR.
- E. Secure products in place with positive anchorage devices, designed and sized to withstand stresses, vibration, and distortion.
- F. Prepare as-built documentation beginning at Project start date. SDR will provide assistance in obtaining one set of reference Drawings, if needed, for documentation purposes.

3.02 CONDUIT AND TUBING INSTALLATION

- A. Concealed pathways for vertical conduit drops, such as the drops from the ceiling space to a flush-mounted junction box behind a user outlet, shall be continuous conduit from inside the junction box within a wall to an accessible location, such as above a lay-in ceiling. This vertical run of conduit, whether Red communications are installed in it or not, shall be continuous IMC, terminated with locknut and bushing inside the junction box to which user outlet is mounted. Consult the MESA PTS Coordinator through the SDR for guidance where conduit cannot be continuous.
- B. Conduit or electrical metallic tubing (EMT) systems shall be installed in accordance with the applicable provisions of the National Electrical Code.
- C. Electrical metallic tubing systems shall not be installed in concrete or underground, but may be utilized on the outside of facilities, unless otherwise specified on Drawings.
 - 1. Electrical-metallic tubing systems shall utilize watertight compression-type threadless fittings throughout unless specified otherwise on Drawings.
 - 2. EMT box connectors shall be securely fastened to all boxes and cabinets with one locknut (installed wrench tight) to ensure good electrical contact.
- D. Rigid galvanized steel conduit (RGS) and intermediate metal conduit (IMC) are to be provided where shown on Drawings or where required to meet NEC or security requirements (refer to subparagraph A above). Rigid and intermediate metal conduit shall be securely fastened to all boxes and cabinets with two galvanized locknuts and one bushing installed wrench tight.
- E. Polyvinyl Chloride (PVC) or other types of conduit are not permitted as interior telecommunications cabling pathways.
- F. All EMT, IMC, and rigid conduit couplings will be installed wrench tight; threads shall be brushed clean to ensure good electrical contact.
- G. Install insulating type bushings, designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system, on rigid steel conduit, IMC and rigid aluminum conduit larger than 1/2-inch size.

Insulated bushings shall be installed on all raceways for conductors No. 4 and larger at the point of entry into gutters, cabinets, boxes, or motor control centers.
- H. Conduits and tubing shall be concealed within the walls, ceilings, and under the floors, or exposed, as shown on Drawings, and shall be kept at least 6 inches from parallel runs of flues, steam pipes, or hot water pipes.
- I. Conduit and tubing systems installed above lay-in type ceilings shall be installed within space allocated as detailed on Drawings and elsewhere in the Contract documents above the ceiling with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns, consisting of cast-metal fittings or symmetrical bends. Conduit runs shall not be attached to ceiling support wires.

- J. Bends and Offsets shall be avoided where possible, but when necessary, shall be made with an approved hickey or conduit-bending machine. The use of pipe tee or vise for bending conduit or tubing will not be permitted. No more than one hundred eighty (180) degrees of bend shall be allowed in any trunk cabling pathway (defined as conduit between distribution boxes, between distribution boxes and pullboxes, and between distribution boxes/pullboxes and IDR/MDR) without installation of secondary pullbox as specified on Drawings and prior approval by SDR and MESA Security and Telecommunications Department.
- K. Conduit or tubing which has been crushed, wrinkled, or deformed in any way shall not be installed.
- L. Each conduit that is buried in or rigidly secured to the building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subjected to excessive stresses shall be provided with an expansion fitting.
- M. Contractor shall exercise the necessary precautions to prevent the lodgement of dirt, plaster, or trash in conduit, tubing, fittings, and boxes during the course of installation.
1. Care shall be taken to ensure that raceways do not contain any type of debris.
 2. A run of conduit or tubing, which has become clogged, shall be entirely freed of these accumulations, or shall be replaced.
- N. All empty conduits shall have a conduit measuring tape cord (Greenlee #435) provided with 2 feet of slack at each end, unless otherwise shown on plans.
- O. No holes for conduit installation will be allowed in steel or reinforced concrete structural members unless approved by the SDR.
- P. All underfloor or underground conduit runs shall be installed so that at minimum, the last thread that is exposed is at least ¼" from the finished floor including miscellaneous slabs, interior grade beams and other portions of the floor.
- Q. Conduit installed within a concrete slab shall be located in the middle one-third of the slab.
- R. All conduit under floor or under slabs shall be installed a minimum of 6 inches under the concrete.
- S. All steel conduits installed in contact with the earth shall receive a protective covering which shall be mechanically applied as hereinafter indicated.
1. One application, half-lapped, of Minnesota Mining and Manufacturing Company "Scotchrap" No. 51, Plymouth Rubber Co. "Plywrap 20" or Westape, Inc. 20 mil Pipe Wrap shall be applied. A "Scotch Coat" No. 101 pipecoating resin treatment will also be accepted.
 - a. All elbows or bends must have the application made after the conduit is bent.

- b. Fittings shall have two separate applications of Minnesota Mining and Manufacturing Company "Scotchrap" No. 51, Plymouth Rubber Co. "Plywrap 20" or Westape, Inc. 20 mil Pipe Wrap, half lapped.
- 2. No conduit shall be covered with backfill until the installation approval is obtained from the SDR.
- T. See Standard Drawing No. 73740/E1 for conduit color coding requirements.
- U. Conduit or tubing risers shall be exposed in air shafts or ducts only when approved.
- V. Cable tray shall be installed with center supports, securely suspended from structure, as recommended by cable tray manufacturer. Assume maximum loading capacity.
- W. Solid bottom cable tray fittings shall have 3-inch holes punched into the sheet steel at 6-inches on center. All field-punched holes shall have self-adhesive grommeting material fixed to edge of hole. Grommeting material shall be Panduit Style GEE slotted wall adhesive-lined grommet edging sized for tray metal gauge.

3.03 SUPPORTS/ANCHORS

- A. Runs of conduit or tubing shall have supports spaced not more than 5 feet apart, unless shown otherwise.
 - 1. Conduit and tubing shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers, or pipe straps, secured by means of toggle bolts on hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surface, and wood screws on wood construction. Conduit and tubing shall not be hung from or attached to hanger support wires used for suspended ceilings.
 - 2. Conduit and tubing risers, exposed in wire shafts, shall be supported at each floor level by means of approved U-clamp hangers.
 - 3. Holes (for electrical supports) drilled in concrete, which are not used, shall be properly filled with concrete grout.
 - 4. The cutting of structural members for the installation of supports shall not be permitted except by prior written approval from the SDR.
 - 5. Conduit or conduit supports shall not be welded directly to steel structures.
 - 6. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure conduit supports.
 - 7. Nails shall not be used as the means of fastening boxes or conduits.
 - 8. Wire or perforated strapping shall not be used for the support of any conduit or tubing.
- B. All metal angles, channels, straps, and other similar pieces to be used to support electrical apparatus shall have all corners ground smooth and all edges filed or ground smooth before installation.

3.04 OUTLET, JUNCTION/PULL BOXES

- A. Boxes shall be installed in a rigid and satisfactory manner, either by wood screws on wood, expansion shields on concrete or filled masonry, or machine screws or self-tapping screws on steel work.

3. Relocations

- a. If outlets are located improperly by more than 6 inches from the locations shown on the plans, they shall be removed and reinstalled in proper locations at no additional cost to SNL.
- b. Contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that his work may fit the Work required by these specifications.
- c. When necessary, Contractor shall relocate outlets so that when fixtures or other fittings are installed, they will not interfere with other work or equipment.
 - (1) When these relocations are required, the SDR will record this new location upon his record plan and on Contractor's plan in red pencil.
 - (2) Contractor will also initial and date both plans.

3.05 CUTTING AND PATCHING

Work shall be carefully laid out, in advance, and where cutting, channeling, chasing, or drilling of floors, wall partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, the affected areas shall be repaired by skilled mechanics of the trades involved, at no additional Contract cost.

3.06 PAINTING

Electrical items shall be painted in accordance with requirements of Division 9, Section "Painting."

3.07 CABLE INSTALLATION

Cable to be installed in pathways in accordance with Division 25, Section "Telecommunications Cabling."

3.08 LABELING

All labeling shall be as delineated in Division 25, Section "Administrative Requirements."

END OF SECTION