

# STATE OF MAINE

## TELECOMMUNICATIONS FACILITIES & WIRING SPECIFICATIONS



OFFICE OF INFORMATION TECHNOLOGY  
(OIT)  
NETWORK SERVICES DIVISION

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## SECTION A - TELECOMMUNICATIONS

### A.1. General

Furnish and install all telecommunications jacks, outlets, conduits, raceways, ducts, cables, electrical wiring, electrical outlets, backboards, racks, air conditioning, flooring, sensors, alarms, and allied accessories, in accordance with any applicable specifications and drawings, and the specifications contained herein. Relocate or remove, as required, any existing jacks, outlets, conduits, raceways, ducts, cables, equipment, etc., due to architectural changes, or as shown on any applicable drawings, if such materials are not reused in the construction, or do not meet the specifications set forth herein.

### A.2. Included and Related Requirements

Basic telecommunications requirements of this Division shall include, but shall not be limited to that which is described in the subsequent sections of this document as follows:

#### Included Work

Section B	Service Entrance
Section C	Switch Room
Section D	Wiring Closets
Section E	Basic Cable/Wiring Standards
Section F	Cable Television (CATV)
Section G	Paging Systems
Section H	Video Systems
Section I	Mechanical Equipment
Section J	Fiber Optic Cable Systems

#### Related Work

Section K	Removal of Old Cable and Facilities
Section L	Cutting and Patching
Section M	Temporary Utilities
Section N	Painting and Cleanup
Section O	Special Services and Facilities

### A.3. Definitions

The following terms are defined as they are used and applied in the text of this document, and any accompanying or related text and/or drawings and sketches.

1. Backboard: A section or sections of wall-mounted plywood, 3/4-inch thickness, on which telecommunications devices, fixtures and related equipment will be mounted.

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2. Category 3 Cable: A 4-pair or other multiple twisted-pair telecommunications cable which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such cable. By current standards, Category 3 cable bears limited and specific usage.
3. Category 5 Cable: A 4-pair or other multiple twisted-pair telecommunications cable which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such cable. By current standards, Category 5 cable is obsolete and is no longer used.
4. Category 3 Hardware: Any telecommunications wiring/cabling hardware, such as telecommunications jacks or outlets, termination blocks, etc., which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such hardware. By current standards, Category 3 hardware bears limited and specific usage.
5. Category 5 Hardware: Any telecommunications wiring/cabling hardware, such as telecommunications jacks or outlets, termination blocks, etc., which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such hardware. By current standards, Category 5 hardware is obsolete and is no longer used.
6. Category 3 Installation: A telecommunications cable/facilities installation which meets all of the applicable EIA/TIA requirements and specifications for such installation, including cables, associated hardware, installation methods and practices. By current standards, Category 3 installations are limited and specific.
7. Category 5 Installation: A telecommunications cable/facilities installation which meets all of the applicable EIA/TIA requirements and specifications for such installation, including cables, associated hardware, installation methods and practices. By current standards, Category 5 installations are obsolete.
8. “Category 5e”; “Category 5 enhanced”: Terms that refer to telecommunications cable, terminating hardware and installation practices that exceed the specifications for “standard” Category 5 cable and terminating hardware, according to EIA/TIA requirements and specifications for such cable, terminating hardware and installation practices. This is the current general cabling standard for State owned or leased premises.
9. “Category 6”: Terms that refer to telecommunications cable, terminating hardware and installation practices that meet EIA/TIA requirements and specifications for such cable, terminating hardware and installation practices.

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The State employs Category 6 standards in very limited and specific installations, such as in data centers and testing laboratory environments.

10. CATV (Common Antenna Television): An acronym generally used in reference to “cable television” services and systems.
11. Certified: Equipment is “certified” if it has been tested, and found by a nationally recognized testing laboratory to meet recognized standards, or to be safe for use in a specified manner or application, and bears a label, tag, or other record of such certification.
12. CLEC (Competitive Local Exchange Carrier): See “LEC”.
13. Coax; Coaxial Cable: A special two-conductor cable in which there is a solid metallic “inner” or core conductor, covered by a flexible insulating dielectric material over which is placed a tubular solid or woven metallic “outer” conductor which shares a common radial axis with the inner conductor. The outer conductor of the coaxial cable is generally sheathed with a protective PVC, TFE, or polyethylene overall insulation. Associated with the cable is a specific ohmic impedance value, which is a function of the inner and outer conductor diameters and their radial separation through the dielectric. This cable has a relatively wide signal bandwidth.
14. CMP (Communications Plenum) Cable: An electrical, telecommunications, or any other type of cable bearing a special insulation and sheath which conforms to NEC and other related safety codes and standards for suppressing the release of noxious gas or toxic smoke when such cable is subjected to heat and flames. This cable is used in an unprotected environment (not in conduit), within any areas used for the ducting or transport of environmental air within or to any building or space designed for human occupation (Article 800, National Electrical Code).
15. Conduits: Piping or tubing used to encase telecommunications or other cables. There are four basic types of conduit, listed below, which are acceptable in specific instances:
  - a. S&D (Soil & Drain), PVC or HDPE (non-metallic);
  - b. Schedule 40 or 80 PVC (non-metallic);
  - c. EMT, a thin walled, steel electrical conduit;
  - d. Rigid, a heavy walled, solid, threaded, steel conduit.
16. Connecting Block: A telecommunications industry series of telecommunications cable termination/connection “blocks” used to organize,

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terminate and hold twisted pair wires and to provide a “cross-connect” point between such termination points of telecommunications cables.

17. Cover Plate: Also known as “face plate”. A special duplex electrical outlet box cover which mounts to the front of such a box, and which is designed to carry associated telecommunications outlet modules which ‘snap in” to such plate. These plates are typically designed to accommodate 2, 3, 4 or 6 telecommunications outlet modules.
18. Demarcation Point: The point at which the RBOC/CLEC/ILEC terminates its incoming service facilities within the premises. Also referred to as “handoff”.
19. Distribution/Cross Frame: A special frame or backboard which is used to receive telecommunications cables from a telecommunications switching system and/or incoming lines from the RBOC/CLEC/ILEC, and which facilitates the cut-down, termination and connection points of the telecommunications cables for distribution to terminal devices.
20. Duplex Electrical Box: A standard electrical outlet box which is typically fastened to a building wall stud for the flush placement of a duplex (2 outlet) electrical receptacle. It can also be used to flush mount telecommunications jacks and CATV outlets designed to fit into such a box.
21. EIA/TIA (Electronics Industry Association/Telecommunications Industry Association): A nationally recognized engineering standards body of electronics and telecommunications professionals, manufacturers, vendors and end-users, which sets various technical and manufacturing standards and specifications for electronic and telecommunications systems and equipment.
22. Face Plate: See “Cover Plate”.
23. Fiber Optics (Optical Fiber): In this context, either individual or multiple single-mode or multi-mode glass fiber cabling systems, which transport telecommunications signals in the form of high frequency light pulses.
24. Fiber Optic Cable: A special telecommunications cable which contains one or more optical glass fibers, each of which is covered with an identifying color-coded sheath, and all of which are covered with an overall sheath containing a structural strength member of Kevlar or similar material. It generally will contain no metallic structure or elements.
25. Fiber Optic Connector: A connector that is fastened to individual optical fibers through adhesive, heat or mechanical means. The connector provides a means to couple the optical fiber to termination panels and/or equipment using



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optical fiber interfaces. Fiber optic connectors are found in numerous coupling configuration designations such as LC, MTRJ, SC and ST, with LC and SC being the predominant couplings for optical fiber cable termination.

26. Fiber Optic Terminal: A wall or rack mounted enclosure designed for the termination of fiber optic cable, and which provides a connection point for cross-connecting fibers or for connecting electronic fiber optic transmitting/receiving equipment to the fiber optic cable.
27. Gas Tube Protection: A 3-element gas tube protection device, installed in series between the telecommunications cable and the equipment frame, jack or telecommunications outlet, and designed to protect the telecommunications equipment from electrical surges or spikes entering the telecommunications cable system, such as may be encountered during an electrical storm. This type of protection device is typically installed on a cable protection terminal in which the cable is terminated, on each pair of conductors within the cable that provide "POTS"-type service. Because of the higher voltage rating of these devices, they should not be used on cable pairs which service digital terminal or communications equipment.
28. Gauge: A term used to describe the physical diameter of a copper wire conductor, as defined by American Wire Gauge (AWG) standards.
29. Ground: (1) An electrical reference to earth potential; (2) Electrically connecting or bonding a conductor or conductive surface, such as electrical/electronic equipment frames, equipment racks/shelves, gas tube or solid-state protection frames, cable shields, etc. to an electrical ground.
30. ILEC (Incumbent Local Exchange Carrier): See "LEC".
31. Innerduct: A flexible, corrugated polymer tubing, usually orange in color, in which fiber optic cable is placed. It is used for the separation and protection of the fiber optic cable from other cables using the same conduit, raceway, riser shaft, etc.
32. Intermediate Distribution Frame (IDF): In a relatively large building, or a building with multiple floors, this is a space, closet, or room where station cables will be terminated for a given area within the building. It will also serve as a termination point for IDF-to-MDF "riser" cables, including copper, fiber optic, and CATV cables. This space, closet or room may will also house electronic switching, amplification and distribution systems for data LAN's, video and CATV systems. This may also be referred to as the "wiring closet".

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33. Key System (KSU): A relatively small electronic telephone switching system which is typically used in a small office environment, and usually accommodates 8 or less RBOC/CLEC/ILEC service lines and 24 or less telephone sets. By current standards, KSUs bear limited usage and are generally considered obsolete.
34. Labeled: Equipment is “labeled” if it bears a valid label, seal, or symbol of a nationally recognized testing laboratory, such as Underwriters Laboratory, Inc., recognizing its acceptability for the intended uses in these specifications.
35. LEC (Local Exchange Carrier): The local servicing public telephone or telecommunications service company or provider. May be CLEC (Competitive LEC) or ILEC (Incumbent LEC).
36. Listed: Equipment is “listed” if it is of a kind mentioned in any document, published by a nationally recognized laboratory which makes periodic inspections during production of such equipment, and states that such equipment meets nationally recognized standards, or has been tested and found safe for use in a specified manner.
37. Main Distribution Frame (MDF): A space, closet or room which serves as the central telecommunications cable and service distribution point for a premises. It will generally house the primary telecommunications voice, data, video, fiber optic, and CATV switching and distribution systems. It will serve as the connection point to RBOC/CLEC/ILEC services, the common termination point for IDF-to-MDF riser cables, including copper, fiber optic, and CATV cables, and will be the primary point for inter-building and intra-building cable cross-connections. This may also be referred to as the “switch room” or “main wiring closet”.
38. POTS: An acronym for “plain old telephone service”, that being the type of service typically offered to the general public and having the technical characteristics of such service. It may also be called an “analog line”.
39. Power Pole: Typically, a square or rectangular duct associated with modular furniture installations, which attaches to and extends vertically from such furniture through the ceiling, and affords a path for the extension of electrical and/or telecommunications cables into such furniture. May also be referred to as “tele-pole” or “com-pole”.
40. PBX (Private Branch Exchange): A generic term for an electronic telecommunications switching system.

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41. Quad Electrical Box: A standard electrical outlet box which is typically fastened to a building wall stud, and is designed for the flush placement of two duplex (2-outlet) electrical receptacles. It can be used to flush mount telecommunications jacks designed to fit into such a box.
42. RBOC (Regional Bell Operating Company): An essentially obsolete term used to designate the local ILEC, that typically being a descendant of the former Bell System, a provider of public telephone/telecommunications services.
43. Riser Cable: Generally, a telecommunications cable of 25 or more pairs which runs between and terminates in the IDF and MDF spaces of a premises, and affords telecommunications service transport between such spaces. It may also be called “vertical cable”.
44. Solid-State Protection: A semiconductor protection device, installed in series between the telecommunications cable and the equipment frame, jack or telecommunications outlet, and designed to protect the telecommunications equipment from electrical surges entering the telecommunications cable system, such as may be encountered during an electrical storm. This type of protection device is typically installed on a cable protection terminal in which the cable is terminated, on each pair of conductors within the cable. Solid-state protection devices are available in various voltage ranges, and should be selected and installed to meet the specific operational parameters of telecommunications equipment being attached to the cable, i.e., equipment with “POTS”-type (analog) line interfaces or digital line interfaces.
45. Station Equipment: See “Terminal Devices”.
46. Station Cable: Generally, a telecommunications cable of 4 pairs which runs between and terminates within the IDF/MDF space and the telecommunications jack. This may also be called “station wiring” or “horizontal cable”.
47. Switch Room: A generic term for a telecommunications switching equipment room or space, and is usually the room in which the MDF and telecommunications switching system and ancillary equipment are located.
48. Telecommunications Cable: A combination of two or more twisted-pair copper wire conductors, which are grouped or bundled in a protective overall jacket or sheath. Each conductor is insulated and color coded with a specific colored insulating material. Cables containing more than 25 pairs shall be fabricated such that specific groups of 25 pairs each, otherwise known as

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“binder groups” are formed and can be recognized as such through industry-standard color coding of the groups.

49. Telecommunications Jack: A fixture which generally combines 2, 3, 4 or 6 modular telecommunications outlets into a standard duplex electrical box, a quad electrical box, a self-contained surface mount fixture, or a portable furniture panel fixture. The voice and data outlets are physically similar (8-pin modular-style) and other outlets are specific to their function (coaxial, fiber optic).
50. Telecommunications Outlet: An 8-conductor modular-style device which terminates the telecommunications station cable at the station end, and allows for telecommunications equipment attachment to the station cable via an attachment cord. Unless otherwise noted, voice and data outlets shall conform to EIA/TIA 568B Category 5e specifications.
51. Terminal Device: A generic term for a telephone, facsimile, data device, printer, or other telecommunications equipment, connected by telecommunications cables or wiring.
52. Transient Voltage Protection: See “Gas Tube Protection”, “Solid-State Protection”.
53. Twisted-Pair: One pair of single-conductor copper wires, each wire encased in its own colored insulation, and twisted around one other in a spiraling fashion at no less than six revolutions or 360 degree “twists” per foot of length. Insulation material composition and exact twist geometry shall be dictated by the EIA/TIA Category certification requirements and cable manufacturing methods.
54. Uninterruptible Power System (UPS): A special power system installed between the commercial electrical source and telecommunications equipment which requires uninterrupted electrical power service. These systems are generally self-contained with an internal battery array. In normal operation, the UPS will condition and pass commercial power to the attached equipment, when such power is available and suitable for use. It will switch to internal battery power generation upon loss or degradation of the commercial power service, all without interruption of power service to the attached equipment.
55. Voice Over Internet Protocol (VoIP): A relatively new telephony service technology whereby telephones are connected to the data network rather than through use of legacy technologies such as POTS or ISDN. VoIP affords the use of the desktop/workstation data jack for connectivity of both a telephone and a computer workstation through a single data jack, thus, in many cases

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eliminating the requirement for individual voice and data jacks at the desktop/workstation.

56. Whip: Typically, a section of flexible PVC electrical conduit with connector fittings, associated with modular furniture installations, which attaches between such furniture and a “hard” wall, and affords a path for the extension of electrical and telecommunications cables into such furniture.
57. Wiring Closet: A space, closet, or room where station cabling will be terminated for a given area within the building. It will also serve as a termination point for IDF-to-MDF “riser” cabling, including copper, fiber optic, and CATV cables. This space, closet or room may also house electronic switching, amplification and distribution systems for data LAN’s, video and CATV systems. This may also be referred to as the “IDF”.
58. 66 Block: An older style twisted-pair cable termination/cross-connect block which uses exposed split metal posts or tabs to capture the wire conductor end and provide an electrical path to another similar wire conductor, thereby facilitating a “cross-connect”. By current standards, 66 blocks bear limited usage and are generally considered obsolete.
59. 110 Block: A newer style twisted pair cable termination/cross connect block which uses a series of “captive caps” with integrated recessed conductor tabs. The “bottom” of the captive cap terminates the pairs of a given cable into the bottom of its conductor tabs. The “top” of the cap provides captive “grooves” for the termination or “punch-down” of another cable into the top of its conductor tabs, thereby facilitating a “cross-connect”.
60. 110-JP Block: A specially designed 110-style termination or “punch-down” block which has integral 8-conductor modular (RJ-45 style) receptacles to facilitate direct connection of data equipment to the block via a “patch cord”. These blocks are generally used in an IDF, MDF, or a computer/data equipment room where multiple connections are concentrated. Single blocks are typically available with modular receptacle counts of 12 or 36. By current standards, 110-JP blocks are considered obsolete.

### A.4. Product Criteria

1. Products used in construction projects shall be the standard products of a manufacturer regularly engaged in the manufacture of those products.
2. Unless approved by the Network Services Division, items of equipment shall essentially duplicate equipment that has been in satisfactory use in the industry for at least five years.

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3. Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located reasonably close to the site.
4. When two or more units of materials or equipment of the same type or class are required, they shall be products of the same manufacturer.
5. All factory wiring of pre-assembled components shall be accompanied by wiring diagrams.

### A.5. Miscellaneous

1. Safeguarding Materials/Work Areas: Responsibility for the safeguarding, care, and protection of all materials and work rests with the contractor until the entire project has been completed, tested, and accepted.
2. Regulatory Requirements: All work shall conform to the requirements of all applicable codes, laws, regulations, local ordinances, and contractors shall cooperate with all authorities having jurisdiction. Compliance with laws and regulations on this project does not relieve the contractor from compliance with more restrictive requirements contained in these specifications.
3. Permits, Fees, Inspections: The contractor shall secure and pay for all permits, fees, inspections, street opening charges, "DigSafe" and any fines assessed in connection with this project.
4. Warranties: Any manufacturers' warranties shall be passed on to the owner at the completion and acceptance of the project. The Contractor shall warrant all material and workmanship to be in compliance with these specifications, according to standards acceptable to the Architect/Engineer and/or the industry. The Contractor shall also warrant their installations to be free of defects in both materials and workmanship for a period of one year, or longer if specifically called for in the general policies section of the specifications dealing with the entire project.

## SECTION B - SERVICE ENTRANCE

### B.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the service entrance work, in accordance with the applicable project drawings and these specifications. Furnish “as built” telecommunications drawings at the completion of the project.

### B.2. Point of Entry

The entrance to the premises shall be at a point mutually acceptable to the owner and the RBOC/CLEC/ILEC, which usually is a point closest to the current facilities of the RBOC/CLEC/ILEC.

### B.3. Entrance Methods

1. Buried: From the designated entrance point of the RBOC/CLEC/ILEC facilities, there shall be conduit(s) buried at a minimum depth of 24 inches, using Schedule 40 or 80 PVC pipe. In areas subject to vehicular traffic, the conduit(s) shall be encapsulated in concrete to a minimum thickness of 3 inches, running the full length of the traffic area. In all areas where public streets are crossed, rigid steel conduit shall be used. All conduits shall be capped after installation to protect them from weather elements and debris. Unless otherwise specified, the minimum size and count for building service entrance conduits shall be as follows:
  - a. Up to 25,000 sq. ft. floor space, one 4-inch diameter;
  - b. For 25,000 to 100,000 sq. ft. floor space, two 4-inch diameter;
  - c. Over 100,000 sq. ft. floor space, three 4-inch diameter.
2. Aerial: If the electrical power service entrance to the premises is aerial, the Architect/Engineer may specify that the telecommunications entrance be aerial as well, up to a maximum entrance cable size of two-hundred (200) pairs (anything larger shall be brought in underground). Any aerial entrance shall be in compliance with RBOC/CLEC/ILEC requirements. All aerial telecommunications cable must be at least two (2) feet lower than any electrical entrance, and shall carry to a standard weather head allowing eighteen (18) feet clearance for any vehicular traffic. A minimum 2-inch diameter weather head and conduit shall be installed to carry aerial cables into the premises.

In either case, any conduits shall be permitted to have only “long sweep” elbows, with not more than 270 degrees of cumulative direction change between any two pulling points (conduit ends or pull boxes). Generally, the conduits shall be continuous from the point of entry into the telecommunications switch room or other designated demarcation point. If the cable run, from the point of building entry into the premises demarcation point, is greater than 50 feet, the entrance cable shall be terminated in a suitable location within 50 feet of the entrance point and a suitable interior cable shall be spliced to it to continue to

## SECTION B - SERVICE ENTRANCE

the demarcation point, unless installed in a suitable conduit which is continuous from the building penetration point to the telecommunications room, or unless the cable material meets applicable codes and standards for open installation within the premises. If the total run of the entrance cable exceeds 150 feet, a suitable pull box may be required, and shall be mounted at the nearest point of entry, inside the building.

### **B.4. Entrance Cable**

The telecommunications entrance cable shall be appropriately sized, twisted pair, gel-filled, and specifically designed for underground or exterior usage (REA PE-89 type cable). The cable and labor to install it will generally be provided by the RBOC/CLEC/ILEC. It is up to the Contractor to make this determination and to provide such cable and installation if the RBOC/CLEC/ILEC does not. If the Contractor supplies the entrance cable, it shall be 24 gauge (minimum) telecommunications cable.

In certain instances, fiber optic and CATV entrance cables may be required. Please refer to the appropriate sections in this document and any included special attachments for details on such requirements.

### **B.5. Switch Room Cable Entrance**

The entrance conduit may enter the switch room from either below the floor or through the ceiling, or through an exterior wall at an appropriate height. In either case, appropriate bushings shall be used in the open ends of the conduit to ensure a smooth edge against the cable, and shall be properly sealed on both ends to ensure no leakage or penetration of water into the switch room. All metallic telecommunications entry conduits shall be bonded to the building's grounding system, in accordance with NEC and/or EIA/TIA specifications. Since the RBOC/CLEC/ILEC may furnish and install the cable, the contractor shall leave a pull rope in the conduit to assist the RBOC/CLEC/ILEC. Entrance of the conduit into the switch room should be in a corner location allowing a left to right breakdown of the cable onto the backboard(s) provided.



## SECTION C - SWITCH ROOM

### C.1. General

Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the switch room work, in accordance with the applicable drawings and these specifications.

### C.2. Size

The switch room shall be a secure room, accessible by service technicians from a common area (hallway, lobby, etc.), air conditioned, and with a two hour fire rating. Unless otherwise specified and approved, the overall size of the switch room shall generally be as follows:

1. Buildings less than 5,000 sq. ft., switch room of 6 x 6 ft.;
2. From 5,000 to 10,000 sq. ft., switch room of 8 x 10 ft.;
3. From 10,000 to 25,000 sq. ft., switch room of 10 x 12 ft.;
4. Greater than 25,000 sq. ft., switch room of 10 x 16 ft.

All shall have a minimum floor-to-ceiling height of 8 ft.

### C.3. Lighting

The switch room shall be fitted with flush or surface-mounted, switched ceiling lights that will provide fifty (50) foot-candles at desktop levels in any area of the room. LED lighting is now the preferred method.

### C.4. Air Conditioning

Switch room shall be air-conditioned with a positive pressure and fresh air make-up, with either its own unit or a dedicated air supply and a return air duct from the room, or exhaust louvers with automatic fire dampers which will close in case of fire. Air conditioning must be continuous, 24 hours per day, every day. See Section I for size estimates. Dedicated split-ductless air conditioning units are now the preferred method of cooling telecommunications MDF/IDF spaces. If the switch room is cooled by common building HVAC system, the air supply to the room shall be controlled by thermostatic control dedicated to the room.

### C.5. Environmental Requirements

The air supplied to the equipment room must be clean and dry. Temperature must be held between 45 degrees and 85 degrees F., with a designed continuous operating temperature of 72 degrees F. Relative humidity must be maintained between 20% and 80% (non-condensing) with a designed continuous operating level of 45%.

## SECTION C - SWITCH ROOM

### C.6. Sprinklers/Fire Rating

If any building specifications and/or safety and fire laws, codes, ordinances or other regulations require a fire sprinkler system to be installed in the switch room, then such system shall be a dry-charged (pre-action) water system. The floor, ceiling, and walls will be constructed to meet the two (2) hour fire rating requirements, including a 36-inch wide, solid metal door and frame.

### C.7. Location of Entrance Cable

Entrance cable conduit shall be brought into one corner of the room that will afford a left to right breakdown of cables onto backboards mounted on two adjacent walls. In a case where there are multiple buildings within the project, two 4-in. diameter conduits shall be run from the switch room to either another switch room or wiring closet in the other buildings. All telecommunications cable between buildings shall be gel-filled PE-89 type twisted-pair, 24 gauge (minimum) cable for analog telephone service and Category 5e/6 or fiber optic of the suitable type for data network service. A pull rope must be installed with each cable. Gas tube and/or solid-state protection is required at each end of copper cables for all inter-building cables. Cables must be installed without back taps (dedicated point-to-point).

### C.8. Cable Sizes

All twisted-pair telecommunications cables between buildings, and from the RBOC/CLEC/ILEC into the switch room (if contractor supplied), shall contain, as a minimum size, 24-gauge conductors. In multiple story buildings (three or more floors), riser cables from the main switch room (MDF) to remote wiring closets (IDF) shall be 24-gauge (minimum) interior cable, ARMM type. Generally, the pair count in any riser cable shall be equal to the telecommunications jack count within any area(s) being served by such cable, times 4. For example, if there are going to be 20 telecommunications jacks installed in an area, a minimum 80-pair count cable is required ( $20 \times 4 = 80$ ). In this case, since there is no manufactured 80-pair cable, the next highest standard count cable (100-pair) would be installed. Project specifics may relax this requirement if a VoIP telephone installation is employed.

### C.9. Backboards

Backboards shall generally be 4-ft. x 8-ft. x  $\frac{3}{4}$ -in. plywood sheets of good quality, painted two coats with a black or medium-gray semi-gloss or satin finish latex paint which maintains the aesthetic quality of the room, mounted thirty-six (36) inches above the floor, as measured from the lowermost edge of the backboard. The horizontal span of

## SECTION C - SWITCH ROOM

single backboards (1 wall installation) shall be 1 ft. less than the length of the wall on which they are mounted, and such backboard shall be horizontally centered on the wall, leaving a 6-in. space on either end between the adjacent wall and the end of the backboard. In multiple backboard installations that meet in room corners, the backboards shall form a continuous corner surface with no gaps. These backboards will, in part, facilitate the construction of the Main Distribution Frame (MDF), and may be referred to as such. All backboards shall be securely fastened directly to the finished wall structure, using appropriate fasteners for the surface to which such backboards are being fastened. Wall surfaces must be finished and painted prior to backboard installation. Generally, backboards shall be mounted with the 4-ft. dimension in the vertical, 36-in. above the finished floor (AFF).

### C.10. Electrical

Overhead lighting operation shall be controlled by a flush-mounted switch(s) adjacent to the strike side of the entrance door to the switch room. Duplex electrical outlets shall be provided (flush mounted) below the bottom edge of the backboards, and on all other walls, at approximately 72-in. centers (i.e., 2 duplex outlets in an 8-ft. backboard), with a minimum of 1 outlet per wall. If more than 2 outlets will be placed in the room, then there shall be a maximum of two outlets per 20-amp circuit, and adjacent outlets shall be on alternating circuits.

A minimum 100-ampere service/breaker panel with an isolated ground bus shall be located within and dedicated to the telecommunications switch room, and shall be connected directly to the main electrical service entrance of the premises. The panel shall be one from a common and widely recognized manufacturer.

The service panel ground bus shall be properly grounded, by an appropriately sized copper conductor, to a dedicated ground rod, bus or other ground point, according to National Electrical Code requirements for isolated grounds for service panels that provide electrical power to computer and/or electronic equipment.

A ground rod, bus or ground cable of minimum size 6 AWG, which is not associated with the isolated ground of the electrical service panel, shall be made available near the entrance conduit and backboard, to enable the direct grounding of gas tube and solid-state protection devices, switching equipment and any ancillary equipment requiring such a ground.

If the switch room contains its own air conditioner or other equipment, which uses electric motors or otherwise presents a relatively heavy load to the electrical service, then such equipment shall be powered from electrical service which is independent of the switch room service panel.

Local fire code may require the installation of an emergency electrical switch, in close proximity to the entrance door, which can disable all power in the room.

## SECTION C - SWITCH ROOM

NOTE: THE ABOVE REQUIREMENTS ARE GENERAL IN NATURE. THERE MAY BE SPECIFIC REQUIREMENTS DUE TO EQUIPMENT CONFIGURATION. CONTACT THE STATE OF MAINE, OFFICE OF INFORMATION TECHNOLOGY / NETWORK SERVICES DIVISION (207-624-8800) BEFORE SPECIFICATIONS ARE WRITTEN.

### C.11. Finish

The switch room floor finish shall be sealed (painted) concrete, vinyl floor covering (VCT), or non-static carpet. Walls and ceiling (except “suspended” ceiling) shall be painted two coats of satin or semi-gloss paint, in either off-white or light beige color. Steel doors and louvers (if any) shall be painted in accordance with the general painting section, or as the Architect/Engineer shall direct. Backboards shall be covered with two coats of black or medium-gray satin or semi-gloss latex paint.

### C.12. Distribution

There shall be conduits exiting the switch room from a point diagonally across from the entrance cable, either through the ceiling or into the floor. The size and number of conduits shall be dependent on the total size of the building and the number of associated wiring closets (next section). After all cabling is in place, all conduit openings shall be sealed with a fire barrier sealant which conforms to electrical codes (such as 3M Fire Barrier Sealer), to ensure a positive seal against rodents, moisture, smoke or gas ingress/egress.

### C.13. Telecommunications Jacks

There shall be a minimum of two telecommunications jacks at the standard electrical outlet height, in the approximate location of any work desk that may be placed in the room. The jacks shall be wired using the same specifications as for the balance of the premises. The employment of VoIP telephony may relax jack quantity in any given area.

### C.14. Keying/Securing

The switch room entrance door shall be lockable. The locks for the switch room (MDF) and all other telecommunications-related rooms, closets, or cabinets within the premises shall be keyed identically, and such keys shall be unique from any other lock and key combinations present within the premises.

### C.15. Fire Extinguisher

There shall be a U.S. DOT (Department of Transportation) approved carbon dioxide (CO2) type fire extinguisher bearing a minimum UL (Underwriters Laboratories) rating

## SECTION C - SWITCH ROOM

of 10B:C, mounted on the wall or in a recessed cabinet, on the outside of the switch room, immediately adjacent to the handle side of the entrance door.

### **C.16. Shelves & Electronic Racks**

Two shelves, one 12-in. depth x 4-ft. length and one 18-in. depth x 4 ft. length, may be required, adjacent to the PBX on the MDF. The 18-in. x 4-ft. shelf should be fitted with a 1-in. slot or gap at the back edge to allow for cable feeds. There may also be requirements for electronic equipment racks (relay racks). Specific requirements shall be determined and approved by Network Services Division personnel prior to any construction.

### **C.17. Locations**

If the switch room (MDF) is to be used to terminate station (horizontal) cables, it must be located so that any telecommunications outlets, whose station cables will terminate directly in that room, will be within 295 cable-feet (90 meters) of that room, per EIA/TIA specifications for maximum horizontal cable distances.

Placement of switch rooms, closets, and jacks must be approved by the Office Of Information Technology, Network Services Division.

### **C.18. Other Uses**

The switch room and wiring closets shall be solely for the use of telecommunications equipment and personnel. They should be considered remote locations owned by the Network Services Division. No storage of any type or any other use of the room shall be permitted.

## SECTION D - WIRING CLOSETS

### D.1. General

Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the wiring closets, in accordance with the applicable drawings and these specifications.

### D.2. Size

A wiring closet(s) shall be a secure room(s), accessible by service technicians from a common area (hallway, lobby, etc.) and shall be constructed to meet a one (1) hour fire rating. Sizes will vary, depending upon telecommunications requirements, but will roughly fall into three categories as follows:

1. Dedicated room, of dimensions approximately 6 ft. (D) X 6 ft. (W) x 8 ft. (H);
2. Recessed closet, adjacent to a hallway, fitted with a double access door, with dimensions of approximately 4 ft. (D) X 6 ft. (W) X 8 ft. (H);
3. Wall access panel, recessed into a hallway or corridor wall, and of dimensions approximately 2 ft. (D) X 4 ft. (W) X 4 ft. (H).

### D.3. Lighting and Environmental Requirements

Wiring closets shall be provided with continuous positive ventilation with exhaust through door/wall louver(s). Normal building environmental air is sufficient provided it shall be clean, dry and free of corrosive fumes or other airborne contaminants, be maintained at a temperature between 45 degrees F, and 85 degrees F, and have a humidity content between 20% and 80% (non-condensing). Equipment in wiring closets may generate approximately 500 - 1000 BTU/hr or more (contact State Network Services Division for actual BTU ratings). Lighting which provides 50 foot-candles throughout is also required. Positive cooling methods (air conditioning) may be required in larger wiring closet applications.

### D.4. Sprinklers

If any building specifications and/or safety and fire laws, codes, ordinances or other regulations require a fire sprinkler system to be installed in the wiring closet(s), then such system shall be a dry-charged (pre-action) water system with pre-action control (smoke + heat rate-of rise sensing).

### D.5. General Layout and Location

All wiring closets shall contain plywood backboards of 3/4-in. thickness, covered with two coats of black or medium-gray semi-gloss or satin latex paint, and shall be constructed in a manner similar to that detailed in Section C.

## SECTION D - WIRING CLOSETS

The incoming conduit from the switch room shall terminate at the left end of the backboard in the wiring closet to allow a left to right breakdown of riser cable(s). On the right end of the backboard, there shall be conduit exit points for horizontal cable distribution throughout the premises. These exit points shall either be full conduits or sleeves through the ceiling, floor, or shall otherwise employ an exit method which can be made tight (foam-filled in the ends of conduits, sleeves, etc.).

In any multiple story building, there shall be a minimum of one wiring closet per floor. On any floor of any relatively large building, there shall be a sufficient number of wiring closets strategically placed throughout the floor, which will ensure current and future adherence to the 295 (maximum) cable-feet (90 meters) EIA/TIA specification for station-to-IDF (jack to wiring closet) horizontal cable runs. Wiring closets shall be serviced by dedicated copper (ARMM type) and optical fiber riser cables from the MDF. Riser cables shall be sized (pair count) according to specifications in Section C.

Location of closets and jacks must be approved by the Office Of Information Technology, Network Services Division.

### **D.6. Electrical**

Each wiring closet shall have a minimum of two duplex electrical outlets, on a 20-amp circuit that is dedicated to that closet. The circuit breaker for this circuit must be proprietary to telecommunications usage, and shall be explicitly marked "VITAL TELECOMMUNICATIONS POWER CIRCUIT - TRIP IN EMERGENCY ONLY". Each closet shall be provided with a switched light source sufficient to support easy visual identification of telecommunications wiring and to support any telecommunications maintenance activity in the closet.

### **D.7. Finish**

Finish of closets shall be aesthetically acceptable and comparable to surrounding areas in both quality and color.

### **D.8. Keying/Security**

All wiring closet entrance doors shall be lockable. The locks for all wiring closets (IDF) and all other telecommunications-related rooms, closets, or cabinets within the premises shall be keyed identically, and such keys shall be unique from any other lock and key combinations present within the premises. In instances where the premises employs electronic card reader access systems, such entrance control to telecommunications spaces is the preferred method.

### **D.9. Fire Extinguishers**

## SECTION D - WIRING CLOSETS

Location of fire extinguishers in or near wiring closets shall generally follow the fire and safety codes which apply to the general physical area(s) adjacent to the wiring closet.

### **D.10. Other Uses**

All wiring closets shall be solely for the use of telecommunications equipment and personnel. They should be considered remote locations owned by the Network Services Division. No storage of any type or any other use of the closets shall be permitted.



## SECTION E - BASIC WIRING STANDARDS

### E.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the telecommunications cable wiring, in accordance with the applicable drawings and these specifications. All wiring must also be performed in accordance with the National Electric Code and any State or Local Building Codes.

### E.2. Scope; Services

The total number of cable runs and the sizes of the cables shall be dependent upon the size, occupancy, and use of the premises.

1. All interior cables to the telecommunications jacks (“horizontal cables”), whether intended for immediate or future use, shall be a minimum of two four-pair, non-shielded, PVC (non-plenum rated) jacketed or TFE/FEP (plenum rated) jacketed, 24 gauge twisted pair cable, with a minimum EIA/TIA certification of Category 5e, one to the “voice” outlet and one to each of the “data” outlets of each telecommunications jack. The voice cables shall have an outer jacket that is gray in color. The data cables shall have an outer jacket that is blue in color. There shall be no exceptions to cable color code. Note: THIS IS MINIMUM TWO SEPARATELY SHEATHED, 4-PAIR EIA/TIA CATEGORY 5e CABLES TO EACH JACK LOCATION. ANY DEVIATION FROM THIS REQUIREMENT MUST BE APPROVED BY THE NETWORK SERVICES DIVISION OF THE OFFICE OF INFORMATION TECHNOLOGY. A typical deviation from this requirement would be considered by the employment of VoIP telephony within the premises.
2. All such cables shall be connected to or “cut down” on the appropriate outlets and terminal blocks, as required herein. The following manufacturer-specific jack hardware shall be used, as required by project specifics, for wall-flush, wall-surface or portable furniture mount (Lucent/Avaya/Commscope part #s, “equivalent” in subsequent language means current Commscope/SYSTIMAX part #). Face plate color exceptions for portable furniture applications (color match) may be specified in project-specific requirements:
  - a. Ivory-colored wall flush-mount face plate, 2-position, M12A-246, or equivalent;
  - b. Ivory-colored wall flush-mount face plate, 3-position, M13A-246, or equivalent;
  - c. Ivory-colored wall flush-mount face plate, 4-position, M14A-246, or equivalent;
  - d. Ivory-colored wall surface-mount box, 2-position, M102SMB-B-246, or equivalent;
  - e. Ivory-colored wall surface-mount box, 4-position, M104SMB-A-246, or equivalent;

## SECTION E - BASIC WIRING STANDARDS

- f. Ivory-colored modular furniture-mount face plate, 3-position, M13C-246, or equivalent.

Each face plate or box shall carry, at a minimum, one ivory-colored “snap-in” Category 5e modular outlet (voice) MPS100E-246 or equivalent, and one orange-colored “snap-in” Category 5e modular outlets (data), MPS100E-112 or equivalent, as required, unless project specifics dictate otherwise (VoIP installations).

3. All 4-pair cables shall be run from the telecommunications jack to the MDF or to the designated IDF for any given area within the premises, and each such run shall be no longer than 295 cable-feet (90 meters), per EIA/TIA specifications for such cables. The cables shall be identified by a jack number and by function (voice or data). The “voice” cables shall be terminated at the IDF or MDF on “110” termination blocks. The “data” cables shall be terminated on Category 5e “110-JP” termination blocks or rack-mounted patch panels. Where IDF spaces are employed, there shall be multi-pair riser cable(s) run from each IDF to the MDF of sufficient total pair count to accommodate the total pair count for both voice and data jack terminations in each IDF space. Sufficient cable length must be left at all cable ends to allow for the proper dressing and cut-down of the cable. Riser cables shall be terminated on “110” termination blocks. All cables shall be run in one continuous length from the jack to the designated termination point (IDF/MDF), with no splices or intermediate terminations in such cables.
4. All riser cables shall be of 24-gauge, sheathed, twisted-pair, color coded and appropriately sized (pair count) for the installation. Fiber optics riser cables may also be required when data design specifications are exceeded on twisted pair cable (see Section J for fiber optics specifications).
5. In all instances where telecommunications cable is run, either between the switch room and wiring closets, and/or from wiring closets or the switch room to the jacks, and where such cable is not in conduit, the cable must be fire rated. In those instances where cables are run in or through any spaces which are used in any way for environmental air, such cable shall be CMP (National Electric Code Article 800, Plenum Cable) rated, and shall be labeled as such.
6. For cable runs between switch room and wiring closets, there should be adequate backboard space provided for the cables and associated termination hardware (see Section C). Both cable ends shall be cut down on termination blocks as specified. All cables and pairs must be appropriately labeled.
7. Placement of telecommunications jacks in any building(s) should be determined by the following general rule; “Wherever an electrical outlet is located, there shall also be located a telecommunications jack, spaced 16 to 24 inches in the horizontal from, and at the same vertical height as such electrical outlet. Exceptions are generally as follows:

## SECTION E - BASIC WIRING STANDARDS

- a. closets;
- b. restrooms;
- c. mechanical rooms (boiler, pump, generator, etc.);
- d. stairwells and hallways;
- e. any large open interior spaces designed specifically for modular furniture installations.

In cases where modular (portable) furniture is to be installed, there shall be, at a minimum, one telecommunications jack located within the furniture baseboard, as close as possible to each desktop work area or workstation location. Each jack shall carry, at a minimum, one Category 5e (voice) and one Category 5e (data) telecommunications outlet, unless project specifics dictate otherwise (VoIP installations). Ingress/egress of the associated telecommunications cables within modular furniture shall be facilitated using a whip or a power pole/"tele-pole", depending upon the specific architectural plan. In the case of whip installation from "hard" walls to the modular furniture, there shall be whips dedicated to telecommunications cables, and, under no circumstances, shall any telecommunications cables share a whip with any electrical or other non-telecommunications cables. There shall be duplex or quad electrical boxes installed in the hard walls, at the standard electrical outlet height, and at strategic points along such walls for connection of the whips to the walls. Such boxes will provide an egress point for telecommunications cables which are routed within the wall void from the overhead spaces. In-wall conduit from such boxes to the overhead spaces will typically be required to afford secure and unobstructed passage of the telecommunications cables through the wall void. All in-wall conduits and furniture whips shall be sized appropriately to afford a maximum 40% cross-sectional cable loading for the number of telecommunications cables required in each such conduit and/or whip. In the case of power pole installation from the overhead, it is possible that electrical and telecommunications cables might share a common power pole. In these instances, electrical and telecommunications cabling within any power pole must be separated by a sheath, conduit, compartment or other method which meets all applicable National Electrical Code (NEC) requirements for such installation. The telecommunications cable compartment in any such pole shall be sized appropriately to afford a maximum 40% cross-sectional cable loading for the number of telecommunications cables required in each such pole, and such compartment shall not be shared with any non-telecommunications cables. In all cases, final count and placement of modular furniture telecommunications jacks, power poles and whips shall be determined by the floor plan, and with the approval of the owner/tenant and the Office of Information Technology, Network Services Division.

This rule should be scrutinized carefully between architect/owner/tenant, in order to understand the designed use, and possible future use of specialized areas, such as classrooms, conference areas, hearing rooms, libraries, etc., and to plan for telecommunications jack placement accordingly.

## SECTION E - BASIC WIRING STANDARDS

Any areas such as conference rooms, gymnasiums, armories or other spaces that might be used in an emergency or special situation to support a phone bank, call distribution center, or emergency support group should be configured with additional telecommunications facilities. The Network Services Division can provide cost effective suggestions.

8. All vertical and horizontal cable runs must be independently suspended by approved hangers, trays, ducts or raceways. All telecommunications cables must be placed to avoid electromagnetic interference caused by electrical/electronic devices, such as florescent light ballasts, electric motors, generators, power supplies, radio transmitters, etc.
9. All jacks must be placed within 295 cable-feet (90 meters) of the switch room or IDF in which such wiring terminates, per EIA/TIA specifications for such cables. The Network Services Division must review and approve placement of jacks.
10. All cable installations shall be tested and verified for proper conductor pair polarity, sequence and continuity. All Category 5e installations will be performed in accordance with all installation practices and guidelines that are recommended for such installation. All Category 5e installations shall be tested and verified for compliance with all applicable standards for such installation, and a complete certification report shall be compiled and submitted to the Network Services Division upon the completion of installation and certification testing.

### **E.3. Labeling**

1. General: Identification labeling of all installed telecommunications facilities and systems shall be specified by the Network Services Division.
2. Trunk/Riser Cables: All telecommunications trunk and riser cables (copper twisted pair, optical fiber, coaxial, etc.) shall carry a unique identification label at both ends of each such cable, and related termination hardware shall be labeled likewise. Specific labeling requirements shall be developed for each installation.
3. Voice/Data Station Jacks, Termination Blocks and Patch Panels: All telecommunications jacks, outlets, termination blocks, patch panels or other terminating hardware shall carry a unique, sequential identification label for each "circuit" formed by a given cable and its associated outlet, termination block position or patch panel port. Telecommunications jack, outlet, termination block and patch panel labeling schemes within any building subject to this Specification shall be in keeping with a logical, orderly, and sequential layout, based on the architectural floor plans for the building, and all such labeling schemes shall be determined and approved by the Network Services Division.

## SECTION F - CABLE TELEVISION (CATV)

### F.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the cable television work, in accordance with the applicable drawings and these specifications. All work must be performed in accordance with the National Electric Code and any State and Local Building Codes.

### F.2. Point of Entry

The CATV service entrance to the premises shall be at a point mutually acceptable to the owner and the local CATV service provider. If the signal is to be provided by antenna arrangements, then it shall be in accordance with the general architectural plans showing that point closest to the area within the premises that is intended to house the receiving or “head-end” equipment.

### F.3. Entrance Methods

1. Buried: From the property line closest to the CATV service provider facilities “drop”, there shall be a conduit(s) buried at a minimum depth of 24 inches, using minimum 2-inch diameter schedule 40 or 80 PVC pipe. In areas subject to vehicular traffic, the conduit(s) shall be encapsulated in concrete to a minimum thickness of 3 inches, and running the full length of the traffic area. In all areas where public streets are crossed, rigid steel conduit shall be used. All conduits shall be capped after installation to protect them from weather elements and debris.
2. Aerial: If the electrical power service entrance and other telecommunications service entrances to the premises are aerial, the Architect/Engineer may specify that the CATV entrance be aerial as well. Any aerial entrance shall be in compliance with the CATV service provider requirements. All aerial CATV cables must be at least three (3) feet lower than any electrical entrance, and shall carry to a standard weather head allowing eighteen (18) feet clearance for any vehicular traffic. A minimum 2-inch diameter weather head and conduit shall be installed to carry cables into the premises, and such conduit shall be continuous into the switch room or other designated point of termination (demarcation point). If the service is via an antenna arrangement on top of the building, then a conduit shall be installed from the base of the antenna location to the point of termination.

In either case, any conduits shall be permitted to have only “sweep” elbows and not over 270 degrees of cumulative directional change between any two cable pulling points. Generally, the conduits shall be continuous from the point of entry into the telecommunications switch room or other designated demarcation point. If the run, from the point of entry into the premises to the demarcation point, is greater than 50 feet, then the entrance cable shall be terminated in a suitable location within 50 feet of the entrance point and a suitable interior cable shall be spliced to it to continue to the demarcation point, unless the entrance cable material meets applicable codes and standards for open

## SECTION F - CABLE TELEVISION (CATV)

installation within the premises. If the total “run” of the entrance cable (in conduit) exceeds 250 feet, then a pull box of sufficient size to accommodate the diameter of the telecommunications cable shall be mounted at the nearest point of entry, inside the building.

In all cases, the CATV entrance should parallel the telecommunications entrance if possible. These may be instances where the CATV entrance may share a conduit with the telecommunications entrance cable, and this will be determined on a “case by case” basis.

### **F.4. Entrance Cable**

The CATV entrance cable shall be a 75-ohm coaxial cable, with a physical composition and diameter to be determined by the length of the service entrance run, and designed for underground usage when it is to be used as such. The cable shall be terminated into a coaxial grounding block by one of the two following methods:

1. If the entrance is via underground conduit, then the grounding block shall be located as close as possible to the point of building penetration and shall be grounded to the telecommunications ground or other suitable nearby ground.
2. If the entrance is aerial, then the grounding block shall be located on the outside of the premises, as close as possible to the point of building penetration, and shall be grounded to an outside ground rod.

In either case, the coaxial cable will then continue to the designated point of termination (demarcation point).

### **F.5. Location**

Entrance conduit may enter the switch room or designated point of termination from either below the floor or through the ceiling. In either case, appropriate bushings shall be used in the open ends of the conduit to ensure a smooth edge against the coax, and shall be properly sealed on both ends to ensure no leakage or penetration of water into the switch room after the coax is in place.

Entrance of the conduit into the switch room or designed point of termination should be in a corner location, which will allow a left to right connection of cables to branch extensions that will terminate on an associated backboard. This entrance and the location of the backboard shall be on a wall location other than those used for telecommunications cable and associated frames, blocks or cross-connects.

### **F.6. Backboard**

## SECTION F - CABLE TELEVISION (CATV)

The backboard shall be of the same construction, affixed to the walls, and painted in a manner which is consistent with the backboard requirements detailed in other sections of this document.

### F.7. **Other Runs**

Conduit runs carrying coaxial cables to other areas shall exit the switch room via a sleeved conduit(s) (in the same general area as the entrance coax), which shall be sealed in the same manner as the end of the telecommunications entrance conduit(s). Coaxial cable runs to terminal locations shall either be placed in conduit, or the coaxial cable itself shall be fire rated. In those instances where the cables are run in or through any spaces which are used in any way for environmental air, it shall be CMP (National Electric Code Article 800, Plenum Cable) rated cable, and shall be labeled as such.

### F.8. **Identification and Termination**

Cable terminations at the jack or “subscriber” end shall be in standard electrical boxes, using standard F-type “feed thru” connector, and will serve as the CATV outlet for the connection of television equipment. Each outlet shall be assigned an identification label and such label shall be marked or affixed to the cover plate of the outlet. Each cable shall be marked at the switch room, or other designed common termination point, with a tag bearing an identifying label which is identical to the one placed or marked on the far end of such cable. Unless otherwise specified, the cables shall not be “cut down” or connected at the switch room or other designed common termination point, but shall be left with sufficient length to be affixed to the backboard and properly connected to various CATV distribution devices. Unless otherwise specified, all CATV distribution devices shall be supplied and installed by the Office of Information Technology, Network Services Division.

## SECTION G - PAGING SYSTEMS

### G.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the paging system work, in accordance with the applicable drawings and these specifications. All work must also be done in accordance with the National Electric code any State or Local Building Codes.

### G.2. Speakers

All speaker units shall be listed equipment and installed in accordance with the manufacturer's recommendations. Units shall be installed to afford future access to the wiring connections, should the need arise.

### G.3. Wiring

All wiring shall consist of the manufacturer suggested cable. Typically, the cable composition will be one (1) shielded pair of 18-gauge copper conductors. A cable shall be run to each speaker unit from the switch room, wiring closet or other area which has been designated to house the paging system switching and amplification equipment. All wiring not in conduit must be fire rated or CMP labeled.

### G.4. Identification

The speaker end of each cable should be trimmed to length, dressed and affixed to the speaker unit. The opposite (switch room) end shall be coiled with sufficient length to allow dressing and connection to the switching and amplification equipment, and shall be labeled in a manner that will identify its associated speaker unit.



## **SECTION H - VIDEO SYSTEMS**

ANY REQUIREMENTS FOR VIDEO SYSTEMS WILL BE DEVELOPED SPECIFICALLY FOR EACH PROJECT REQUIRING SUCH SYSTEMS.

## SECTION I - MECHANICAL EQUIPMENT

### I.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete installation of mechanical equipment required for the support of the telecommunications infrastructure, in accordance with the applicable drawings and these specifications. All work must also be done in accordance with the National Electric code any State or Local Building Codes.

### I.2. Air Conditioning

There shall be a continuously operating, forced air conditioning and ventilation system servicing the switch room. Should the existing building system be sized and operated in a manner which would allow adequate ventilation and air conditioning of the switch room, as required by the PBX and other telecommunications equipment specifications, then separate feed and return air ducts shall be supplied to the switch room from the existing system. Use the following guidelines for size estimates:

1. Minimum 24,000 BTU/hr of cooling in any room in which a large PBX (approximately 50 stations or more) is to be installed, or when a room size exceeds, by 50 percent, the minimum required space as specified in Section C.
2. Minimum 12,000 BTU of cooling in any room in which a small PBX (approximately 49 stations or less), key system, or any other electronic telecommunications equipment will be installed.

All mechanical equipment shall be listed and certified as to its use and application in this instance and for this specific use. There shall be labeled fire dampers installed in all duct work with a certified fire closing link fuse or other device designed to close off the air flow in the event of such a situation.

In addition to any other installation requirements, the installation of a dedicated air condition system for switch rooms shall be in accordance with the following:

1. Should the design call for an independent, dedicated air conditioning unit for the switch room, then such a unit shall be provided. The unit provided shall be of a recognized, listed brand designed for such an application and shall be installed in such fashion as to prevent any possible leakage of water into the switch room. Therefore, if a water cooled unit is provided, it shall be installed outside the switch room. Should an air cooled unit be provided, it may be installed within the switch room in a location not directly over the PBX or backboard locations.
2. Air conditioners must be powered separately from the switch room electrical service.

## SECTION I - MECHANICAL EQUIPMENT

### I.3. Related Electrical Wiring

All wiring, circuitry and electrical components shall be UL (Underwriters Laboratories) approved and installed in accordance with all codes. All electrical circuits utilized shall be protected by a circuit breaker of sufficient size to support the installation.

## SECTION J - FIBER OPTIC CABLE SYSTEMS

### J.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the installation of fiber optic cable systems, in accordance with the applicable drawings and these specifications. All work must be performed in accordance with the National Electric Code and any State and Local Building Codes.

ALL WORK INVOLVING FIBER OPTICS MUST BE APPROVED IN WRITING BY THE OFFICE OF INFORMATION TECHNOLOGY, NETWORK SERVICES DIVISION.

### J.2. Point of Entry

The entrance to the premises shall be at a point mutually acceptable to the owner and the RBOC/LEC. If cables are to be installed within or between buildings, then such entrances shall be in accordance with general architectural and Office Of Information Technology, Network Services Division plans showing that point closest to the planned location of the optical receiving/transmitting devices.

### J.3. Entrance Methods

1. Buried: From the property line closest to the RBOC/CLEC/ILEC facilities, there shall be a conduit(s) buried at a minimum depth of 24 inches, using minimum 2-inch diameter schedule 40 PVC pipe. In areas subject to vehicular traffic, the conduit(s) shall be encapsulated in concrete to a minimum thickness of 3 inches, and running the full length of the traffic area. In all areas where public streets are crossed, rigid steel conduit shall be used. All conduits shall be capped after installation to protect them from weather elements and debris.
2. Aerial: If the electrical power service entrance and other telecommunications service entrances to the premises are aerial, the Architect/Engineer may specify that the fiber optic cable entrance be aerial as well. Any aerial entrance shall be in compliance with the RBOC/CLEC/ILEC requirements. All aerial fiber optic cables must be at least two (2) feet lower than any electrical entrance, and shall carry to a standard weather head allowing eighteen (18) feet clearance for any vehicular traffic. A minimum 2-inch diameter weather head and conduit shall be installed to carry cables into the premises, and such conduit shall be continuous into the switch room or other designated point of termination (demarcation point).

In either case, any conduits shall be permitted to have only “long sweep” elbows and not more than 270 degrees of directional change between any two cable pulling points. Generally, the conduits shall be continuous from the point of entry into the telecommunications switch room or other designated demarcation point.

## SECTION J - FIBER OPTIC CABLE SYSTEMS

If the run from the point of entry into the premises to the demarcation point is greater than 50 feet, then the entrance cable shall be terminated in a suitable location within 50 feet of the entrance point, and a suitable interior cable shall be spliced to it to continue to the demarcation point, unless the cable material meets applicable codes and standards for open installation within the premises. If the total “run” of the entrance cable (in conduit) exceeds 150 feet, then a pull box of sufficient size to accommodate the diameter of the telecommunications cable shall be mounted at the nearest point of entry inside the building.

In all cases, the fiber optic cable entrance should parallel the telecommunications entrance if possible. There may be instances where the entrance cable may share a conduit with other telecommunications or CATV entrance cables, and this will be determined on a “case by case” basis. In any case where a conduit is shared with other cables, an innerduct shall be installed in such conduit to carry the fiber optic cable.

### **J.4. Fiber Optic Cable**

The fiber optic cable shall be appropriately sized (numbers of fibers) and shall be appropriate for its intended installation environment, whether underground, aerial, interior (riser), or plenum. Each fiber shall be encapsulated in a color-coded buffer/sheath, the fiber bundle shall be reinforced with a nonmetallic lateral strength member (typically Kevlar), and all shall be sheathed in an overall jacket of appropriate type for the given installation, and as specified by the Network Services Division. Specific fiber optic cable type shall be determined by specific project application. Typical fiber optic types are 50/125 micron (OM3/OM4), 62.5/125 micron (OM1) and 9/125 micron (single-mode). Specific requirements for types of fiber optic cable installations shall be determined on a case-by-case basis and approved by the Office of Information Technology, Network Services Division.

### **J.5. Location**

Entrance conduit may enter the switch room from either below the floor or through the ceiling. In either case, appropriate bushings shall be used in the open ends of the conduit to ensure a smooth edge against the cable, and shall be properly sealed on both ends to ensure no leakage or penetration of water into the switch room after the cable is in place. One entrance of the conduit into the switch room should be in a corner location, allowing a left to right connection to the fiber optic terminal equipment. This entrance and the location of the backboard shall be on a wall location other than those used for other telecommunications cable and associated frames, blocks or cross-connects.

### **J.6. Backboard**

The backboard shall be of the same construction, affixed to the walls, and painted in a manner which is consistent with the backboard requirements detailed in other sections of this document.

## SECTION J - FIBER OPTIC CABLE SYSTEMS

### **J.7. Cable Ingress/Egress, Termination, Splicing**

Conduit runs carrying fiber optic cables to other areas shall exit the switch room via a sleeved conduit(s) (in the same general area as the entrance cable), which shall be sealed in the same manner as the end of the telecommunications entrance conduit(s).

Fiber optic cable runs to terminal locations shall either be in dedicated conduits or placed in fiber optic innerduct of dimensions specified by the Network Services Division. Fiber optic cable terminations shall be performed using SC-style fiber connectors, and shall terminate in AT&T/Lucent/Commscope “Lightguide” or equivalent fiber optic terminals that are approved by the Network Services Division. Specific termination connector type shall be determined by the Network Services Division prior to the commencement of such work. All new fiber optic installations and terminations shall use factory pre-polished “pigtailed”, fusion-spliced to the cable.

Fiber splicing is to be performed only with the permission of the Network Services Division. Fiber splicing and termination must only be performed by trained personnel and must be in accordance with industry accepted fiber splicing methods.

### **J.8. Certification and Identification**

All terminated fibers shall be guaranteed by the installer to meet continuity and system design loss criteria. Upon completion of the fiber optic cable system installation, each terminated fiber of all fiber optic cables shall be tested and certified for continuity and end-to-end loss. Supporting documentation which details such test and certification shall be submitted to the Office of Information Technology, Network Services Division upon completion of the project. Each fiber optic cable and each fiber within such cable shall be marked at both termination points to clearly identify the cable, its associated fibers and termination points.

## **SECTION K - REMOVAL OF OLD CABLE AND FACILITIES**

### **K.1. General**

Execute all removal of old telecommunications cable, conduits, racks and other facilities presently existing within the premises, and which will not be reused in any new installation, in accordance with the applicable drawings and these specifications.

### **K.2. Inspection**

The Contractor shall inspect existing conditions with the Office Of Information Technology, Network Services Division to make a determination of what is to be removed and which existing conduits, cables, etc., shall be reused.

### **K.3. Removal**

Removal shall consist of the disconnection of all wiring and/or cables and their subsequent removal by pulling out of conduits, raceways, over ceilings, in crawl spaces or wall cavities, removing surface wiring or cable and any related fastening devices wherever possible. If old wiring and/or cables should be installed in walls, floors or ceilings in such a manner which makes it impossible to remove, then it may be left, with the consent and written permission of Office of Information Technology, Network Services Division. Such wire and/or cable shall be cut as close to the surface as possible and the cut ends taped to prevent accidental reuse, and shall be pushed inside the structure to allow patching and refinishing of the remaining holes. In all cases, removal of telecommunications facilities shall be accomplished in a manner which will allow for a clean, clear surface to remain, i.e., one which can be patched, restored, and painted to match the surrounding conditions without degradation to the premises.

All items shall be removed from the premises in accordance with the general provisions regarding this project, or as the Architect or engineer shall dictate. All waste materials must be disposed of in accordance with any and all applicable local, State, and Federal waste disposal regulations.

## SECTION L - CUTTING AND PATCHING

### L.1. General

Execute cutting, fitting, and patching (including ground excavation and back fill if needed) and furnish all labor, materials, equipment, supplies, temporary barricades, and covers for equipment/furnishings; and perform all operations necessary to complete the telecommunications project, in accordance with the applicable drawings and these specifications.

### L.2. Inspection

The contractor shall inspect conditions, including any and all elements subject to damage, movement, disruption or safety requirements during cutting and patching operations.

### L.3. Acceptance

The commencement of cutting or patching means the contractor has accepted existing conditions.

### L.4. Protection

Contractor shall provide supports, temporary barricades, covers, or other protective devices to ensure protection of other portions of the project from direct, indirect or incidental damage.

### L.5. Restoration

All restoration work shall be accomplished with new materials by the crews or work forces performing the original work on this project, whenever possible.

### L.6. Cutting

All cutting of rigid materials shall be accomplished using metal, wood cutting, or masonry saws or core drills. Pneumatic tools shall not be used in occupied buildings without prior approval of the owner.

### L.7. Corrosive and Foreign Materials

Whenever conduits, pipes or wiring traverses through walls, and cannot be closed securely for reasons of expansion/contraction, pipe collars shall be used to close the opening as much as possible against dust, dirt, corrosive or foreign materials, or for cosmetic purposes.



## SECTION L - CUTTING AND PATCHING

### L.8. Finish

All finish work shall be smoothed, sanded, fitted and painted or finished to ensure a cosmetically acceptable, finished product.

### L.9. Exterior

Any exterior ground trenching shall be back filled, compacted, and covered to match the preexisting conditions (i.e., gravel, crushed stone, hot top, concrete sidewalk, loam and sod). When excavating through a hot top area, all cuts shall be “saw cut” and “infrared bondings” shall be used when replacing hot top materials.

## SECTION M – TEMPORARY UTILITIES

### M.1. General

Furnish all necessary labor, materials, equipment, supplies and perform all operations necessary to provide temporary heat, lights, and power for any telecommunications activities for the duration of the project.

### M.2. Supervision

The contractor shall allow Owner/Lessee-supervised telecommunications installers, technicians or service personnel, including telecommunications contractor(s) under contract to the owner/Lessee, to enter the premises and to perform required telecommunications installations, repairs, and modifications.

### M.3. Temporary Measures

All telecommunications activities performed under this section shall be provided with temporary heat and toilet/ sanitary facilities as deliverable and available to the balance of the project, as well as temporary lighting and power outlets as required, until such permanent utilities and fixtures become available for use.

### M.4. Coordination

Telecommunications contractors and personnel under control of the Owner/Lessee shall coordinate all activities and hours of working with the contractor or subcontractor responsible for the completion of the telecommunications portion of this project.

### M.5. Protection

The contractor shall take all steps required to secure and protect telecommunications equipment, supplies and tools placed in the premises and not part of this contract. Such protection shall include, but is not necessarily limited to, security, temporary covers, barricades, and space heating.

### M.6. Safety

The contractor shall provide and install all temporary measures necessary to protect the safety of all pedestrian and/or vehicular traffic during any internal or external construction activities in which the contractor is engaged. Such safety measures shall include, but shall not be limited to warning signs, banners, ribbons, barricades, fences, ropes, reflectors or lights. All temporary safety measures installed by the contractor shall be removed when work is completed and when no further work area hazards exist.

## SECTION N – PAINTING AND CLEANUP

### **N.1. General**

Furnish all labor materials, equipment, supplies and perform all operations necessary to complete the painting and cleanup of all telecommunications activities, in accordance with the applicable drawings and these specifications.

### **N.2. Coordination**

The telecommunications contractor(s) shall coordinate with the general contractor for the entire project or premises to ensure completion of all work in accordance with these plans and specifications.

### **N.3. Painting**

Final painting shall be accomplished with color selection being determined either by requirements to match existing work, or as directed by the contractor/subcontractor responsible for painting and interior finish work for the entire project.

### **N.4. Rubbish Removal**

At the completion of the telecommunications work, all trash, scrap materials, broken or discarded construction materials, boxes, cartons, scrap wire/cable, empty containers, temporary barricades, safety devices, temporary utility connections, shall be removed from the work areas or otherwise moved or placed at the direction of the general contractor responsible for the total project. All waste materials must be disposed of in accordance with any and all applicable local, State and Federal waste disposal regulations.

### **N.5. Cleanup**

All areas involved in the scope of the telecommunications plans and specifications shall be swept clean, floors mopped down, and floor finish applied, as required. All hand smudges, paint droppings or other noticeable defects that would affect the cosmetic appearance of the project, shall be corrected to the satisfaction of the general contractor, and the architect/engineer on the project.

## **SECTION O – SPECIAL SERVICES AND FACILITIES**

ANY REQUIREMENTS FOR SPECIAL TELECOMMUNICATIONS SERVICES AND/OR FACILITIES WILL BE DEVELOPED SPECIFICALLY FOR EACH PROJECT REQUIRING SUCH SERVICES AND/OR FACILITIES.

# APPENDIX

VOICE / DATA OUTLET WIRING DETAILS (EIA/TIA 568B)..... I

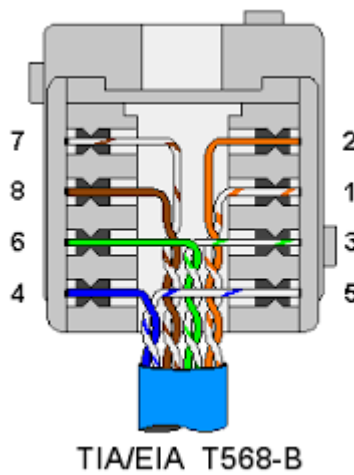
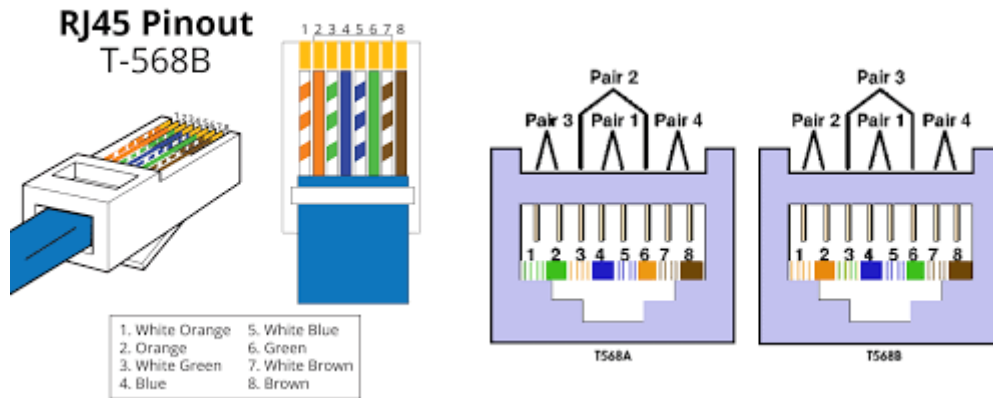
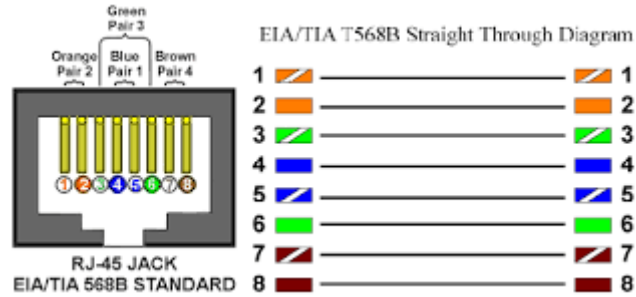
TYPICAL BUILDING TELECOMMUNICATIONS MDF/IDF ROOM LAYOUT..... II

TYPICAL TELECOMMUNICATIONS MDF/IDF EQUIPMENT RACK LAYOUT..... III

TYPICAL TELECOMMUNICATIONS CONNECTIVITY LOGICAL DIAGRAM..... IV

# APPENDIX

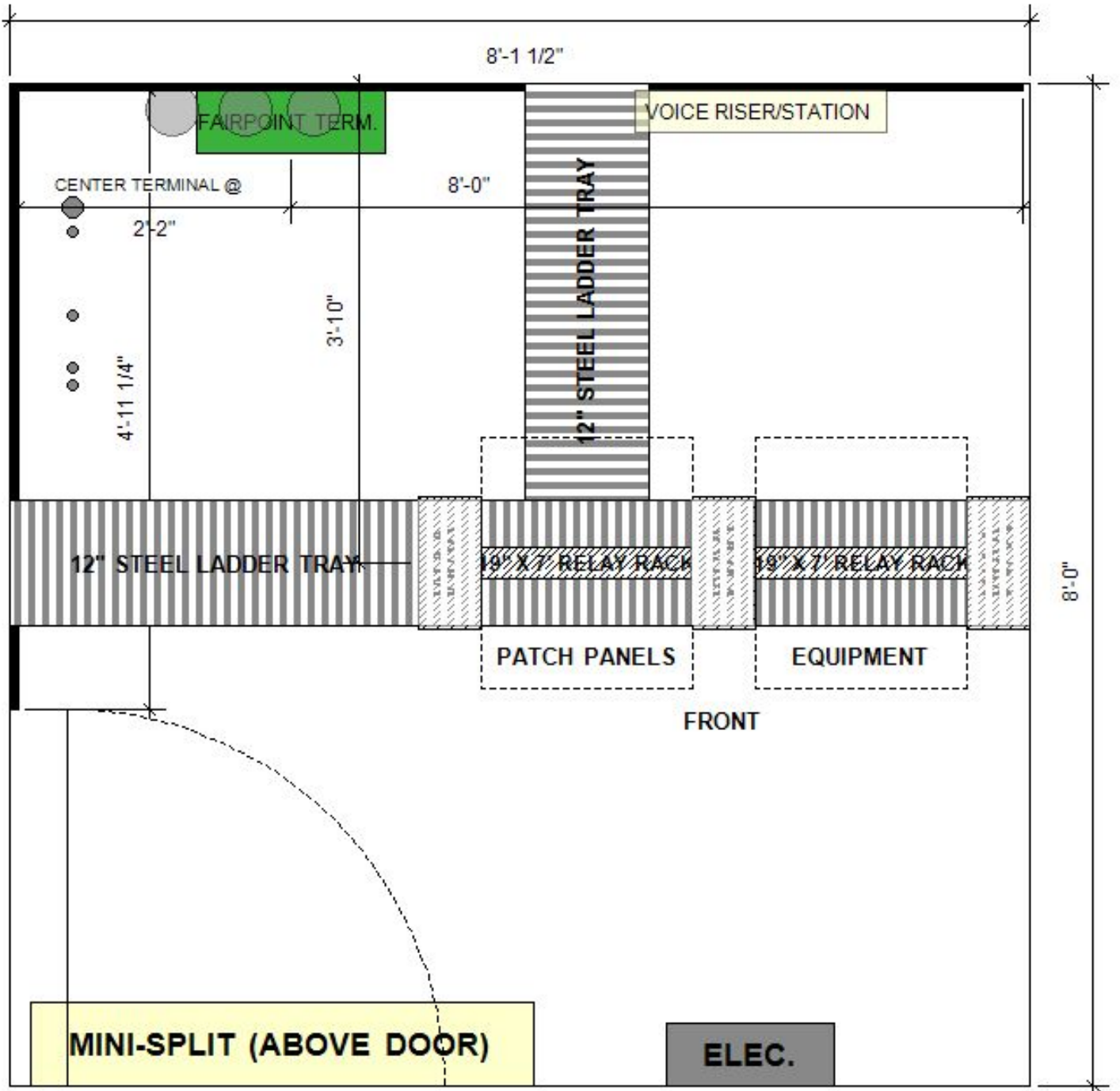
## TELECOMMUNICATIONS VOICE AND DATA OUTLET WIRING CONFIGURATION FOR EIA/TIA 568B STANDARD





# APPENDIX

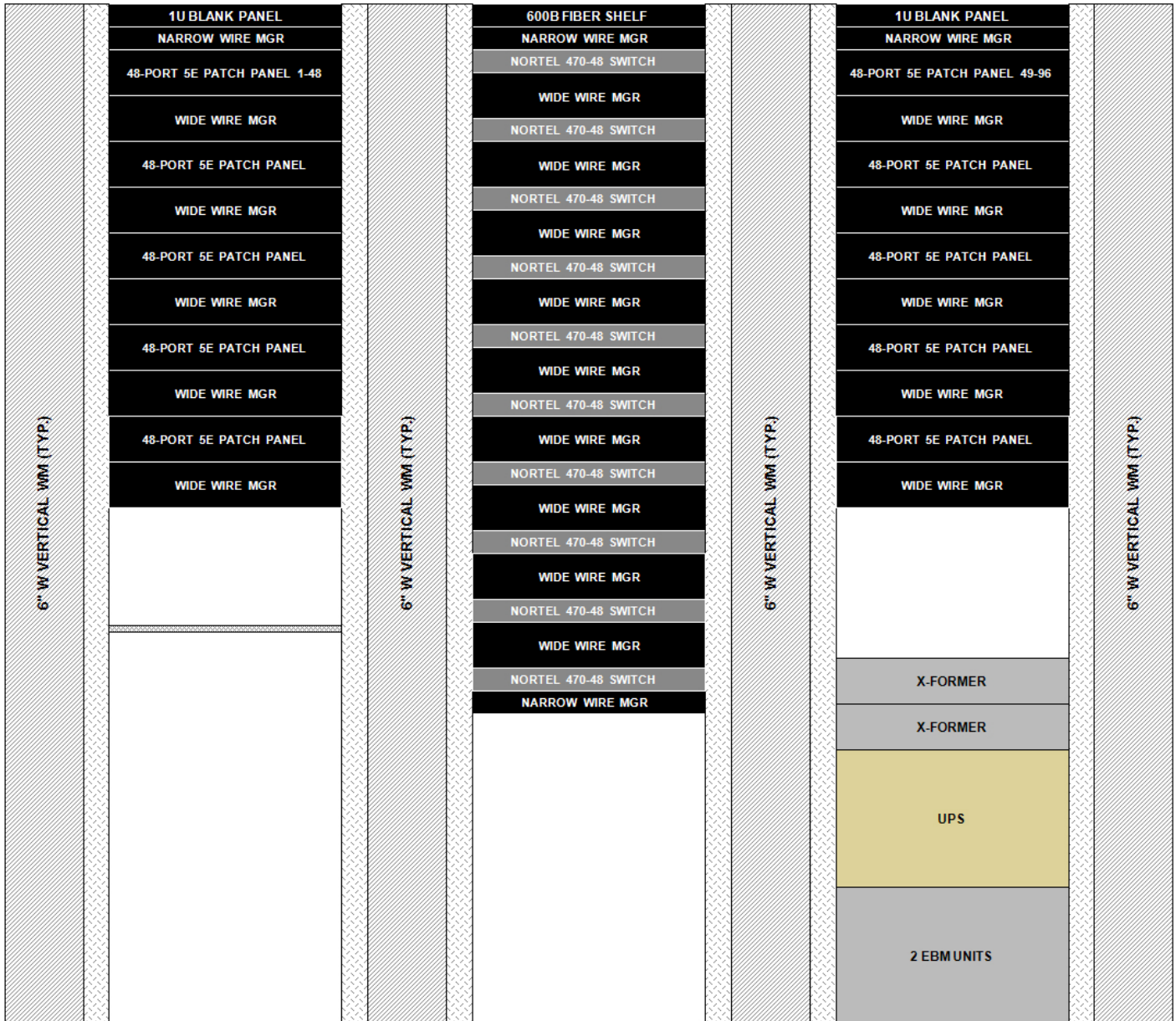
## TYPICAL BUILDING TELECOMMUNICATIONS MDF/IDF ROOM LAYOUT PLAN VIEW (MID-SIZE)





# APPENDIX

## TYPICAL TELECOMMUNICATIONS MDF/IDF (SWITCH ROOM) RACK LAYOUT FOR A RELATIVELY LARGER BUILDING



**THREE-RACK LAYOUT (TYP.)**

# APPENDIX

## TYPICAL TELECOMMUNICATIONS LOGICAL CONNECTIVITY DIAGRAM

