

	<i>State of Michigan Department of Technology, Management & Budget</i>	TECHNICAL STANDARD
Subject:	Network and Telecommunications Infrastructure Facility Standard	Standard Number
Authoritative Policy:	1345.00 IT Network & Infrastructure Policy	1345.00.02
Procedure Number:	n/a	
Distribution:	Statewide	

Purpose: To establish a statewide facilities standard for network and telecommunications infrastructure within state government so that consistency is maintained and so that DTMB is in compliance with Public Act 431 of 1984, as amended.

Contact/Owner: DTMB Infrastructure & Operations (I&O)
Network and Telecommunications Services Division (NTSD)

Scope: Applicable to all state of Michigan (SOM) information technology (IT) systems that require NTSD. This guide is limited to the following:

- The design considerations regarding the telecommunication rooms, pathways, entrance facilities, environmental and electrical requirements, cabling and equipment components of the SOM's telecommunication network.
- The construction and installation requirements for telecommunication rooms, pathways, entrance facilities, environmental and electrical requirements, cabling and equipment components for SOM's communication network infrastructure relative to state owned and/or leased facilities.

Standard: The SOM requires an appropriate environment for network and telecommunication products/infrastructure to support voice, data and video systems based on requirements of the building and its occupants. Telecommunication items incorporated in any building shall adhere to ANSI/EIA/TIA and BICSI Standards (see Glossary on page 2 for definitions of these acronyms). The detailed specification for network and telecommunications may override the ANSI/EIA/TIA and BICSI standards in some areas due to changes in technology. In addition to the ANSI/EIA/TIA and BICSI Standards, all applicable building standards and codes must be incorporated. Appendix #1 and

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Appendix #2 of this document describe the National Electrical Code (NEC), applicable codes and current industry standards all relating to building spaces, pathways and equipment which will be required from the building owner in order to achieve compliance.

Exceptions to this standard, that cannot be agreed to by the requesting agency and DTMB (IT and facilities), shall be requested through the DTMB Executive Technology Review Board (ETRB) per 1305.00.02 Policy and Product Exception Process Standard.

Glossary:

ANSI	American National Standards Institute
BICSI	Building Industry Consulting Services International – Helps develop standards and guidelines for networking. Its certifications are de-facto standards for cable installers.
BTU	British Thermal Unit
CAT 3	Category 3 – An unshielded twisted pair (UTP) cable designed to carry voice and data up to 10 megabits per second (Mbs) and with transmission frequency of up to 16 Mhz.
CAT 5	Category 5 – An unshielded twisted pair (UTP) cable that can support data speeds of 100 Mb or more. Cables can reach length of 100 meters.
CAT 5e	Enhanced Category 5 that supports 1000 Mb, i.e., gigabit speed.
CBTC	Commercial Building Telecommunications Cabling – a subcommittee of the TIA (see below), tasked with revising the TIA’s “Building Automation System Cabling Standard.”
CMS	Cable Management System
DEMARC	Demarcation point – This is the physical point at which the public network of a telecommunications organization, such as a phone or cable company ends and the private network of the customer begins. This is usually where the cable physically enters a building.
ECIA	Electronic Components Industry Association (see EIA below)
EIA	Electronics Industries Alliance – This organization ceased operations in February 2011. It assigned the maintenance of existing “interconnect, passive electro-mechanical (IP&E) standards to the ECA, (Electronic Components Association, which in turn has joined the ECIA (Electronic Components Industry Association). From the ECIA’s website as of 5/31/2013, “the EIA standards brand will continue for IP&E standards within ECIA.”

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**TECHNICAL
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LM/Ft2	Lumens per square foot – a standard for measuring brightness in foot candles.
MTR	Main Telecommunication Room - located in the center of the building. When possible this placement will minimize the size and length of the vertical cable as well as the length of the horizontal information transportation system. For example: In a 9-story single-tenant office building, place the MTR on the fifth floor.
NEC	National Electrical Code – Set of standards for the safe installations of electrical wiring and equipment. It is not a legally binding regulation, but it is often used by states and municipalities. “NEC” and “National Electrical Code” are registered trademarks of the National Fire Protection Association (NFPA). The NEC has also been approved by ANSI as a national standard.
Systimax®	Product family specializing in network infrastructure. Currently owned by CommScope; formerly owned by Avaya.
TGB	Telephone ground bar
TIA	Telecommunications Industry Association – Accredited by ANSI to develop standards for information and communication technologies.
TR	Telecommunications Room

Approving Authority:

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Appendix #1 – General Specifications

A. **Building Entrance Conduit**

Building Entrance Conduit Overview: A minimum of three (3) conduits having a four (4) inch diameter are required to facilitate building entrance of outside cables. These conduits are to originate at the property line and terminate in a manhole or hand-hole just outside the landscape area adjacent to the building. Also, there must be a minimum of three (3) – four-inch conduits placed which connect the manhole or hand-hole to the Telecommunication DMARC room. The placement of underground conduits, with respect to location on the property line and required redundancy, is to be coordinated with the SOM Department of Technology, Management and Budget, Telecommunications Division. Note: See the Technical Specifications in Appendix 2 of this document.

B. **Building Main Telecommunication Room (MTR)**

1. The Telecommunication System for a building requires a Main Telecommunication Room (MTR) for telephone (voice), data and video services. This room is to be located in the center of the building. When possible this placement will minimize the size and length of the vertical cable as well as the length of the horizontal information transportation system. For example: In a 9-story single-tenant office building, place the MTR on the fifth floor.
2. Considerations for off-loading and moving the equipment to the MTR and stacked Telecommunication Rooms (TRs) along with availability of elevators, passageways and loading docks should be kept in mind. These TRs are to be established using, the ANSI/EIA/TIA and BICSI standards, but should not be limited to them.

C. **Telecommunication Rooms (TR)**

Each floor, with the exception of the floor which contains the Main Telecommunication Equipment Room, shall have at least one TR.

1. The location of this TR is to be in the center of the building.
2. The TR will house, at a minimum, information outlet terminations, cable terminations for the riser system and at least one cabinet.
3. The number of TRs per floor is dependent on the maximum length of the station cable terminating in that TR. This length is not to exceed two hundred ninety (290) feet. This means that if the footprint of the building does not allow all areas of the floor being served by this TR to be served with cable equal to or less than two hundred ninety (290) feet, then an additional TR will be required. This distance requirement also holds true on the floor which contains the MTR.
4. The TRs shall be “stacked”, one above the other on adjacent floors.
5. TR voice terminations will be made on wall field.
6. Voice wall field will consist of 110A-type connecting blocks.

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7. TR data cables, CAT 5e and above, will terminate in equipment rack mounted patch panels that will support the applicable Category certified data rate.
8. Horizontal cable will be plenum and/or non-plenum depending on the application. The cable type must be as required in the applicable national electric code (NEC).
9. The TR wall field is to incorporate a cable management system.
10. The TR equipment racks are to be equipped with a cable management system.
11. Equipment racks mounted in the TRs are to be arranged with clearances as prescribed in BICSI standards.
12. CAT 3 voice jacks will be ivory in color.

D. **Backbone Pathways**

A pathway must be installed which will allow for the placement of continuous riser communication cables from the MTR to each of the TRs. When the TRs are stacked one above and/or below the other, sufficient sleeves or slots must be installed which will allow the passage of cables to serve that and other TRs. The TIA has a subcommittee, named TR-42.1, on Commercial Building Telecommunications Cabling. In July of 2012, TR-42.1 opened a Task Group to revise the TIA-862-A “Building Automation System (BAS) Cabling Standard,” which in turn was published in April of 2011. Close attention should be given to the new revision, which will be titled, “Intelligent Building Systems Cabling Standard” for planning required pathways.

E. **Horizontal Pathways**

Each floor of the building will be provided with a cable management system (CMS). The CMS may consist of cable trays, J-hooks and/or conduits, and it will allow the placement of voice, data and video cable from the serving TR to the work station. The CMS must be designed with no sharp edges which could damage the cable. Metallic cable trays and conduits must be bonded and grounded.

F. **Telecommunications Systems**

The SOM has standardized on the Systimax® family of products for its structured cable system (SCS) and this will be used throughout state buildings. The data portion of the Systimax® SCS will be certified to operate at the maximum bandwidth of the category classification of the cable and hardware. The voice portion will be certified to operate at EIA/TIA Category 3 levels. This cable system shall possess a minimum twenty year warranty. The warranty is to cover both labor and materials and is to be provided by the equipment manufacturer not the installing contractor. Systimax® test records must be provided to the SOM by CommScope.

G. **Horizontal Cable Systems**

The horizontal cabling system will adhere to, but not be limited to, the EIA/TIA and BICSI standards. The voice cable will be CAT 3 and the data cable will be CAT 5e or above. The cable will be run within the cable paths as described in the above section titled, “Horizontal Pathways.” All data cables will be certified to operate at the maximum bandwidth of the Category classification of the cable. All voice cabling will be certified to operate at CAT 3 or greater.

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Appendix #2 – Technical Specifications

A. Building Entrance Conduits

1. All conduits are to be 4” rigid steel.
2. If bends in total length of conduit from property line to hand-hole exceed one hundred eighty (180) degrees an access box is to be installed at the point where adding another bend would exceed the one hundred eighty (180) degree limit. This is to be done for each length on conduit where bends would exceed one hundred eighty (180) degrees.
3. All bends will be made with a sweeping radius. No sharp 90 degree bends are allowed.
4. Conduits within the building are to be reamed and have an insulated bushing on each end.
5. Hand-holes will be a minimum of three (3) feet by three (3) feet and eighteen (18) inches in depth.
6. Conduits are to be placed at least twenty four (24) inches below finished grade.
7. All conduits placed underground are to be painted with corrosion inhibitor paint.
8. All ends of the conduits are to be sealed thereby blocking the entrance of debris and water into the conduits.
9. Conduits entering building and going to the DMARC require a hand-hole within thirty feet of the entrance wall
10. Conduits placed from the outside hand-hole to the Telecommunication DMARC room shall be 4” diameter
11. If bends totaling more than one hundred eighty (180) degrees are required a junction box measuring at least three (3) feet by three (3) feet will be placed at each point where the addition of a bend would result in that length of conduit having total bends in excess of one hundred eighty (180) degrees.
12. Conduits within the building are to be bonded and grounded.

B. Main Telecommunication Room (MTR)

1. Size of Main Telecommunication Room (MTR) is to be twenty five (25) feet by twenty (20) feet unless otherwise negotiated with DTMB Telecommunications.
2. Walls are to be constructed of approved materials – masonry brick, drywall, cement block etc.
3. Glass in doors or walls will be security glass.
4. Door is to be three (3) feet wide and eighty (80) inches tall.
5. Door is to swing outward.
6. Door hinge pins must be non-removable or installed on the inside of the room.
7. Locking systems are to be high security pin-tumbler cylinder locks that meet the following requirements:
 - a. Key-operated mortised or rim-mounted dead bolt lock.
 - b. A dead bolt throw of one inch or longer.

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- c. Double cylinder design. Cylinders are to have five or more pin tumblers.
 - d. Convenience type locking devices, such as card key or sequenced button activated locks, used in conjunction with electrical strikes, are authorized for use on a limited basis.
8. Telephone equipment room shall be environmentally controlled seven (7) days a week, twenty four (24) hours a day.
 - a. Temperature range: 65F - 85F degrees.
 - b. Humidity range: 20 - 60 percent relative.
 - c. Heat dissipation: 750 – 10,000 BTUs per hour per cabinet.
9. Physical security. It is preferred that vents and louvers be protected by an Underwriter Laboratory (UL) approved electronic intrusion detection system that will annunciate at a protection console. UL approved central station, or local police station and given top priority for guard/police responses during any alarm situation.
10. It is assumed three (3) cabinets will be placed originally in a Telecommunication Room. Furthermore, it is recommended that vents be placed there as well.
11. Hazardous elements such as water, steam, gas pipes and explosive or corrosive atmosphere must be excluded from the Telecommunication Rooms.
12. The MTR shall be placed in line with the stacked Telecommunication Rooms (TRs) located on each of the other floors.
13. The MTR shall contain the Main Telephone Ground Bar.
14. The stacked TRs () shall each contain a telephone ground bar.
15. All telephone ground bars are to be two-hole configurations that accommodate two-hole ground lugs.
16. The telephone equipment room shall have three (3) emergency powered 20A 110V circuits distributed on duplex wall plugs. These circuits are for equipment operation.
17. A 110/208V 200A power panel connected to emergency power is required in the MTR.
18. The 200A power panel shall be equipped with transient voltage surge suppression (TVSS).
19. AC outlets being served by emergency power are to be orange in color.
20. Circuits required for equipment operation, MTR lighting and MTR environmental conditions are to be connected to the emergency power.
21. The MTR shall contain one 15A 110V circuit distributed on duplex wall plugs. This circuit is for test equipment and such.
22. One 15A duplex receptacle is to be located on each wall.
23. Gaseous fire suppression equipment is recommended for use in the MTR.
24. Two adjacent walls are to be covered with fire retardant plywood:
 - a. The wall containing the door is not one of the walls to be covered with plywood.
 - b. Plywood is to reach from 1.5 feet above floor to ceiling or eight (8) feet vertically whichever is less.
 - c. Plywood is to be clear grade.
 - d. Plywood is to be 3/4" in thickness.

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25. The MTR requires the A.C. (Alternating Current) electrical power to be dedicated branch circuits.
 - a. The MTR and TRs are to have floors finished to keep dust to a minimum.
 - b. Carpet is not to be used in the telecommunication equipment room.
 - c. Antistatic floor tile is required.
26. Local exchange carrier requirements are to be taken into consideration for MTR and stacked TR requirements
27. MTR and TR walls must be from floor to deck.
28. Ceiling height must be at least 8 1/2 feet.
29. Emergency lighting is required in the MTR.
30. The lighting when measured at floor level must have:
 - a. A uniform intensity of thirty (30) LM/Ft²
 - b. Light fixtures that are fused separately from those that provide service to the equipment or other electrical circuits in the equipment space.
31. There shall be 4" conduit sleeves placed between the stacked Telecommunication Rooms (Closets) for the purpose of providing a pathway for the riser cable system. The number of 4" sleeves will depend on the riser cable design. A minimum of two (2) sleeves are required. If more than one sleeve is required to accommodate the riser cable system, then an additional empty sleeve shall be installed. This means that upon completion of this telecommunication system installation, a vacant 4" sleeve between stacked Telecommunication Rooms will exist.
32. All metal conduits and/or metal sleeves are to be reamed and bushed on both ends.

C. Telecommunication Room (TR)

1. Size of TR is to be twelve feet by nine feet.
2. Door is to be three feet wide and eighty inches tall.
3. Walls are to be constructed of approved materials – masonry brick, drywall, cement block etc.
4. Glass in doors or walls will be security glass.
5. Door is to swing outward.
6. Door hinge pins must be non-removable or installed on the inside of the room.
7. Locking systems are to be high security pin-tumbler cylinder locks that meet the following requirements:
 - a. Key-operated mortised or rim-mounted dead bolt lock.
 - b. A dead bolt throw of one inch or longer.
 - c. Double cylinder design. Cylinders are to have five or more pin tumblers.
 - d. Convenience type locking devices such as card key or sequenced button activated locks, used in conjunction with electrical strikes, are authorized for use on a limited basis.
8. Two adjacent walls are to be covered with fire retardant plywood.
9. The wall containing the door is not one of the walls to be covered with plywood.
10. Plywood is to be placed 1.5 feet above the floor and extend vertically to ceiling or eight feet whichever is less.

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11. Plywood is to be clear grade.
12. Plywood is to be 3/4" in thickness.
13. There should be one 15A 110V circuit e/w duplex receptacle on each wall. The purposes of these outlets are for plugging in test gear, etc.
14. Two (2) 20A 110V circuits on emergency power are to be provided in the TRs. They shall be distributed on four (4) duplex outlets along the long wall that is covered with plywood.
15. AC outlets being served by emergency power are to be orange in color.
16. Electrical circuits serving the telecommunication equipment are to be connected to the emergency power source.
17. There shall be 4" conduit sleeves placed between the "stacked" TRs for the purpose of providing a pathway for the riser cable system. The number of 4" sleeves will depend on the riser cable design. At a minimum two (2) sleeves are required. If more than one sleeve is required to accommodate the riser cable system, then an additional empty sleeve shall be installed. This means that upon completion of this communication system installation, a vacant 4" sleeve between stacked TRs will exist.
18. All metal conduits and/or metal sleeves are to be reamed and bushed on both ends.
19. The floor is to be finished in a manner that will keep dust to a minimum.
20. Carpet is not to be used in the TRs.
21. Anti-Static floor covering is to be used in the TRs
22. There are to be no electrical cabinets, transformers, water pipes, steam pipes, etc. within the TRs
23. The TRs are to have a Telephone Ground Bar (TGB). This TGB is to meet ANSI/EIA/TIA standards.
24. All TGBs are to be a two-hole configuration that accommodates two-hole ground lugs.
25. The lighting when measured at floor level must have a uniform intensity of 30 LM/ft.
26. The TR shall be environmentally controlled seven (7) days a week, twenty four (24) hours a day.
27. Temperature range: 65F - 85F degrees
28. Humidity range: 20 - 60 percent relative
29. Heat dissipation: 750 - 10,000 BTUs per hour per cabinet.

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