

State of Michigan Technical Standard

1345.00.02 ENTERPRISE OPERATIONS CENTER – USER EXPERIENCE INFRASTRUCTURE FACILITY STANDARD

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(<https://www.michigan.gov/dtmb/-/media/Project/Websites/dtmb/Law-and-Policies/Admin-Guide/1300/POLICY-1345-Enterprise-Information-Technology-Infrastructure.pdf>)

Associated Procedures: n/a

Distribution: Statewide

PURPOSE

To establish a statewide facilities standard for Main Telecommunications Rooms and Telecommunications Rooms in newly built or significantly remodeled State owned DTMB managed facilities or State leased facilities within state of Michigan (SOM) government so that consistency is maintained and so that DTMB is in compliance with Public Act 431 of 1984, as amended.

CONTACT/OWNER

Department of Technology, Management and Budget (DTMB)
Office of the Chief Technology Officer (CTO)
Enterprise Operations Center – User Experience (EOC-UX)

SCOPE

Compliance with this standard is mandatory for Executive Branch Departments, agencies, and sub-units. Its provisions apply to all design, construction, and maintenance of SOM telecommunications rooms. 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 American National Standards Institute (ANSI) / Telecommunications Industry Association (TIA) and Building Industry Consulting Services International (BICSI) Standards. The detailed specification for network and telecommunications may override the ANSI/TIA and BICSI Standards in some areas due to changes in technology. In addition to the ANSI/TIA and BICSI Standards, all applicable building standards and codes must be incorporated. Appendix #1 and 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.

To allow for cost and resource limitations in bringing SOM facility infrastructure to complete compliance with this Standard, the following timeframes are established:

- New SOM-owned DTMB-managed facilities must comply with this standard as they are built or significantly remodeled, affecting the Main Telecommunications Rooms.
- New SOM-leased facilities must comply with this standard within four (4) years of DTMB assuming the lease.

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 SOM 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. It provides performance up to 100 Mhz. Cables can reach length of 100 meters.

CAT 5e

Enhanced Category 5 that supports 1000 Mb, i.e., gigabit speed.

CAT 6

Standard for cable used for Gigabit Ethernet, i.e., 1000-Base-T (GbE) and 10-Gigabit Ethernet (10 GbE). It is backward compatible with CAT 5/5e and CAT 3 standards. It provides performance up to 250 MHz and it has a maximum length of 100 Meters, though only 55M when used for 10GbE. It has more stringent specifications for preventing crosstalk.

CAT 6A

Augmented Category 6. This is characterized to 500 MHz and can run 10 Gigabit Ethernet for 100 meters.

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.

Crosstalk

A phenomenon by which a signal transmitted on one circuit or channel of a transmission system creates interference or an undesired effect in another circuit or channel.

DMARC

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.

LM/Ft2

Lumens per square foot – a standard for measuring brightness in foot candles.

MTR

Main Telecommunication Room – located near 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.

TGB

Telephone ground bar.

TIA

Telecommunications Industry Association – Accredited by ANSI to develop standards for information and communication technologies. Also, TIA’s website states that its “Engineering Committee TR-42 develops and maintains voluntary telecommunications standards for telecommunications cabling infrastructure in user-owned buildings, such as commercial buildings, residential buildings, homes, data centers, industrial buildings, etc.”

TR

Telecommunications Room.

REFERENCES

[Public Act 431 of 1984, as amended](#)

(<http://legislature.mi.gov/doc.aspx?mcl-Act-431-of-1984>)

[SOM 1305.00.02 Policy and Product Exception Process Standard](#)

(https://stateofmichigan.sharepoint.com/teams/insidedtmb/work/_policies/IT%20Policies/1305.00.02%20Technical%20Policy%20and%20Product%20Exception%20Standard.pdf)

APPROVING AUTHORITY

Michelle Lange, Acting Director

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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 (4) -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, Enterprise Operations Center – User Experience 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 near 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/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 the TR is to be centrally located in the area it is servicing, when possible.
2. The TR will house, at a minimum, information outlet terminations, cable terminations for the riser system and at least one cabinet and/or relay rack.
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. When possible, the TRs shall be “stacked”, one above the other on adjacent floors.
5. Voice wall field will consist of 110A-type connecting blocks.
6. TR data cables, CAT 5e and above, will terminate in equipment rack mounted patch panels that will support the applicable Category certified data rate.
7. 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).
8. The TR wall field is to incorporate a cable management system.
9. The TR equipment racks are to be equipped with a cable management system.
10. Equipment racks mounted in the TRs are to be arranged with clearances as prescribed in BICSI standards.

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.

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 workstation. The CMS must be designed with no sharp edges which could damage the cable. Metallic cable trays and conduits must be bonded and grounded. CMS type must be determined and approved by DTMB EOC-UX. CMS design must be approved by DTMB EOC-UX.

F. Telecommunications Systems

The SOM has standardized on a DTMB-EOC-UX-approved end-to-end structured cable system (SCS) throughout all State buildings and supported venues. The SCS must be certified to operate at the maximum bandwidth of the category classification of the cable and hardware. The SCS shall possess a minimum twenty five (25) -year warranty and shall comply with the EIA/TIA 568 Standard.

The warranty must cover both labor and materials and must be provided by the equipment manufacturer not the installing contractor. Test records must be provided to the SOM by the equipment manufacturer or its certified vendor.

G. Horizontal Cable Systems

The horizontal cabling system will adhere to, but not be limited to, the EIA/TIA 568 Standard and BICSI Standards. The data cable shall be rated CAT 5e or above. New building construction data cable shall be rated CAT 6 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.

APPENDIX #2 – TECHNICAL SPECIFICATIONS

A. Building Entrance Conduits

1. All conduits are to be four (4) inch rigid steel unless otherwise agreed upon.
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.
 - a. All bends will be made with a sweeping radius. No sharp ninety (90) - degree bends are allowed.
3. Conduits within the building are to be reamed and have an insulated bushing on each end.
4. Hand-holes will be a minimum of three (3) feet by three (3) feet and eighteen (18) inches in depth.
5. Conduits are to be placed at least twenty-four (24) inches below finished grade.
6. All conduits placed underground are to be painted with corrosion inhibitor paint.
7. All ends of the conduits are to be sealed thereby blocking the entrance of debris and water into the conduits.
8. Conduits entering building and going to the DMARC require a hand-hole within thirty feet of the entrance wall.
9. Conduits placed from the outside hand-hole to the Telecommunication DMARC room shall be four (4) inch diameter unless otherwise agreed upon.
10. 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.
11. Conduits within the building are to be bonded and grounded.

B. Main Telecommunication Room (MTR)

1. Size of Main Telecommunication Room (MTR) area measurements must be determined and approved by the DTMB Enterprise Operations Center – User Experience (EOC-UX).
2. Walls are to be constructed of approved materials – masonry brick, drywall, cement block, etc.

3. Door is to be at least three (3) feet wide and at least eighty (80) inches tall. Door is to swing outward unless prohibited by local codes.
4. Door security hinge pins must be non-removable when accessible from outside the room, or door security pins must be installed to prevent door opening if hinge pins are removed. Standard hinge pins can be used when installed on the inside of the room.
5. 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 (5) 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.
6. Telephone equipment room shall be environmentally controlled seven (7) days a week, twenty-four (24) hours a day.
 - a. Average room temperature – is not to exceed 85F degrees.
 - b. Humidity range: 20 - 60 percent relative.
 - c. Heat dissipation: 750 - 10,000 BTUs per hour per cabinet.
7. Hazardous elements such as water, steam, gas pipes and explosive or corrosive atmosphere must be excluded from the Telecommunication Rooms.
8. It is preferred that the MTR shall be placed in line with the stacked Telecommunication Rooms (TRs) located on each of the other floors.
9. The MTR shall contain the Main Telephone Ground Bar.
10. The stacked TRs shall each contain a telephone ground bar.
11. The Main Telephone Room shall have four (4) 20A 110V circuits distributed on quadplex wall plugs. These circuits are to be connected to emergency power when available. These circuits are for equipment operation.
12. The power panel feeding the MTR shall be equipped with transient voltage surge suppression (TVSS).
13. Alternating Current (AC) outlets being served by emergency power are to be orange in color.

14. Circuits required for equipment operation, MTR lighting and MTR environmental conditions are to be connected to the emergency power when available.
15. The MTR shall contain one 15A 110V circuit distributed on duplex wall plugs. This circuit is for test equipment and such.
16. One 15A duplex receptacle is to be located on each wall.
17. Gaseous fire suppression equipment is recommended for use in the MTR.
18. Typically, one wall is to have six (6) feet by four (4) feet of fire-retardant plywood placed on it. Plywood is to be placed thirty (30) inches above finished floor.
 - a. The wall containing the door is not one of the walls on which plywood can be placed.
 - b. Plywood is to be clear grade.
 - c. Plywood is to be 3/4inches in thickness.
19. The MTR requires the AC electrical power to be dedicated branch circuits.
20. The MTR are to have floors finished to keep dust to a minimum.
 - a. Carpet is not to be used in the telecommunication equipment room.
 - b. Antistatic floor tile or anti-static concrete sealer is required.
21. Food and drink are prohibited in the MTR.
22. The MTR shall be dedicated to communications use only and shall not be shared with departmental storage, janitorial staff, equipment, or other materials.
23. Hazardous or corrosive materials shall not be stored in the space.
24. Local exchange carrier requirements are to be taken into consideration for MTR requirements.
25. MTR walls must be from floor to deck.
26. Ceiling height must be at least 8 1/2 feet.
27. Emergency lighting is required in the MTR.
28. 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.

29. There shall be four (4) inch conduit sleeves placed between the Telecommunication Rooms (Closets) for the purpose of providing a pathway for the riser cable system. The number of four (4) inch 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 four (4) inch sleeve between Telecommunication Rooms will exist. Conduits and sleeves will be fire-stopped in accordance with the NFPA.
30. All metal conduits and/or metal sleeves are to be reamed and bushed on both ends.

C. Telecommunication Room (TR)

1. The size and number of TRs must be approved by DTMB Enterprise Operations Center – User Experience Division (EOC-UX). DTMB considers basic guidelines for typical Telecommunication rooms:

Floor Size (usable square feet)	Room Dimensions
Greater than 8,000 to 10,000	10' x 11'
Greater than 5,000 to 8,000	10' x 9'
Under 5,000 usable SF	6' x 8'

2. Door(s) are to be a minimum of three (3) feet wide and eighty (80) inches tall.
3. Walls are to be constructed of approved materials – masonry brick, drywall, cement block, etc.
4. Door is to swing outward when allowed by local building codes.
5. Door hinge security pins and/or security hinge pins must be non-removable when accessible from outside the room. Standard hinge pins can be used when installed on the inside of the room.
6. 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 (1) inch or longer.
 - c. Double cylinder design. Cylinders are to have five (5) 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.

7. Typically, one wall is to have six (6) feet by four (4) feet of fire-retardant plywood placed on it. Plywood is to be placed thirty (30) inches above finished floor.
 - a. The wall containing the door is not one of the walls on which plywood can be placed.
 - b. Plywood is to be clear grade.
 - c. Plywood is to be 3/4 inches in thickness.
8. 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.
9. Two (2) 20A 110V circuits are to be provided in the TRs. When possible, they will be connected to the emergency power source. They shall be distributed on quadplex outlets along the wall containing the plywood.
10. AC outlets being served by emergency power are to be orange in color.
11. Electrical circuits serving the telecommunication equipment are to be connected to the emergency power source, if available.
12. There shall be four (4) inch conduit sleeves placed between stacked TRs for the purpose of providing a pathway for the riser cable system. The number of four (4) inch 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 four (4) inch sleeve between stacked TRs will exist.
13. All metal conduits and/or metal sleeves are to be reamed and bushed on both ends.
14. The floor is to be finished in a manner that will keep dust to a minimum.
15. Carpet is not to be used in the TRs.
16. Anti-Static floor covering or anti-static concrete sealer is to be used in the TRs.
17. Food and drink are prohibited in the TRs.
18. TR's shall be dedicated to communications use only and shall not be shared with departmental storage, janitorial staff, equipment, or other materials.
19. Hazardous or corrosive materials shall not be stored in the space.
20. There are to be no electrical cabinets, transformers, water pipes, steam pipes, etc. within the TRs.

21. The TRs are to have a Telephone Ground Bar (TGB). This TGB is to meet ANSI/TIA Standards.
22. The lighting when measured at floor level must have a uniform intensity of 30 LM/ft.
23. The TR shall be environmentally controlled seven (7) days a week, twenty-four (24) hours a day.
24. Average room temperature– is not to exceed 85F degrees.
25. Humidity range: 20 - 60 percent relative.
26. Heat dissipation: 750 - 10,000 BTUs per hour per cabinet.