Telecommunications Room Master Plan

including Recommended Design, Product, and Implemenation Standards

October 1, 2022

Prepared by Archi-Technology LLC

Archi-Technology LLC
Technology Consultants

Connecting people, technology and buildings.

Telecommunications Room (TR) Master Plan

Introduction

Purpose
To ensure all the district's Telecommunications Rooms—the spaces that securely house IT telecommunications and other systems' equipment—are designed to the same industry best practices, system technology, and manufacturer-specific standards.

This section is also designed to provide preliminary Serving Zone (SZ) drawings for district use. Serving Zones are determined by building architecture, existing labeling, and cable IDs, and are designed to keep cabling within 300' of the TR for optimal performance. These SZ drawings will assist with the planning of future cabling projects.

Audiences
These Design Standards shall be used by the following involved parties in the design, procurement, or installation of Telecommunications Rooms and other IT-equipment spaces:
• Architectural/Engineering firms
• Design professionals
• System integrators/vendors
• District IT professionals to assist in troubleshooting and locating the origination and destination of cabling.
• Tradespeople

Sections and Subsections
Each section focusing on a technology infrastructure system includes the following subsections:
• **Overview** describing the major functional requirements of the system.
• **Product Standards** to use when purchasing products from vendors.
• **Implementation Standards** to use when designing, installing and deploying these systems.
• **Documentation Standards** to use for Design and As-Built documentation for these subsystems.

Contents

Applicable Industry Standards

• Americans with Disabilities Act
• ANSI/BICSI 005-2103 Electronic Safety and Security (ESS) System Design and Implementation Best Practices
• ANSI/TIA-568-C
• ANSI/TIA-569-C
• ANSI/TIA-606-B
• ANSI/TIA-607-D
• ANSI/TIA-758-B
• ANSI/NECA/BICSI 568
• ANSI/TIA-862-B Building Automations Systems
• ANSI/
• Building Code of New York State
• BICSI Telecommunications Distribution Methods Manual
• BICSI Customer-Owned Outside Plant Design Manual
• Federal Communications Commission
• Federal Occupational Safety and Health Administration
• Institute of Electrical and Electronics Engineers, Inc. (IEEE)
• Insulated Cable Engineers Association
• ISO/IEC 11801-International Organization for Standardization
• National Life Safety Code, NFPA 101
• National Electrical Code, NFPA 70 (NEC)
• NYS State Education Department (NYSED), Office of Facilities Planning - Manual of Planning Standards for school buildings
• New York State Department of Labor Rules and Regulations
• New York State Department of Health
• National Electrical Safety Code (NESC)
• National Fire Protection Association (NFPA)
• OSHA (Standards-29 CRF) Telecommunications –1910.268
• TIA/EIA-J-STD-037
• Underwriters Laboratory

Telecommunications Rooms (TRs) and Spaces

Overview

Telecommunications Rooms (TRs) contain Network, Voice, Access Control, Intrusion Detection, Video Surveillance and Public Address (PA) equipment and cabling. There are several types of these rooms which are described below along with their functions and requirements. The terms and definitions are specific to the District's IT Department. They also hold sensitive data on servers such as student data, surveillance video.

Telecommunications Room (TR)

These are rooms that contain equipment and cabling for systems such as Network, Voice, Public Address (PA), Access Control, Intrusion Detection, Video Surveillance, Life Safety, and CATV cabling and equipment. Each TR provides a connection point between the work area outlets and edge devices of each system and the network in a predetermined serving zone. Each building must have at at least one TR but most buildings have several. The number of TRs a building has depends on the several factors such as:

• Distance limitations of the Horizontal cabling

• Connected Device counts

• Building Construction

Because of their function TRs are specialized rooms that have unique requirements that need to be considered during the Design such as;

• Security

• Environmental control

• Power/ Emergency Power

• Telecommunications Grounding Backbone

TRs are grouped into two categories:

• Main Telecommunications Rooms (MTR) and;

• Intermediate Telecommunications Rooms (ITRs).

An MTR connects all ITRs via Intra-building backbone cabling and pathways. The MTR is also the location where the building Network equipment connects to the Inter-building Outside Plant Cabling (OSP) cabling of the District's CORE Networks.

Entrance Facilities (EF)

Entrance Facilities (EF) are communications spaces that provide a Transition Point between the Outside Plant cabling and the Service Provider cabling. EFs can be located within a TR but, due to code considerations with respect to OSP cabling, these are often separate spaces near the point where the OSP cabling enters the building. Entrance Facilities also provide a Demarc location between Outside Service Providers where the district can connect to the Services.

Server Rooms (SR)

Server Rooms (SR) are climate controlled spaces dedicated to the continuous operation of computer servers. These spaces shall have min 36" doors to allow for the installation and removal of large equipment.

Location: Shall not be located on the top floor or in basements. Avoid exterior walls with windows to maximize security. Ideally the room should be located in a centralized location within the building. The Server Room shall be accessible from a corridor and without having to use stairs of any type. Generally first levels are preferred locations.

Product Standards for TRs and Spaces

These general recommended standards and best practice will vary slightly between districts.

Racks

• **Size:** 19"w x 84"h

• **Type:** 4 post

• **Fittings**

  – Provide communications racks within each TR.

  – Racks must accommodate at least 33% growth after original design.

Cabinets

• **Size:** 19"w x 7'h x 28"d

Horizontal and Vertical Cable Management

• **Size:** 16"w x 7"h

• **Vertical Cable Management Fittings:** Provide a minimum of (2) vertical Front/ Rear cable management to each rack.

Overhead Cable Management - Ladder Racks

• **Size:** 12" – 18"w

• **Type:** Hollow bar, Telco-style construction with 9" spacing between rungs and black powder coated.

• **Fittings:** Hollow-bar, metal cable runway shall be provided around the room and over the communication racks. (Wire basket tray or any other cable tray is not permitted. See details for typical room configuration).

  – The cable runway shall be mounted 7'6" above the Communications Racks.

  – Provide a rack mount kit that connects to the cable runway to the Communications Racks.

  – Provide radius drop out kits where cables will drop into vertical management of the Communications Racks.

  – Runway must accommodate at least 33% growth after original design.

  – Runway must be supported by wall brackets, trapeze hangers and ⅜"-threaded rod and rack connection kits (provide threaded rod covers as required).

Power Distribution Units

• **Type:** 8-outlet, 20 Amp

• **Fittings:** Provide (2) power strips for each rack.

• **UPS:** Connect to UPS.

Implementation Standards for TRs and Spaces

TR Location

The TR **shall be:**
- Centrally located within the Serving Zone.
- Free of water or drain pipes not directly required in support of the equipment within the room.
- Located in an accessible area on each floor. Access to the TR should be directly from hallways or service corridors; not through classrooms, offices, or spaces not accessible by maintenance level keys.
- Vertically stacked between floors where possible. When staking TRs, make sure that the doors are also aligned to prevent conflicts with the riser pathways and cabling between floors.

The TR **shall not** be located:
- In any place that may be subject to water, steam, humidity, heat, and any other corrosive atmospheric or environmental substance.
- Near electrical power supply transformers, elevator or pump motors, generators, radio transmitters, induction heating devices, and any other potential sources of electromagnetic interference (EMI).
- Near sources of mechanical vibration that could be conveyed to the room through the building structure such as air handlers and exhaust fans.
- In a shared space or near electrical closets, boiler rooms, washrooms, janitorial closets and storage rooms.

TR Sizing
Recommended **minimum** IT Room sizes:
- **Entrance Facility:** 6'w x 4'd
- **Main Telecommunications Room (MTR):** 10'w x 12'd
- **Intermediate Telecommunications Room (ITR):** 9'w x 10'd

TR Layout
- In a TR dedicated to communications infrastructure, the communications rack(s) shall be installed adjacent to each other and parallel to the wall with the greatest length.
- A clearance of 6" should be maintained from the first rack to the wall, and a minimum of 3'. should be left at the anticipated end of the row of equipment racks. A 3' minimum clearance at the front and back of the equipment racks will allow space for wall mounted equipment and cable terminations.
- In larger buildings requiring additional rows of equipment racks, the racks shall be lined up in rows with 5' separation row-to-row, and 3' row-to-wall. The number of equipment racks required will determine the dimension.

TR Requirements

Major factors that must be considered when designing the ER/TR include:

Ceiling
- The minimum ceiling height must be 9'.
- Ceiling protrusions need to be removed to assure a minimum clear height of 8'6 inches to provide space over the equipment facilities for cables and suspended racks.
- For maximum flexibility, accessibility and airflow, drop ceilings shall not be installed.

Entrance Doors
- The door shall be a minimum of 36"w x 80"h. Door shall be fire rated for a minimum of one hour or more as required by local code requirements.
- Doors must open outward (code permitting).
- TR doors shall be equipped with Card Access.
- Provide double doors for shallow closet TRs.

Walls
- Interior finishes shall be in a light color (linen) to enhance room lighting.
- TRs shall be supplied with void-free, ¾-inch AC-grade plywood 8' in length. Quantity and layout will be based on cable support structure and routing pathways required in the space.
- The plywood must be securely fastened to the wall-framing members.
- Plywood shall be fire retardant or painted with fire retardant paint. Plywood will be mounted vertically starting at 6" above the finished floor.

Floors
- Floors must be anti static Vinyl Composition Tile (VCT) that has been bonded to minimize dust and static electricity that can damage electronics located in the room.
- Floor loading capacity in the TR shall be designed for a minimum distributed load rating of 50 lbf/ft².

Environmental Controls
- The recommended operating temperature should be set between 60°F to 80°F.
- The recommended humidity level should fall between 30% and 65%. Humidity should be a concern if it is anticipated that normal level within the TR would fall outside these parameters.
- Heating, ventilation, and air-conditioning sensors and dedicated control equipment related to the environment within the TR must be located in the TR.

Lighting
- Provide a min of 50 ft. candles measured 3' above finished floor.
- Suspended light fixtures should be mounted at 8'6" above the finished floor.
- Position the light fixture(s) above an aisle area, front and back only, and not directly over equipment racks or cabinets.
- Wall-mounted fixtures are permissible if lighting standards are met. Wall mounts should be placed in such a manner that they will not interfere with infrastructure pathways, protective equipment, and cables.
- Emergency lighting should ensure that the loss of power to normal lights will not hamper emergency exits from the telecommunication spaces.

TR Requirements (cont.)

Electrical
- All TRs shall have a minimum of (2) 20A dedicated power circuits per equipment rack.
- These power circuits shall be sourced from two different electrical risers and one shall be sourced from emergency power if available.
- TRs shall also have a minimum of two courtesy outlets mounted on two different walls with in the room.
- Check with IT Department for additional power requirements for UPS's

Bonding and Grounding
- Bonding and Grounding shall conform to ANSI/TIA-J-STD-607-B Generic Telecommunications Grounding and Bonding (Earthing) for Customer Premises, NEC Article 250 and hardware manufacturer's grounding requirements.
- The telecommunications grounding main busbar must be connected to the electrical system building ground electrode. All TRs must be provided with a Telecommunications Grounding Busbar (TGB) that is ANSI approved and UL listed.
- The IT bonding and grounding system shall be dedicated to the TRs within the building.

Documentation Standards

All Technology Infrastructure projects shall have the following components for Design and As-Built documentation.

Design Documentation
T-Drawings Technology drawings shall be identified as "T" series (Technology) drawings in the approved construction drawings, separated from "E" (Electrical) drawings. These T-series drawings shall include:
- Symbols and Legends: Use industry standard symbols with explanatory legends.
- Riser diagrams for communications cabling.
- System one-line drawings
- Serving Zone Boundaries Identified
- Plan view drawings showing outlets, cable pathways, sleeves, and conduits.
- Telecommunications Room layout/elevations
- Equipment rack layouts
- Installation Details to include, but not limited to:
  – Communications outlets
  – Teaching Stations
  – Cable trays
  – Grounding and bonding
  – Wireless Access Points
  – Camera locations
  – IP clocks and PA speaker locations.
  – Installation information
- Outside plant, cabling, methods and paths with footages and bends.

Documents MUST be provided to the District for review and approval before final design acceptance will be issued.

As-Built Drawings

Upon completion of each project, a complete As-built of the installed cable plant shall be provided by the contractor to the district's IT department. As-built documentation shall include the following:

Drawings
Including cable routing, termination location and labeling information
- CAD files of the As-builts
- PDFs of the As-builts
- Hard copies: (1) set of drawings printed at the same size as the Contract Construction drawings.

Cable schedules
Excel formatted minimally with individual columns labeled:
- TR
- Cable ID# (ex 1A-A-48)
- Room #

Cable Test results
- **Copper test results:** Organized by TR in electronic format
- **Fiber test results:** Organized by TR in electronic format

Documents MUST be provided to the District for review and approval before final acceptance will be issued and or the project closed out.

Leverage facilities data today for smarter buildings tomorrow.

Here are some fundamental ways that organizations can use facilities data to improve operations, reduce expenses, and streamline processes for district staff, contractors and vendors.

1. Verify data integrity as part of project closeout.

As-built drawings and documentation have tremendous value for future planning, troubleshooting, repairs, warranties, service contracts, Preventative Maintenance (PM), and component refresh cycles.

> *Ensure that closeout data is turned over in standard fields to allow use in facility management software.*

HSMS-ACP-001
Access Control

Make
Honeywell

Model
ACPXXE

Serial
ACP-XXE- 0798S56 097

### 2. Capture, monitor and maintain facility systems' asset data.

A centralized database of your district's Electronic Facility Records is critical to extending the usable lives of system components through regular documented PM procedures and optimized refresh cycles.

> *Have an onsite facility asset survey completed that captures data in standard fields that can be used by various software applications.*

3. Use facilities management software to improve operations.

Many software applications are available for Work Orders (including PM procedures), inventory, refresh cycle and capital planning, and other functions. They all rely on accurate data in standard fields.

> *Implement and maintain a facility management software system. Automate work flows where possible.*
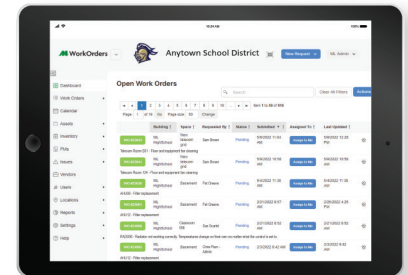
4. Make data and drawings secure and accessible.

Many organizations have plan rooms where construction drawings and as-built are underutilized. There are usually lots of large-format drawings with valuable information that must be accessed using time-intensive manual review.

> *Digitize your buildings and assets using software that provides secure access to staff and vendors.*

Find more information about Electronic Facility Records and asset record standard fields at **www.efrstandard.org**

Archi-Technology and its sister company MasterLibrary can provide BOCES-aidable services and software to upstate NY school districts looking to improve facility operations and extend systems' usable lives.

> Contact Kevin Zimmer at **315.796.8212** to discuss how Archi-Technology can help your district provide a safe, effective, and positive experience for students, teachers, staff, and community.

Archi-Technology
Technology Consultants LLC

Connecting people, technology and buildings.
Rochester NY 14692 ■ 585.424.1952 ■ Archi-Technology.com

A proud supporter of
NEXT-GEN FACILITY MANAGERS
See why at masterlibrary.com/ngfm

NEXT-GEN FACILITY MANAGER