SPS Network Infrastructure Design Standards

Version 1.0d

Prepared by SPS Network Services

1.0 Revision History

1.0d Feb 27, 2023 ☃️
- Added section about IP configuration in Section 8.0.2.

1.0c Jan 16, 2023 🥳
- Minor edits to section 5.0.2

1.0b Dec 1, 2022 🌨️
- Added additional information about network cable coloring.

1.0a Oct 31, 2022 🎃
- Added images of fiber LC connectors and UPC polish.

1.0 Aug 5, 2022
- Initial version.

2.0 Introduction

This document serves as a reference for SPS network design standards. These guidelines are written to ensure a safe, reliable, cost-effective and high-performance District network. For further clarifications, comments or questions, please contact SPS Network Services (SPS NS).

3.0 Contacts

- Pat Best, Network Services Supervisor, pat.best@springfield.k12.or.us, 541-726-3212
- Jake Shaw, Senior Network Engineer, jacob.shaw@springfield.k12.or.us, 541-726-3390
- SPS Facilities Dept, 541-744-6375

4.0 General Requirements

4.0.1 Codes, Standards and Regulations

On network infrastructure projects at Springfield Public Schools, comply with federal, state and local codes, rules, regulations and ordinances. In addition, adhere to any specifications supplied by the Springfield Public Schools Facilities and Operations department.

If this document presents a compliance conflict, promptly bring it to the attention of the SPS Network Services Supervisor in writing. Please include the specific provision in this document and state the rule, regulation, industry standard, code provision, manufacturer requirement or policy that is in conflict. Where these standards are more stringent than the requirements of other applicable authorities, these provisions will apply.

4.0.2 Labeling

- All labeling shall be mechanically labeled using a durable adhesive. No handwritten labeling unless otherwise specified by Network Services in writing.

4.0.3 Construction

- If construction is being performed that will result in dust and debris, notify Network Services prior to beginning work so that we can power down equipment and cover network racks to protect the equipment and fiber optic assemblies from dust and debris.

5.0 Network Cabling

5.0.1 Specifications

- Category 6 for standard network connections. A minimum of 3 connections per drop.
- Category 6A for Wireless Access Point (WAP) connections. A minimum of 2 connections per WAP drop.
- Preferred manufacturers: Panduit, CommScope
- Cabling shall be undamaged and installed in accordance with ANSI/TIA specifications, as well as all federal, state and local codes, rules, regulations and ordinances.
    - All horizontal cabling runs shall be solid core and terminate to a patch panel or jack**.** Solid core runs should not terminate to a connector!
    - All patch cables shall be stranded core and terminate to a 8P8C (also known as RJ-45) connector. Stranded core runs shall not terminate to a patch panel or jack!
- Cable paths shall be neat.
- Cable paths shall not block Rack Units (RU).

5.0.2 Testing and Certification Requirements

- All cabling shall be tested for proper installation in accordance with the ANSI TIA-568B specification.
- Test results shall be provided to Network Services in written or electronic form.
- All voice and data cabling shall be continuous from the nearest Network Facility to the telecommunications outlet. Splicing of cable is not allowed.

5.0.3 Labeling

- **No handwritten labels**! All labels shall be mechanically-labeled with a strong adhesive (eg. Brother TZe labels). No pens, no Sharpies.
- **All patch panels shall be mechanically labeled.** Patch panel labeling is in the format P# (eg. P1), where # begins at the top left rack and moves down and continues to rack on the right.
- **All jacks shall be labeled.** Jack labeling is the IDF letter, a hyphen, panel number, a hyphen, and then the patch panel port number (eg. A-P1-48).
- All above-ceiling jacks will be labeled on the jack as normal, as well as **on the ceiling near the above-ceiling jack location**.

- All horizontal runs will be labeled on each end of the cable run, no closer than 2 inches from the jacketed end and no farther than 6 inches from the jacketed end.

5.0.4 Cable Coloring

- Security camera network cabling shall be orange.
- All other network cabling shall be colored blue.

6.0 Fiber Optic

6.0.1 Specifications

- Single-mode fiber everywhere. Do not install multi-mode fiber without prior written approval from SPS Network Services.
- Fiber polish shall be UPC, with blue connectors, unless otherwise specified by SPS NS.

- Fiber connectors shall be LC UPC for new and existing construction, unless otherwise specified by SPS NS.

- All splicing should be fusion. No mechanical splicing.
- Minimum 12 strands for intra-building and intra-campus fiber.

- Preferred manufacturers: Corning, CommScope
- Cabling shall be undamaged and installed in accordance with ANSI/TIA specifications, as well as all federal, state and local codes, rules, regulations and ordinances.

6.0.2 Testing and Certification

- All cabling shall be tested for proper installation, strand ordering, continuity and attenuation. Test results shall be provided to Network Services in written or electronic form.

6.0.3 Labeling

- No handwritten labels! All labels shall be **mechanically-labeled** with a strong adhesive (eg. Brother TZe labels).
- **All patch panels shall be labeled.** Patch panel labeling is in the format P# (eg. P1), where # begins at the top left rack and moves down and continues to rack on the right.
- **All jacks shall be labeled.** Jack labeling is the IDF letter, a hyphen, panel number, a hyphen, and then the patch panel port number (eg. A-P1-48).
- All above-ceiling jacks will be labeled on the jack as normal, as well as on the ceiling near the above-ceiling jack location.
- All horizontal runs will be labeled on each end of the cable run, no closer than 2 inches from the jacketed end and no farther than 6 inches from the jacketed end.

7.0 MDF/IDF/Network Closets

7.0.1 Specifications

- Minimum size shall be 9 feet by 10 feet.
- Rooms shall be keyed with the District IDF key.
- Racks are typically a 2 post rack (CPI part number 66353-703), unless the IDF will contain server hardware, in which case we will spec a 4 post rack cabinet (CPI part number 15252-703).

7.0.2 Power

- All receptacles shall be mechanically-labeled with the breaker panel designation and the breaker numbers.
- A 120V convenience receptacle with 4 outlets on a dedicated circuit directly behind the rack location.
- A single 208V receptacle on a dedicated circuit directly behind the rack location.

7.0.3 Cooling

- Adequate cooling for the equipment to be installed. SPS NS can help estimate BTU loads. HVAC with a thermostat in the room, strongly preferred.

8.0 Network Configuration and IP Address Requests

8.0.1 Overview

Submit all network configuration and IP address requests to Network Services **at least 30 days before needed.** This gives NS adequate time for planning and completion.

8.0.2 IP Address and Subnet Requests

To request IP addresses or subnet allocations for equipment, submit an Excel document with all of the following information for each device requiring an IP address:

- Make
- Model
- Purpose (eg. “Video Recorder System”)
- Site
- Room or location
- Ethernet Address

All devices shall be configured for DHCP mode. No device IP address shall be configured manually, unless specifically authorized **in writing** by SPS Network Services. Unauthorized devices can and probably will be blocked from accessing the District network.

8.0.3 User Account and VPN Access Requests

To request a District user account or VPN access, submit your request with all of the following information:

- Entity making the request, along with their contact information
- The District sponsor or point of contact.
- Purpose of request (eg. “to monitor HVAC remotely”)

9.0 Wi-Fi

The following are typical guidelines. Please consult with Network Services on all wireless planning.

9.0.1 Specifications

- Our design criteria for coverage is a signal-to-noise ratio (**SNR**) of **20 dBm minimum** and a signal no less than **minus 65 dBm** at **5 GHz** measured at the extents of the target coverage areas. Design for capacity in high density areas such as classrooms, auditoriums, meeting rooms, study areas, and multipurpose areas.
- Generally, one wireless access point (WAP) per 50 seats.
    - One per classroom. *At least* two WAPs per library, computer lab or commons area.

    - Wall construction materials may affect WAP counts considerably.
- We standardize on Aruba wireless, although we have legacy Cisco wireless equipment deployed.

9.0.2 Installation

- WAPs shall be installed in a location reachable from a 10 foot ladder.
- WAPs shall be installed at least two feet away from any protruding metal objects.
- WAPs with internal antennas shall not be wall-mounted vertically unless otherwise designed by the manufacturer.
- WAPs in high play areas, such as gyms shall be installed in impact resistance and radio frequency (RF) transparent enclosures.

9.0.3 Budgeting

- A wireless site survey, wireless and supporting equipment and installation shall be budgeted into new campus or any major facility construction.

9.0.4 Antennas

- Dipole antennas shall be positioned perpendicular to the ground

10.0 Terminology: Acronyms, Abbreviations and Definitions

Intermediate Distribution Frame (IDF) is a supplemental telecommunications service room into the campus. IDFs are typically fed from the MDF. Also colloquially known as a “network closet”.

Main Distribution Frame (MDF, also known as IDF A and BICSI Entrance Room) is the main telecommunications service room into the campus. Also colloquially known as the “main network closet”.

Network Facility (NFs, also known as Telecommunications Rooms [TRs] or BICSI Equipment Rooms [ERs]) are environmentally controlled spaces and secured rooms housing telecommunication and network equipment such as data, voice and video components and their associated connectivity infrastructure. The types of Network Facilities are Main Distribution Frame, Building Distribution Frame, Intermediate Distribution Frame and Telecommunication Enclosure.

20.0 Future

This section should be disregarded. It includes items that may or may not appear in the standards.

- Add blurbs about special jack colors (eg. for HDMI over Ethernet)
    - Here is the UH guidelines as an example:

- **Red** General purpose, office and lab connection — other than Category 6A
- **Blue** General purpose, office and lab connection — Category 6A
- **Yellow** Wireless Access Point connection
- **Violet** Security camera, security device, lighting controller, door lock or Code Blue phone
- **Green** EMECS system connection
- **White** AV