

San Diego Unified School District
DISTRICT STANDARD DESIGN GUIDE
MAIN DISTRIBUTION FRAME SYSTEMS

D8022 MAIN DISTRIBUTION FRAME SYSTEMS

1.1 Goals and Objectives

- A. The objective of this design guide is to provide guidance for all new construction and whole site modernization of Main Distribution Frames (MDF).
- B. The objective of all the MDF installations is to provide a secure, controlled environment for a standard set of cabling, communications infrastructure, voice communications, network equipment, and uninterruptible power supplies (UPS).
- C. The environmental controls shall address physical security, rack space and enclosures, power conditioning and cooling.

1.2 Codes and Regulations

- A. TIA/EIA-569-C Communications Pathways and Spaces
- B. ANSI/TIA-607-B Communications Systems Grounding and Bonding
- C. ANSI/TIA-758-B Outside Plant Standard Entrance
- D. ASHRAE Class 3
- E. NFPA 70 Safe Work Practices

1.3 Related Design Guides and Specifications

*NOTE: Specifications highlighted in **YELLOW** in this document need to be updated by the architect, design team or consultant.*

- A. 260519 Low-Voltage Electrical Power Conductors and Cables Rev 8.1.11
- B. 262416 Panel Boards Rev 8.1.11
- C. 270526 Grounding and Bonding for Communication Systems Rev 8.1.11
- D. 271523 Communications Copper Horizontal Cabling Interior Rev 8.1.11
- E. 271300 Communications Optical Fiber Backbone Cabling Rev 8.1.11
- F. 271116 Communications Cabling, Racks, Frames and Enclosures Rev 8.1.11
- G. 272123 Data Communication Switches Rev 8.1.11
- H. 272133 Data Communication Wireless Access Points Interior Rev 8.1.11
- I. 281300 Access Control Rev 8.1.11
- J. 281600 Intrusion Detection Rev 8.1.11
- K. 282300 Video Surveillance Rev 8.1.11
- L. 283111 Digital Addressable Fire Alarm and Voice Evacuation System Rev 5.15.12
- M. D8021 Structured Cabling Systems

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- N. D8023 Wireless Local Area Network (WIFI) Systems
- O. D3020 Mechanical Systems Selection
- P. D3030 Mechanical Systems.

1.4 Summary

- A. The following guidelines are intended to provide guidance to the architect in the design and construction of site MDFs.
- B. The i21 Classroom initiative calls for new technology systems and significant increases in the number of mobile devices that will require the highest possible performance standards and provision for growth in all school communications systems.
- C. The MDF is based on the assumption that school and administrative buildings contain structured cabling plants, local-area-network (LAN) equipment, wide-area- network (WAN) equipment, wireless networking equipment (WIFI), Voice-over Internet-protocol (VoIP) equipment, and energy management systems.

1.5 Definitions

- A. LAN – Local Area Network – Each site shall have a 10Gbps LAN.
- B. WIFI – Wireless Fidelity –Each site shall have WIFI saturation.
- C. VoIP – Voice-over Internet Protocol – Each site shall have an IP Telephony system.
- D. MDF - Main Distribution Frame – Central dedicated facility for communications and other low-voltage distribution systems. Hosting facility for fiber-optic backbone panels, copper-horizontal cable panels (local building) and core and edge switches.
- E. IDF - Intermediate Distribution Frame – Distribution facility for communications and other low-voltage distribution systems downstream from the MDF. Hosting facility for fiber-optic backbone panels, copper-horizontal cable panels and edges switches.
- F. Prop O-type – Legacy MDF/IDF topology installation-type from Proposition O. These installations shall be modernized.

1.6 Design Assumptions

- A. Main Distribution Frame
 - 1. The MDF shall be a dedicated, secured and environmentally controlled room designed for low-voltage electronic systems. The MDF shall be located in proximity of the center of the buildings (campus) and be the central core (hub) of the LAN topology. The LAN fiber-optic backbone will emanate from the MDF providing direct pathways to each IDF.

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2. MDFs shall be designed to accommodate fiber- optic cable termination boxes, Category 6 patch panels; uninterruptible power supplies (UPS), data communications equipment as well as other associated or non- associated low voltage systems or components. The MDFs shall provide telecommunications racks and enclosures commensurate with the low voltage equipment requirements.
3. Existing Dedicated MDF
 - a. The design team may encounter a Prop O-type MDF backboard facility upgraded to the standard MDF package used in the Prop MM installations.
 - b. The design shall modernize the existing MDF facility to comply with the stated Codes and Regulations as defined.
 - c. The existing MDF may be a dedicated telecommunications room with the existing LAN/WAN equipment, as well as the other site electronic systems such as fire alarm, and voice PBX.
 - d. The design shall modernize the existing MDF facility to comply with the stated Codes and Regulations as defined.
4. No Existing MDF
 - a. In some Prop O-type sites, there is no MDF room.
 - b. The current fiber backbone termination point (MDF) and core switch equipment may be located on a wooden backboard, inside a swing-out enclosure, in a storage room location, or a separate non- dedicated room. This is a separate telecom backboard that is not in common with any other site low-voltage service.
 - c. These type of non-permanent and non-compliant systems shall be abandoned.
 - d. The design shall construct a new, dedicated MDF facility to comply with the stated Codes and Regulations as defined.

1.7 MDF Physical Characteristics

- A. Physical Security – The MDF facility shall be:
 1. Physically secured with a fire-rated and/or pressure-rated door
 2. Controlled and monitored by a card access system
 3. Alarmed and monitored by district video security system.
- B. Building Envelope - The MDF shall have the following characteristics:
 1. Space isolation for security and environmental control

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2. Standard building insulation between MDF and exterior walls
3. Vapor retardants to maintain proper relative humidity controlled by air conditioning unit(s)
4. Sealing of cable and pipe entrances.

C. Working Clearance Requirements

1. For MDF installations, a minimum of 36” of working clearance must be available to allow both front and rear enclosure doors a full range of motion with no obstruction due to doors, pathways, pipes, etc.
2. The design must assess adjacent or opposite-wall mounted equipment with enclosure doors working clearance. Temperature & Humidity

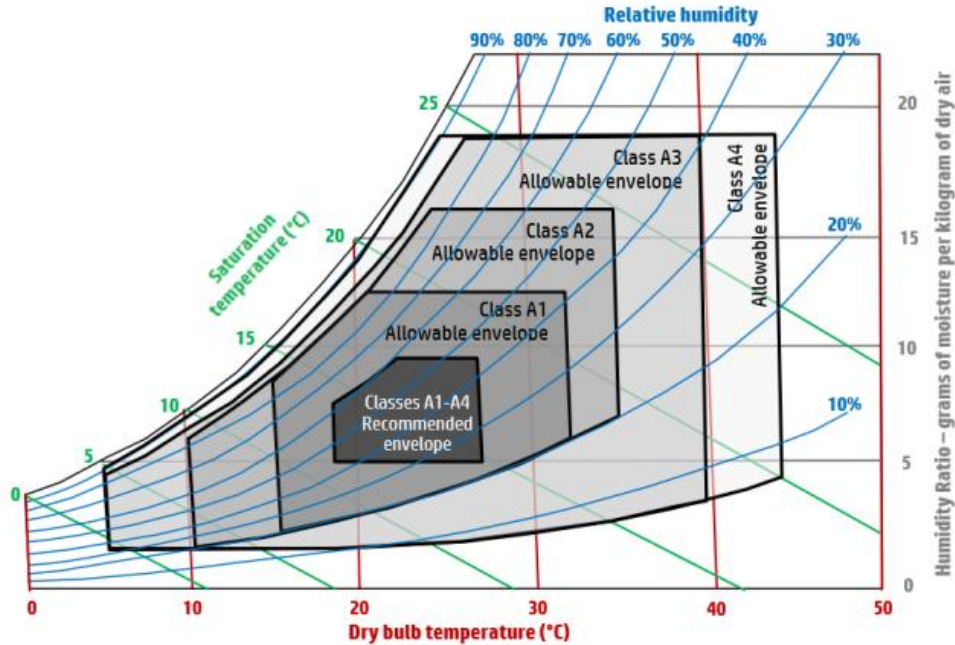
1.2 Environmental Control

The MDF environmental design assumptions are based on 2011 ASHRAE Class A3 Thermal Guidelines for Data Processing Environments, and Network Equipment-Building Systems (NEBS) classification standards.

Condition	Allowable Level	Recommended Level
Temperature Control Range	41°F - 104°F	76°F -
Maximum Temperature Rate of Change	2.9°F/min.	
Relative Humidity Control Range	5% - 85% 82°F Max Dew Point	Max 55%

The following table defines the NEBS environmental parameters required for SDUSD MDF's:

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Note: Envelopes define air entering IT equipment operating at sea level.

1.3 Filtration /Ventilation

- A. If the MDF is to be cooled via external air sources, outside air should be treated and preconditioned to remove dust, salts and corrosive gases before it is introduced into the MDF.
- B. Ventilation of air from outside the building is NOT required for the MDF. The MDF may utilize ducting to channel intake and exhaust air from and into the plenum.

1.4 Energy Management Control System (EMCS) Integration

The MDF shall be designed to provide alert status of various systems within the MDF to any existing energy management system. Statistics such as:

- 1. Space temperature near rack exhaust or output
- 2. Air supply temperature
- 3. Door and lock status
- 4. Power status

1.5 Racks, Cabinets & Enclosures

- A. Cabinets shall be selected and configured to provide adequate:
 - 1. Cooling (airflow) between cabling cable management, panels, shelves, and network equipment

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2. Vertical cable management facilities on the top and sides of the cabinets for entry into the cabinet system
3. Horizontal cable management to accommodate up to 100% growth without impairing airflow.

1.6 Entrance Room/Space

1. All fiber backbone and copper horizontal cabling shall enter the room via designated conduit, routed to and supported by overhead mounted ladder racks.
2. Ladder racks shall be secured to structural members using ¼” threaded rod according to manufacturer’s, as well as state and local, seismic requirements.

1.7 Power

A. Power Requirements:

1. The rack designated for the Core Switch shall have a 208V – 20amp, twist-lock receptacle installed on the bottom rack panel facing the rear of the rack.
2. The rack designated for the UPS (center rack) shall have a 208V – 30amp, twist-lock receptacle installed on the bottom rack panel facing the rear of the rack.
3. These circuits will be separate and dedicated to this purpose.
4. These circuits will not be shared with the air conditioning unit. The air conditioning unit shall be fed from the building power panel branch circuits.
5. Additionally, the MDF shall have installed.
 - a. One (1) quad 120V (20A) outlet on each wall.
 - b. One (1) quad 120V (20A) outlet at the cable tray level on each rack.
 - c. These circuits shall also be individual and separate from the above described dedicated circuits.

B. The architect shall provide power distribution, filtration, and continuity guidelines for commissioning of the Power Systems.

6. The power systems shall include power isolation, grounding, distribution or uninterruptible power supplies (UPS) in support of any data communications, telephony, or security systems.
7. Computers or servers shall not be included in the UPS commissioning. The integrator shall demonstrate power provision to all equipment according to technology infrastructure plan. The integrator shall demonstrate that UPS systems provide uninterrupted power in the case of power loss. The integrator shall connect and demonstrate operation of low-power status to district-based UPS monitoring and alarm systems.

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1.8 Uninterruptible Power System

The MDF shall be designed to provide a minimum of thirty (30) minutes of uninterrupted power for all voice and data network within the MDF solution. Other non-data-network systems (PBX, Fire Alarm) may have dedicated UPS solutions not integrated with the LAN systems.

1.9 MDF Air Conditioning

The MDF does not require dedicated Air Conditioning and may be part of the buildings HVAC controls as long as the room the MDF is located in is balanced with its own vents and returns.

1.10 Fire Detection

All Fire Detection systems shall comply with all state, and district fire detection, alarm, and monitoring standards. The contractor shall demonstrate and deliver documentation supporting the commissioning of the Fire Detection system. The contractor shall demonstrate integration with and district-based alarm and monitoring systems.

1.11 Fire Suppression

All Fire Suppression systems shall comply with all state, and district fire suppression standards. The contractor shall demonstrate and deliver documentation supporting the commissioning of the Fire Suppression system. The contractor shall demonstrate integration with and district-based alarm and monitoring system.

2.1 Exceptions

E-Rate FY2015 projects do not include expansion, construction or upgrades of MDF facilities throughout the District. Existing MDF facilities will be retained and utilized. If the architect determines that a new MDF is required, such determination is subject to review by District staff. The rack designated for the 5Kva UPS shall have a 208V – 30amp, twist-lock receptacle.