

APPENDIX SECTIONS

Appendix A: Structured Cabling Infrastructure Standards

Appendix B: Energy & Sustainability Design Guidelines

Appendix C: Facility Room Numbering Standards

Appendix D: Request for Clarification & Deviation Form



APPENDIX A

IT CABLING STANDARDS

TABLE OF CONTENTS

PART 1. DOCUMENT PURPOSE

- 1.01-1.08 Structured Cabling Infrastructure Standard Guideline for Structured Cabling Infrastructure

PART 2. DOCUMENT HISTORY

- 2.02 Standards created by Technology and Facilities Planning Departments

PART 3. INDUSTRY STANDARDS

- 3.01 Standard Codes and Best Practices

PART 4. CONTRACTOR QUALIFICATIONS

- 4.01 Hubbell Mission Critical Certified Installer (MCCI)

PART 5. WARRANTY ON PARTS AND LABOR

- 5.01 Hubbell (MCCI) Mission Critical 25-year warranty in writing

PART 6. NOMENCLATURE

- 6.01 Main Distribution Frame (MDF)
- 6.02 Intermediate Distribution Frame (IDF)

PART 7. DISTRICT INFRASTRUCTURE STANDARDS

- 7.01 Telecommunications Spaces
 - A. Main Distribution Frame (MDF)
 - B. Intermediate Distribution Frame (IDF)
- 7.02 Entrance Pathways and Conduits
 - A. Design Principles
 - B. Service Provider Conduits
 - C. Campus Serving Conduits
 - D. Portable Serving Conduits
 - E. Building Entrance for Large Campus
- 7.03 Cable Management in Telecommunications Spaces
 - A. Equipment Cabinets/4 Post Racks
 - B. Overhead Cable Management

- 7.04 Cable Support in Pathways
 - A. Main Cable Pathway
 - B. Sleeves in Penetrations
 - C. Workstation Rough-Ins and local power (Typ.)

- 7.05 Backbone Cabling
 - A. Service Provider Demarc
 - B. Inter-building Backbone Cabling (Campus)
 - C. Intra-building Backbone Cabling

- 7.06 Horizontal Cabling
 - A. Workstation Cable
 - B. Workstation Configurations
 - C. Wall Mounted Digital Display
 - D. Wireless Access Point Outlet
 - E. IP Camera Outlet
 - F. Time Clocks
 - G. HVAC
 - H. Access Control
 - I. PA System Head End Unit
 - J. Minimum Standard Installation

- 7.07 Grounding
- 7.08 Labeling
 - A. Type
 - B. Fiber
 - C. Copper Backbone
 - D. Horizontal
 - E. Faceplates

- 7.09 Testing
- 7.10 As-Build Documentation

PART 8. ACCEPTABLE MANUFACTURERS / PRODUCTS

- 8.01 General
- 8.02 Fiber Optic Cable
- 8.03 Fiber Optic Innerduct
- 8.04 Fiber Optic Terminations
- 8.05 High Pair Count Copper Cable
- 8.06 Horizontal Category 6A 4-Pair Cable

- 8.07 Category 6A Copper Patch Cord
- 8.08 Copper Terminations
- 8.09 Equipment Cabinets
- 8.10 Cable Support
- 8.11 Plywood
- 8.12 Paint
- 8.13 Firestop
- 8.14 Ground Bus Bars
- 8.15 Cable Ties
- 8.16 Labeling
- 8.17 Electrical Pedestal
- 8.18 Hubbell Metal Raceway
- 8.19 Wireless AP Mount above 12 feet
- 8.20 Wireless AP Mount for Gymnasium
- 8.21 Wireless Surface Mount Box

PART 9. SUMMARY OF STANDARDS

- 9.01 Summary

PART 10. REFERENCE ITEMS

PART 1. DOCUMENT PURPOSE

1.01 The San Antonio Independent School District Structured Cabling Infrastructure Standard is a guideline for structured cabling infrastructure and the associated spaces to be applied by the design team for new or renovated facilities. Information herein is applicable to the IT consultant, Architect, MEP, and contractors and shall be considered for each project by all team members.

A. The standard sets forth parameters for the technical system in addition to the site and building requirements to facilitate a properly installed, standards compliant structured cable system organized as follows.

- a. Telecommunications spaces; Architectural, HVAC, Power, Entrance Pathways and Conduits.
- b. System Requirements; Cable Management in Telecommunications Spaces, Cable Support in Pathways, Backbone Cabling, Horizontal Cabling, Grounding, Labeling, Testing, and As-Built Documentation.
- c. Telecommunications Diagrams

1.02 The standard addresses infrastructure for typical academic campus buildings and is not intended for the design of data centers or specialty facilities, of which should be considered on a case-by-case basis.

1.03 Designers shall not deviate from this standard without explicit written approval from the owner.

1.04 Any deviations shall immediately be brought to the attention of the owner's representative in writing for resolution.

1.05 Where specific product brands are mentioned, an equal equivalent will be considered following an official submission of product literature and written acceptance by the San Antonio Independent School District Office of Networking and Communications.

1.06 Where means, methods and best practices is mentioned, contractor shall follow the manufacturers and owner's requirements, industry standards or code, whichever is most stringent.

1.07 Basic contractor qualifications are set forth but may be made more stringent as applicable to each project based upon size and scope.

1.08 This document is for structured cabling infrastructure for new facilities and renovations only and does not include any network hardware or installation/configuration services associated with such hardware.

PART 2. DOCUMENT HISTORY

2.01 This document supersedes all previous standards, which has been fully reevaluated and described herein by the San Antonio Independent School District Office of Networking and Communications and Facilities and Construction Management Department.

2.02 The contents of this standard were derived by the assembly and input from the San Antonio Independent School District's Office of Networking and Communications along with Facilities and Construction Management.

PART 3. INDUSTRY STANDARDS

3.01 The following industry standards shall be adhered to unless specifically directed, otherwise by San Antonio Independent School District. The list is not all-inclusive and does not alleviate compliance with the latest applicable standards, codes, and best practices:

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. Alliance for Telecommunications Industry Solutions (ATIS)
- D. Electronics Industry Alliance (EIA)
- E. Federal Communications Commission (FCC)
 - a. FCC Part 15, Radiated Emissions Limits, revised 1998
 - b. FCC Part 68, Connection of Terminal Equipment to the Telephone Network, revised 1998
 - c. FCC Part 76, Cable Television Service, revised 1998
- F. International Electrotechnical Commission (IEC)
- G. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
 - a. IEEE Standard 81-1983, IEEE Guide for Measuring Earth Resistance, Ground Impedance, and Earth Surface Potential of a Ground System
 - b. IEEE Standard 1100-1999, Recommended for practice for Powering and Grounding Sensitive
 - c. Electronic Equipment in Industrial and Commercial Power Systems (IEEE Emerald Book)
 - d. International Organization for Standardization (ISO)
 - e. International Organization of Standardization/International Electrotechnical Commission (ISO/IEC)
 - f. ISO/IEC 11801, Information Technology-Generic Cabling for Customer Premises, 1995
 - g. ISO/IEC 14763-1, Information Technology-Implementation and Operation of Customer
 - h. Premises Cabling-Administration, 1999

- i. National Cable Television Association (NCTA)
- j. National Electrical Code (NEC)
- k. National Electrical Manufacturers Association (NEMA)
- l. National Fire Protection Association (NFPA)
 - i. NFPA-70, National Electrical Code
 - ii. NFPA-75, Protection of Electronic Computer Data Processing Equipment
 - iii. NFPA-101, Life Safety Code
 - iv. NFPA-297, Guide on Principles and Practices for Telecommunications Systems
 - v. NFPA-780, Standard for the Installation of Lightning Protection Systems
- m. National Institute Standards and Technology (NIST)
- n. Occupational Safety and Health Administration (OSHA)
- o. Rural Utility Services (RUS)
- p. Telecommunications Industry Association (TIA)
 - i. ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises, 2009
 - ii. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard, 2009
 - iii. ANSI/TIA -568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, 2009
 - iv. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, 2008
 - v. ANSI/TIA/EIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces, 2005
 - vi. ANSI/TIA-569-B Amendment 1, Commercial Building Standard for Telecommunications Pathways and Spaces, 2009
 - vii. ANSI/TIA-606 -A, Administration Standard for Commercial Telecommunications Infrastructure, 2007
 - viii. ANSI-J-STD-607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications, 2002.
 - ix. ANSI/TIA-758, Customer-Owned Outside Plant Telecommunications Infrastructure Standard, 2004
- q. Underwriters Laboratories, Inc. (UL)

PART 4. CONTRACTOR QUALIFICATIONS

- 4.01 The Contractor shall be a Hubbell Mission Critical Certified Installer (MCCI) prior to submitting a proposal for work
- A. The Contractor shall possess all relevant manufacturer certifications for the company and all installers prior to submitting a proposal for work. Contractor shall provide a list of their installers with their work experience, training history, and manufacturer’s certifications for the company and installers

- B. Installers must be certified, trained, and experienced on the specific installation, termination and testing of the systems as specified
- C. The Communications Contractor's Project Manager/Superintendent shall be a Registered Communications Distribution Designer (RCDD)
- D. The Contractor shall certify, and the manufacturer of the solution shall warranty the solution for a period of no less than twenty-five (25) years
- E. The Contractor shall be an established business with local support within 60 miles of San Antonio, TX and shall have been in business for a minimum of five (5) years
- F. The Contractor shall have prior experience with projects of a similar size and scope. The contractor shall provide a minimum of (5) installed systems comparable to the Owner's installation, where the systems have been in continuous satisfactory operation for at least one (1) year. The Contractor shall provide the following information for each reference: Project Name, Project Location, Project Start Date, Project Completion Date, Project Start Cost, Project Completion Cost, Brief Description of Project, Client Point of Contact Name and Phone Number
- G. Past performance with the Owner is a selection criterion. Experience related to any past or present project with the Owner shall be disclosed with bid response
- H. Qualified Contractors should submit proof of all certifications and experience detail with bid response and product submittals

PART 5. WARRANTY ON PARTS AND LABOR

- 5.01 The contractor shall furnish a Hubbell (MCCI) Mission Critical 25-year warranty in writing
- 5.02 Defects in material or workmanship appearing within this period, shall be promptly repaired without cost to the District
- 5.03 All labor shall carry a minimum warranty period of one (1) year from the date of final system acceptance

PART 6. NOMENCLATURE

- 6.01 Main Distribution Frame (MDF) – An environmentally controlled centralized architectural space for telecommunications equipment that usually serves as the demarcation point for service providers and houses the backbone terminations for cross connection and distribution to Intermediate Distribution Frames.
- 6.02 Intermediate Distribution Frame (IDF) – An environmentally controlled enclosed architectural space for housing telecommunications equipment and houses backbone terminations for cross connection and distribution to the MDF and end user workstations.

PART 7. DISTRICT INFRASTRUCTURE STANDARDS

7.1 Telecommunications Spaces

A. Main Distribution Frame (MDF)

a. Description

- i. The MDF is a telecommunications space that serves a building or multi building facility or campus. There is only one (1) on each campus
- ii. The MDF houses the entrance conduits, terminations, and cross connections for all incoming inter-building backbone cabling from the IDF's in other buildings on the campus and the intra-building backbone cabling from the IDF's in the building in which it resides and cross connects to user workstations
- iii. Wall and floor space shall be reserved for service provider demarcation equipment and incoming infrastructure terminations
- iv. Campus distribution network equipment, servers and other centralized telecommunications related equipment will reside in the MDF; the MDF is not intended to support academic servers, which will reside in a separate space
- v. The MDF may share space with other systems such as security panels, fire alarm panels, paging systems, CCTV and building control panels. Space allocation for other systems shall be coordinated with the applicable disciplines
- vi. The MDF shall not be used for storage, serve as a mechanical or electrical distribution space, nor shall it have, within its space, main electrical feeds, electrical switchgear, transformers and water or sprinkler main lines
- vii. The layout of cabinets and/or four post racks, wall fields, and cable management shall be as indicated on the attached diagrams

b. Architectural Requirements

- i. The MDF shall be a minimum of 150 square feet with minimum clear lineal walls of at least 10 feet by 15 feet; all walls shall go to deck. When walls are drywall, they shall be double-layered drywall on both sides to help reduce the risk of unauthorized entry
- ii. The MDF Room shall be in the Administration area
- iii. The floor finish shall be sealed bare concrete or VCT
- iv. The MDF shall not contain windows
- v. The MDF shall not be located adjacent to or below restrooms or other water-based facilities, or sources of EMI and mechanical vibration

- vi. A minimum of one (1) non-door wall shall be covered with AC Grade 3/4" Fire Retardant Plywood aligned vertically starting at 12 inches above the finished floor. The plywood shall be painted with two (2) coats of fire-retardant paint
 - vii. It is recommended that no ceiling be installed except in instances where it is required. Cables or devices penetrating the ceiling tiles shall not pass through a bare ceiling tile but shall be routed through adequately sized sleeves with bushings. The ceiling shall be a minimum of 24 inches above the highest cabinet or the cable runway, 36 inches is recommended
 - viii. Entry to the space shall be through a minimum of 36-inch by 80-inch door opening that swings outward. Door shall be solid core or steel. The door shall securely lock, and access shall only be by San Antonio Independent School District approved personnel. The door shall open to an interior hallway or space; it is not recommended that the door open to the exterior of the building
 - ix. The entrance to the MDF and IDF shall be equipped with a proximity card reader and electrified door hardware
 - x. Fire suppression for the MDF shall be determined by the specific code requirements for the fire protection scheme of the overall building
- c. HVAC Requirements
- i. The MDF shall be serviced by a dedicated, standalone unit that is part of the building's main system. The unit shall maintain a constant 24/7 cooled environment of 72 degrees Fahrenheit with relative humidity of 40% - 55%. Minisplit is not acceptable.
 - ii. Changes in temperature and humidity shall be kept to around 1 percent
 - iii. The minimum HVAC load shall be designed to displace 12KW of power or 3.5 Tons, and shall be coordinated with the San Antonio Independent School District Office of Facilities Maintenance and designed to load if the known load is greater at the time of design
 - iv. HVAC sensors and controls shall be in the MDF at 4 feet AFF
 - v. HVAC systems shall be alarmed for high temperature
- d. Lighting Requirements
- i. LED light fixtures shall be at least 24 inches above the top of the highest cabinet or cable runway, 36 inches is recommended
 - ii. Lighting shall be a minimum of 50-foot candles at 2 feet above the floor in the entire space

e. Power Requirements

i. Power shall be in two categories: dedicated and convenience.

1. Dedicated

- a. The MDF shall be equipped with NEMA L14-30P 208/240V 60Hz input (4 wire split phase); L6-30, L6-20 (208/240V) & 5-15/20 (120V) outlets; L5-20P (10 amp/120V) outlet(s). (*Unless otherwise specified by the District Network and Communications representative)
 - Configuration of outlets may differ between types of campuses, such as:
- b. The originating electrical panel will be equipped with 20-AMP and 30-AMP breakers and shall be located inside the MDF
- c. High Schools require at least one 50-AMP Circuit
- d. Conductors shall be routed from the panel in conduit along the cable runway to a metallic back box clipped to the rail of the cable runway facing the rear of the racks
- e. An existing MDF shall have an existing UPS solution capable of supporting the main network connection to the campus (ex. Cisco 9500), 911 router, and at least one copper switch servicing the front office phones and computer network. A newly constructed or renovated MDF shall have a newly purchased UPS solution capable of supporting the main network connection to the campus (ex. Cisco 9500), 911 router, and at least one copper switch servicing the front office phones and computer network.
- f. Additional power circuits to be allocated to security, fire alarm, building controls, and service provider equipment shall be considered and coordinated at the time of building design

2. Convenience

- a. A minimum of (1) duplex receptacle shall be placed in each non dedicated receptacle wall and be flush mounted to the finished wall surface at 18 inches above finished floor

3. Outlets should be positioned overhead of the cabinet, unless otherwise specified by the District Office of Network

and Communications representative, as depicted in the illustration below

- a. Outlets should be rear facing and within a (one) foot height from the top of the cabinet or four post rack



- f. Cabinets and Cable Management Requirements
 - i. The MDF shall be equipped with a one (1) four post rack with cable management with a four foot all around clearance.
 - ii. The MDF shall be equipped with cable runway encircling the room at 84 – 86 inches above the finished floor and crossing the room above the cabinets (1) time
 - iii. Cable runway and electrical shall not be secured to the top of the equipment cabinets
 - iv. A vertical section of cable runway shall be attached to the wallboard to manage backbone and service provider cables as they transition from the entrance conduits to the overhead cable runway
- g. During Construction or Renovation Requirements
 - i. During construction or renovations in or around the MDF, the MDF technology functions must be temporarily relocated to a space outside the construction/renovation zone until significant work has been completed
 - ii. Enough power should be made available to run the full complement of devices contained within the cabinet or four post rack

B. Intermediate Distribution Frame (IDF)

a. Description

- i. An IDF is a communications space that resides in each building that requires more than a single telecommunications space from which to terminate horizontal workstation cables. There may be multiple IDF's in each building as required to maintain horizontal cable distances of 275 feet for the permanent link.
- ii. An IDF for a building where the MDF is located houses the terminations and cross connection for all incoming intra building cabling from the MDF of the building in which it resides
- iii. An IDF houses the terminations and cross connections for the intra building cabling from the MDF and the horizontal user workstation cabling in the building that it serves
- iv. The IDF may share space with other systems such as security panels, , and paging system cabling. Space allocation for other systems shall be coordinated with the applicable disciplines.
- v. The IDF shall not be used for storage, serve as a mechanical or electrical distribution space, nor shall it have within its space main electrical feeds, electrical switchgear, transformers, water or main sprinkler lines
- vi. The layout of cabinets, wall fields, and cable management shall be as indicated on the attached diagrams

b. Architectural Requirements

- i. The IDF shall be a minimum of 100 square feet with minimum clear lineal wall lengths of at least 10 feet by 10 feet, all walls shall go to deck. When walls are drywall, they shall be double layered on both sides to help reduce the risk of unauthorized entry.
- ii. Floor finish shall be bare sealed concrete or VCT
- iii. The IDF shall not contain windows
- iv. IDF's shall not be located next to or below restrooms or other water-based facilities or sources of EMI and mechanical vibration
- v. A minimum of one (1) wall of the IDF shall be covered with AC Grade 3/4" Fire Retardant Plywood, aligned vertically starting at 12 inches above the finished floor. The plywood shall be painted with two (2) coats of fire-retardant paint. The plywood-covered wall must not be the door wall.
- vi. The room shall be with a lift out tile ceiling when required. Cables or devices penetrating the ceiling tiles shall not pass through a bare ceiling tile but shall be routed through adequately sized bushings. The ceiling shall be a minimum of 24 inches above the

highest cabinet or cable runway, thirty- six (36) inches is recommended. Entry to the space shall be through a minimum 36- inch by 80-inch clear door opening that swings outward. Door shall be solid core or steel. The door shall securely lock, and access shall only be by San Antonio Independent School District approved personnel.

vii. The entrance to the IDF shall be equipped with a proximity card reader and electrified door hardware.

c. HVAC Requirements

i. The IDF shall be serviced by a dedicated, standalone system deemed satisfactory by a MEP consultant. The room shall maintain a constant 24/7 cooled environment between 72 degrees Fahrenheit with relative humidity of 40% - 55%.

ii. The minimum HVAC load shall be designed to displace 4KW of power, or 1 Ton and shall be coordinated with San Antonio Independent School District Office of Facilities Maintenance and designed to load if the load is greater and known at the time of design

d. Lighting Requirements

i. LED light fixtures shall be at least 24 inches above the top of the highest cabinet or cable runway, 36 inches is recommended

ii. Lighting shall be a minimum of 50-foot candles at 2 feet above the floor in the entire space

e. Power Requirements

i. Power for the IDF shall be in two categories: dedicated and convenience.

1. Dedicated

a. The IDF shall be equipped with a minimum of two (2) dedicated receptacles and shall be coordinated with the San Antonio Independent School District Office of Networking and Communications and designed to load if the known load is greater at the time of design. The originating electrical panel will be equipped with 20 AMP breakers.

b. Additional power circuits to be allocated to security, fire alarm, CCTV and building controls shall be considered and coordinated at the time of design

2. Convenience

a. A minimum of (1) duplex receptacle shall be placed in each non dedicated receptacle wall and be flush mounted to the finished wall surface at 18 inches above finished floor.

3. Power Outlet Positioning for Wall Mounted Cabinets

- a. One electrical duplex shall be mounted above or equal to the cabinet top corner

f. Cabinets and Cable Management Requirements

- i. The IDF shall be equipped with a minimum one (1) equipment cabinet or four post rack with cable management with a four foot all around clearance.
- ii. The IDF shall be equipped with cable runway encircling the room at 84 – 86 inches above the finished floor and crossing the room above the cabinets one (1) time for full sized cabinets only
- iii. Cable runway and electrical shall not attach to the top of the equipment cabinets
- iv. A vertical section of cable runway shall be attached to the wallboard to manage backbone and service provider cables as they transition from the entrance conduits to the overhead cable runway

g. During Construction or Renovation Requirements

- i. During construction or renovations in or around an IDF, the IDF technology functions must be temporarily relocated to a space outside the construction/renovation zone until significant work has been completed or completely disassembled, inventoried, either stored by contractor or returned to SAISD, then either returned to production after construction is complete, replaced or decommissioned per the Office of Network and Communications
- ii. Enough power should be made available to run the full complement of devices contained within the cabinet or four post rack
- iii. Fiber connections should be extended to the temporary location to provide full functionality of services

7.2 Entrance Pathways and Conduits

A. Design Principal

- a. Pathways and conduits are described herein regarding capacity, function, and basic design principles and shall be designed by the MEP in accordance with NEC and EIA/TIA-758, Customer Owned Outside Plant Telecommunications Cabling.
- b. Telecommunications Conduit Systems shall:
 - i. Be Schedule 40 when placed underground
 - ii. Contain no more than the equivalent of two (2), sweeping 90-degree bends between pull boxes
 - iii. Maintain a minimum bend radius of 10 times the diameter of the conduit
 - iv. not exceed 40 percent fill ratio

- v. Be placed at a minimum depth of 36 inches from the top of the conduit to the finished grade with 3-inches of sand above and below the buried conduit and a metallic tracer warning tape 3-inches below grade throughout the entire pathway
- vi. Be interrupted by an adequately sized pull box at least every 100 feet for sections containing up to one (1) sweeping 90-degree bend and at least every 350 feet for sections with the equivalent of two (2) sweeping 90-degree bends
- vii. Pull boxes shall be of adequate depth for conduits to enter from the side of the pull box and not be required to sweep up into the box
- viii. Stub up into the MDF and/or IDF at 4-inches above the finished floor
- ix. Contain a pulling tape, be fitted with bushings, and sealed appropriately at both ends

B. Service Provider Conduits

- a. Minimum of (2) 4-inch conduits shall route underground from the MDF to the edge of the property right of way and terminate as required by the service provider(s).
- b. High school sites shall have 2 additional 4-inch conduits shall be added per high school, utilizing a different pathway as the conduits installed under section (a) above. Must include separate pull boxes. Manholes and pull boxes shall be utilized as required for a tele-communications compliant conduit distribution system
- c. Where the service provider termination location is unidentified at the time of design, the conduits shall route from the MDF to an adequately sized pull box or manhole at least 30 feet from the building edge

C. Campus Serving Conduits

- a. This specification is only for IT cabling and does not include fire alarms.
 - i. Minimum of (2) 4-inch conduits shall route underground from the MDF to the IDF on the first floor of each additional building on the campus. Additional conduits shall be added as required if fill capacity exceeds 40 percent
 - ii. Manholes and pull boxes shall be utilized as required for a Telecommunications compliant conduit distribution system
 - iii. Where only the first building of a campus is being designed, (2) 4-inch conduits for each additional future building shall route from the MDF to an adequately sized pull box or manhole at least 30 feet from the building edge

D. Portable Serving Conduits

a. For permanent portables

- i. Minimum of (2) 2-inch conduits shall route from the MDF to the IDF in each portable building on the campus. Additional conduits shall be added as required if fill capacity exceeds 40 percent.
- ii. Manholes and pull boxes shall be utilized as required for a telecommunications compliant conduit distribution system.

b. For temporary portables

- i. Minimum of (2) 2-inch conduits shall route from the nearest IDF in each portable building on the campus. Additional conduits shall be added as required if fill capacity exceeds 40 percent.
- ii. Manholes and pull boxes shall be utilized as required for a telecommunications compliant conduit distribution system.

E. Building Entrance for High Schools

- a. For High Schools the MEP and Structural Engineer shall consider a conduit entrance vault as part of the MDF sub floor.

7.3 Cable Management in Telecommunications Spaces

A. Equipment Cabinets/Four Post Racks

a. Four Post Racks

- i. MDFs shall be provided with four post racks with vertical cable managers and a vertical rack mounted power strip with digital readout
- ii. When the network cables exceed the capacity of a wall mounted cabinet, the IDFs shall be provided with four post racks and shall include vertical cable management and a rack mounted power strip with digital readout
- iii. Cabinets shall not be bolted to the concrete floor and/or to the overhead cable runway

b. Wall Mounted Cabinets

- i. Wall mounted cabinets shall be standard wall mounted cabinets with Plexiglas door and lock, one pair of special double tapped rails (one leg tapped 10-32 and one leg tapped 12-24), a double fan kit and a rack mounted power strip with transformer spacing
- ii. Wall mounted cabinets shall be utilized based on the capacity need for the design and future growth
- iii. Wall mounted cabinets shall have enough cable slack to

comfortably open the back of the cabinet without placing any strain on the cables

- iv. Wall mounted cabinets shall be bolted to the wall on a plywood sheet that extends beyond the parameter of the cabinet for a minimum of 3-inches on all sides and to the overhead runway utilizing manufacturer recommended hardware and methods

c. Overhead Cable Management

- i. Overhead Cable Management shall be 18-Inch (MDF), or 12 inch (IDF) universal cable runway made of 3/8" x 1-1/2" x .065" wall rectangular steel tubing with cross members welded at 12-inch intervals
- ii. MDFs shall be provided with 18-inch-wide universal cable runway
- iii. IDFs shall be provided with 12-inch universal cable runway
- iv. Universal cable runway shall be installed utilizing appropriate hardware to support, join or attach sections to structures, and shall be supported at a minimum of 5-foot intervals
- v. Universal cable runway shall not attach to the full-sized equipment cabinets

7.4 Cable Support in Pathways

A. Main Cable Pathway

- a. Main cable pathway shall be j-hooks installed at a minimum of every 4 feet on center utilizing appropriate hardware to support, join and attach j-hooks to structures. J-hook sizing and quantity shall be scaled to the application not to exceed a 40 percent fill ratio
- b. A separate j-hook shall be provided for each media type:
 - i. Backbone Fiber
 - ii. Backbone Copper
 - iii. Horizontal Data
 - iv. Horizontal Wireless
 - v. Horizontal Audio Visual
 - vi. Horizontal Security
- c. Cables should not be touching pipes (whether insulated or not), conduit, all thread, or bare iron
- d. Cables should not weave through pipes or conduit, rather, should be above or below pipes or conduit and be consistent throughout run, on approved J-hooks

B. Sleeves and Penetrations

- a. Sleeves and penetrations are described herein regarding capacity, function and basic design principles and shall be designed in accordance with NEC and EIA/TIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces
- b. All sleeves shall be equipped with nylon bushings
- c. Scale the quantity of sleeves to maintain a 40 percent fill ration in each sleeve
- d. Above MDF and IDFs, install minimum of (4) 4-inch EMT sleeves through the partition wall between the MDF and/or IDF overhead space and the main cabling pathway
- e. Between directly aligned vertically stacked MDF and IDFs, install a minimum of (2) 4" EMT sleeves through the floor of the upper IDF
- f. Between skewed MDF and IDFs on adjacent floors, install a minimum of (1) 4" EMT sleeves through the floor of the upper IDF into the accessible ceiling space below and utilize main cabling pathway to route cabling into the IDF or MDF on the lower floor

C. Workstation Rough-ins and Local Power (Typ.)

- a. At each flush wall mounted workstation location, install a 4-11/16 inch by 4-11/16 inch by 2-1/8-inch double gang back box with single gang mud ring at 18 inches above the finished floor and at appropriate height for above counter and millwork locations
 - i. Install a 1-inch conduit from the double gang box to above accessible ceiling in the room where double gang box is located. If ceiling is not accessible, install conduit to nearest accessible ceiling.
 - ii. Terminate the conduit above accessible ceiling and install nylon bushing and pull string
 - 1. Conduit shall be installed in accordance with EIA/TIA-569-B, contain no more than the equivalent of two (2) 90-degree bends and/or 98.4 feet between pull boxes and maintain a bend radius of 6 times the diameter of the conduit
- b. At locations where the workstation outlets cannot be installed flush in the wall, a Hubbell Surface Mounted Raceway that is appropriately sized and designed to meet the specific requirements shall be provided
 - i. When power is provided in the surface mounted raceway, a dual channel surface mounted raceway shall be provided to separate the power from the structured cabling
 - ii. The use of surface mounted raceway shall only be considered when no option is available to install the workstation outlets flush in the wall
 - iii. Where used, all surface mounted raceway and boxes must be

screwed onto the wall. If adhesive-backed raceway is used, the raceway must ALSO be screwed onto the wall. Snap-on covers are acceptable

- c. Floor-mounted workstation locations are not desired and should be avoided whenever possible
 - i. When no other option is available and a floor mounted workstation location must be utilized, install a floor-mounted pedestal specifically designed for the application and environment adequately sized to accommodate the quantity of installed horizontal data cables
 - ii. All computer labs will use Hubbell Metal Raceway with divider and all associated accessories (Part # HBL4750),
 - iii. Pedestals should be used only as last resort and all other options should be explored before implementing
 - 1. Large Vista Point 5 column pedestals (24 inch in height), and/or dual channel data poles with knockouts for connectivity depending on the layout
 - 2. Pedestals will be used where needed to provide access to underground data lines in the center of a room. It is not acceptable to have lines run on the floor. Install (1) 1-inch conduit for every (6) cables from the floor mounted pedestal
 - 3. Dual-channel data poles will be used where needed if pedestals cannot be installed. This will be determined on a case-by-case basis by the San Antonio Independent School District Office of Networking and Communications or designee
- d. For modular furniture workstation, a rough-in pathway shall be considered and designed according to the furniture type, quantity of cables and location as required for each furniture system
 - i. Wall drops and wall power adjacent to workstations shall be accessible for servicing without taking furniture apart.
 - ii. The use of power poles shall be considered only on a case-by-case basis
- e. For ceiling-mounted outlets above accessible ceiling such as wireless access points or IP Cameras, no rough in is required. The data cable will terminate into a surface mount box and be secured to the structure above the accessible ceiling.
- f. The electrical engineer shall design at a minimum (1) quad NEMA 5-20R receptacle within 12" of each workstation outlet location

7.5 Backbone Cabling

A. Service Provider Demarc

- a. The service provider demarc shall be located inside the MDF when feasible
 - i. For all new construction, the service provider demarc shall be located inside the MDF. The service provider demarc location and requirements shall be coordinated with the San Antonio Independent School District Office of Networking and Communications.
 - ii. For renovation projects where the service provider demarc is not currently located inside the MDF but is required to be relocated because of the renovation, the service provider demarc shall be relocated to the MDF. The service provider demarc location and requirements shall be coordinated with the San Antonio Independent School District Office of Networking and Communications.
 - iii. For renovation projects where the service provider demarc is not currently located inside the MDF and is required to be relocated because of the renovation, the service provider demarc shall be extended to the MDF via copper and/or fiber as required. The service provider demarc extension and requirements shall be coordinated with the San Antonio Independent School District Office of Networking and Communications.

B. Inter-building Backbone Cabling (Campus)

a. Permanent Structures

i. Copper

1. Copper is not required between buildings for technology/data connectivity.

ii. Fiber

1. Inter-building Backbone Fiber Optic Cabling shall be armored indoor/outdoor 12-strand plenum rated 50-micron OM4 (up to 350 meters) Grade 5 Multi-Mode home run from the MDF to each of the IDFs in each of the buildings on the campus and dressed with fan out kits as required. Provide a 10-foot service loop at both ends of each cable stored on the wall above or below the cable runway. Provide a 20-foot service loop in each manhole or pull box. Cables shall be secured with hook and loop tie wraps in the MDF or IDF.
2. Inter-building Backbone Fiber Optic Cabling shall be armored indoor/outdoor 50-micron OM4 (greater than 350 meters) Grade 5 Multi-Mode home run from the MDF to each of the IDFs in each of the building on the campus and dressed in fan

out kits as required. Provide a 10-foot service loop at both ends of each cable stored on the wall above or below the cable runway. Provide a 20-foot service loop in each manhole or pull box. Cables shall be secured with hook and loop tie wraps in the MDF or IDF.

3. Terminate all strands of each fiber optic cable on LC connectors. Connect terminated LC connectors to the back of coupler panels placed into 19-inch rack mounted fiber optic termination housings.

b. Portable Buildings

i. Copper

1. Copper is not required between buildings for technology/data connectivity.

i. Fiber

1. Inter-building Backbone Fiber Optic Cabling shall be armored indoor/outdoor 6 strand plenum rated 50-micron OM4 (up to 350 meters) Grade 5 Multi-Mode home run from the MDF to each of the IDFs in each portable building on the campus and dressed with fan out kits as required. Provide a 10-foot service loop at both ends of each cable stored on the wall above or below the cable runway. Provide a 20-foot service loop in each manhole or pull box. Cables shall be secured with Hook and Loop tie wraps in the MDF or IDF.
2. Inter-building Backbone Fiber Optic Cabling shall be armored indoor/outdoor 6 strand 50-micron OM4 (greater 350 meters) Grade 5 Multi-Mode home run from the MDF to each of the IDFs in each portable building on the campus and dressed with fan out kits as required. Provide a 10-foot service loop at both ends of each cable stored on the wall above or below the cable runway. Provide a 20-foot service loop in each manhole or pull box. Cables shall be secured with Hook and Loop tie wraps in the MDF or IDF.
3. Terminate all strands of each fiber optic cable on LC connectors. Connect terminated LC connectors to the back of coupler panels placed into 19-inch rack mounted fiber optic termination housings.

C. Intra-building Backbone Cabling

a. Copper

- i. Copper is not required between buildings for technology/data connectivity.

- b. Fiber
 - i. Intra-building Backbone Fiber Optic Cabling shall be Superior Essex Part# L4012PW01 interlocking armored indoor/outdoor 12-strand plenum rated 50-micron OM4 (up to 550 meters) Multi-Mode from the MDF to each of the IDFs in the building. Provide a 10-foot service loop at both ends of each cable stored on the wall above or below the cable runway. Cables shall be secured with hook and loop tie wraps in the MDF or IDF and in the cable runway.
 - ii. Terminate all strands of each fiber optic cable on LC connectors. Connect terminated LC connectors to the back of coupler panels placed into 19-inch rack mounted fiber optic termination housings.

7.6 Horizontal Cabling

A. Workstation Cable

- a. Horizontal Data Cabling shall be category 6A UTP, minimum factory sweep tested to 550 MHz, plenum rated, installed from the patch panel in the MDF or IDF to the workstation location not to exceed 275 feet for the permanent link. Provide a 10-foot service loop in the MDF or IDF and 1 foot of slack behind the faceplate. Cable bundles shall be secured with hook and loop tie wraps and concealed with split loom in the cable runway in the MDF or IDF.
- b. At the workstation, each Category 6A cable shall be terminated in a Category 6A modular jack inserted and snapped into a single or double gang faceplate. Faceplates shall be equipped with designation windows for labeling and blank inserts in unused ports.
- c. In the MDF or IDF, each Category 6A cable shall be terminated on the back of Category 6A IDC patch panels, which are mounted in the equipment cabinets
- d. Category 6A cable shall be terminated with the T568B sequence
- e. All Category 6A UTP cables shall be terminated on separate Category 6A IDC Patch Panels in each MDF/IDF room labeled in the following fashion:
 - i. Data
 - ii. Security
- f. All Category 6A UTP wireless AP cables shall be terminated on a separate Category 6A IDF Patch Panel in each MDF/IDF room labeled in the following fashion:
 - i. Data
 - ii. Wireless
 - iii. Security

B. Workstation Configurations

- a. Office Workstation
 - i. Install two (2) blue Category 6A cables for data into a four-port

double gang flush faceplate. The blue cables shall be terminated with blue category 6A modular jacks and placed in the first and second position in the faceplate.

- ii. Furnish two (2) blue CAT6A Data on one wall in each office of approximately 100 sq. ft. Offices that are larger shall be designed with consideration given the size of the office and number of personnel planned for the office.
- iii. Modular furniture clusters shall be designed to accommodate the user requirements at the time of construction.

b. Teacher Workstation

- i. Install two (2) blue Category 6A cables for data into a four-port double gang flush faceplate. The blue cables shall be terminated with blue category 6A modular jacks and placed in the first and second position in the faceplate.

Install a total of two (2) sets of the blue Category 6A cables as described in the front and back of the classroom.

- ii. Furnish one (1) teacher workstation on the front wall in each classroom oriented.

c. Student Workstation

- i. Install two (2) blue Category 6A cables for data into a four-port double gang flush faceplate. The cables shall be terminated with Category 6A blue modular jacks and placed in the first through third positions in the faceplate.

- ii. Furnish one (1) two port student workstation in each classroom oriented on a different wall from the classroom teacher.

C. Wall Mounted Digital Display

- a. No dedicated Category 6A cable is needed if display has wireless capability.

D. IP - based PA system

- a. Install one (1) blue Category 6A cable with a 15-foot slack loop at each location, terminated with a blue category 6A modular jack placed in a surface mounted box/biscuit.

E. Wireless Access Point Outlet

- a. Install one (1) blue Category 6A cable with a 15-foot slack loop at each wireless access point location, terminated with a blue category 6A modular jack placed in a surface mounted box/biscuit along with a category 6A 7-ft black Hubbell patch cord (HC6ABK07) attached and secured to the building structure when mounted above the accessible ceiling.

- i. When a wireless access point workstation/network drop is installed above the accessible ceiling on an HSB surface mount box, a label shall be permanently attached to the ceiling grid directly below the outlet.
- ii. Upon SAISD Technology approval, when an accessible ceiling is not available, the outlet for the wireless access point shall be terminated on a RJ-45 connector in an OBERON Right-angle AP Mount with Universal T-bar Bracket and Cover (Part# 1011-00). Installation coordination with the San Antonio Independent School District Office of Networking and Communications is required. This option is to be used only in the event the ceiling is over 12 feet high.
- iii. At a minimum, allocate one (1) wireless access point location per classroom. The wireless designer shall coordinate with the SAISD Technology Department to determine quantities and locations of wireless access points.

F. IP Camera Outlet

- a. Install one (1) yellow Category 6A cable with a 10-foot slack loop at each IP camera location terminated on yellow category 6A modular jack placed in a surface mounted box and secured to the building structure when mounted above the ceiling.
 - i. When an IP Camera workstation is installed above the accessible ceiling, on an ISM surface mount box, a label shall be permanently attached to the ceiling grid directly below the outlet.
 - ii. When an accessible ceiling is not available, the outlet for the IP camera shall be terminated in a 2-port single gang flush mounted faceplate located 6-inches below the ceiling not to exceed 12-feet above finished floor.
 - iii. The designer shall coordinate with the San Antonio Independent School District Police to determine quantities and locations of IP Cameras.

G. Time Clocks

- a. Install one (1) blue Category 6A cable with a 10-foot slack loop at each time clock location 48 inches above finished floor terminated on a blue category 6A modular jack placed in a surface mounted box and secured to the building structure when mounted on a hard surface.
- b. Install one (1) blue Category 6A cable with a 10-foot slack loop at each time clock location 48 inches above finished floor terminated on a blue category 6A modular jack placed in a single gang flush faceplate when installed on drywall.
- c. For each time clock terminated on its respective Data MDF/IDF Category

6A Hubbell Patch Panel, each time clock patch panel port shall be labeled TIME CLOCK.

H. HVAC

- a. Install two (2) blue Category 6A cables with a 10-foot slack loop at each MDF/IDF/Mechanical room location terminated on a green category 6A modular jack placed in a surface mounted box and secured to the building structure when mounted on a hard surface.
- b. Install two (2) blue Category 6A cables with a 10-foot slack loop at each MDF/IDF/Mechanical room location terminated on a green category 6A blue modular jack placed in a single gang flush faceplate when installed on drywall.
- c. Each HVAC MDF/IDF line shall be terminated on the last two Hubbell data patch panel ports.
- d. Each HVAC Mechanical room line shall be terminated on the patch panel port before those indicated above.
- e. For each HVAC terminated on its respective Data MDF/IDF Category 6A Hubbell Patch Panel, each HVAC patch panel port shall be labeled with HVACX where X represents the cable line number. (ex. HVAC1 HVAC2)

I. Access Control

- a. Install two (2) yellow Category 6A cables with a 10-foot slack loop at each MDF location terminated on a yellow category 6A yellow modular jack placed in a surface mounted box and secured to the building structure when mounted on a hard surface.
- b. Install two (2) yellow Category 6A cables with a 10-foot slack loop at each MDF location terminated on a yellow category 6A yellow modular jack placed in a single gang flush faceplate when installed on drywall.
- c. Install two (2) yellow Category 6A cables with a 10-foot slack loop for each first floor IDF located at a non-MDF detached building terminated on a yellow category 6A yellow modular jack placed in a surface mounted box and secured to the building structure when mounted on a hard surface.
- d. Install two (2) yellow Category 6A cables with a 10-foot slack loop for each first floor IDF located at a non-MDF detached building terminated on a yellow category 6A yellow modular jack placed in a single gang flush faceplate when installed on drywall.
- e. Each Access Control MDF/IDF line shall be terminated on the last two Security Hubbell security patch panel ports.
- f. For each Access Control terminated on its respective Security MDF/IDF Category 6A Hubbell Patch Panel, each patch panel port shall be labeled with ACONTROL1 and ALARM1

J. Patch Cables

- a. MDF/IDF
 - i. Fiber Patch Cables
 - 1. In the MDF/IDF, install at the patch panel at the time of substantial completion, one (1) fiber optic patch cable plus 25 percent for each terminated strand
 - 2. Color must be aqua 1,2, 3-meter. Connector ends to be coordinated with owner. Typical is LC to LC but can vary with equipment.
 - ii. Copper Patch Cables
 - 1. In the MDF/IDF, install at the patch panel at the time of substantial completion one (1) Category 6A modular non-booted patch cable plus 25 percent for each terminated cable in the following proportions:
 - a. One (1) 1-foot Category 6A blue patch cable for each data and time clock outlet terminated at the patch panel end.
 - b. One (1) 1-foot Category 6A green patch cable for each HVAC outlet terminated at the patch panel end.
 - c. One (1) 1-foot Category 6A yellow patch cable for each IP camera and Access Control outlet terminated at the patch panel end.
 - d. One (1) 1-foot Category 6A black patch cable for each wireless access point outlet terminated at the patch panel end.

K. Minimum Standard Installation

- i. Each classroom shall have, at minimum, two (2) blue Category 6A cables for data at the front (learning wall) and rear of the classroom as well as one (1) blue Category 6A cable for wireless access point in/on ceiling (10.04 Classroom Minimum Standard)
- ii. Libraries, cafeterias, band/choir halls, (primary) gyms, JROTC assembly halls and auditoriums shall have, at minimum, two (2) blue Category 6A cables for wireless access points, location to be determined by wireless survey provided by wireless/technology vendor or Office of Network and Communications representative
- iii. See District Wireless Network Access Standard for additional detail

7.7 Grounding

- A. Grounding shall be designed and installed in accordance with ANSI-J-STD-607-A and

TIA standards

- a. Install one (1) Telecommunications Main Grounding Busbar (TMGB) in the MDF and one (1) Telecommunications Grounding Busbar (TGB) in each IDF
- b. Install a Telecommunications Bonding Backbone (TBB) no smaller than #2 AWG stranded green insulated copper conductor in a star topology between the TMGB and each TGB in each building. When IDFs are stacked, a single TBB can be daisy chained between TGBs back to the TMGB
- c. Install an Equipment Bonding Conductor (EBC), #6 AWG green insulated conductor from the TMGB or TGB as applicable to each cable runway system, equipment rack, cabinet, lightning protector or multi pair cable with a metallic element
 - i. Install no smaller than #2 AWG stranded green insulated copper conductor from the TMGB to the main building electrical service ground in each building
 - ii. In a metal frame (structural steel) building, where the steel framework is readily accessible within or external to the room; each TGB and TMGB shall be bonded to the vertical steel metal frame using a minimum #6 AWG conductor. The connection to building steel does not eliminate the requirement for the TBB or BC to the service ground.
- d. Install a Grounding Equalizer Conductor no smaller than #2 AWG stranded green insulated copper conductor to interconnect multiple TBBs on the top floor and every 3rd floor when required by ANSI-J-STD-607-A
- e. When exceeding 13 feet, the conductors shall be sized at 2kcmil per linear foot of conductor length no smaller than #2 AWG

7.8 Labeling

- A. All labels shall be typed and not handwritten.
- B. Fiber Backbone Cables
 - a. Backbone Fiber shall be labeled within 18 inches of the visible end of the jacket
 - b. Cables shall be labeled identically at both ends
 - c. The labeling shall consist of 4-part alphanumeric designation indicating the origin (MDF/IDF), destination (MDF/IDF), fiber type, and strand numbers. The 4-part designation shall consist of the following parts:
 - i. Part 1: Origin
 1. M = Main Distribution Frame (MDF)
 2. I1 = Intermediate Distribution Frame (IDF) 1
 3. I2 = Intermediate Distribution Frame (IDF) 2
 4. I3 = Intermediate Distribution Frame (IDF) 3, etc.

- ii. Part 2: Destination
 - 1. M = Main Distribution Frame (MDF)
 - 2. I1 = Intermediate Distribution Frame (IDF) 1
 - 3. I2 = Intermediate Distribution Frame (IDF) 2
 - 4. I3 = Intermediate Distribution Frame (IDF) 3, etc.
- iii. Part 3: Media Type
 - 1. SM – Single Mode
 - 2. MM – Multi Mode
 - 3. 50mm = 50 micron
- iv. Part 4: Strand Count
 - 1. 001-006 = 1-6 Strands
 - 2. 001-012 = 1-12 Strands
 - 3. 001-024 = 1-24 Strands
 - 4. Fiber optic backbone cable shall be labeled identically at each end denoting the origin (MDF/IDF), destination (MDF/IDF), fiber type and strand number (i.e., M- I1-50MM-001-012)
 - 5. Fiber optic enclosures shall be labeled alpha numeric starting with the first fiber optic enclosure in the top of the first equipment cabinet. A label for each terminated strand shall be securely placed inside each fiber optic enclosure
 - 6. Fiber optic couplers panels in fiber enclosures shall be labeled at each end by strand denoting origin (MDF/IDF), and strand number to and from respectively (i.e. I1-50MM-001-012)

C. Horizontal Cables

Description	MDF/IDF Patch Cable	Building Plenum Cabling	Wall Outlet Or End Connector	Wall Outlet Labeling (Example)	
				MDF	IDF
*Wireless Devices	Black	Blue	Black	M-W-01	I3-W-01
Data	Blue	Blue	Blue	M-D-01	I3-D-01
HVAC System	Green	Blue	Green	M-D-01	I3-D-01
Security Cameras	Yellow	Yellow	Yellow	M-S-01	I3-S-01

- a. Horizontal Cables shall be labeled within 12 inches from the termination point

inside the MDF/IDF

- b. Horizontal Cables shall be labeled within 12 inches from the termination point at the workstation end and on the faceplate
- c. Cables shall be labeled identically at both ends
- d. The labeling shall consist of 3-part alphanumeric designation indicating the origin (MDF/IDF), media type and port number assignment. The 3-part designation shall consist of the following parts:
 - i. Part 1: Origin
 - 1. M = Main Distribution Frame (MDF)
 - 2. I1 = Intermediate Distribution Frame (IDF) 1
 - 3. I2 = Intermediate Distribution Frame (IDF) 2
 - 4. I3 = Intermediate Distribution Frame (IDF) 3, etc.
 - ii. Part 2: Media Type
 - 1. D = Data
 - 2. W = Wireless
 - 3. S = Security
 - iii. Part 3: Patch Panel Port Number Assignment
 - 1. 01 = 1st Port
 - 2. 02 = 2nd Port
 - 3. 03 = 3rd Port, etc.
- e. Horizontal cables shall be labeled identically at each end denoting the origin (MDF/IDF), media type and port number. (i.e. I1-D-01).

D. Workstation Faceplates

- a. Workstation Faceplates shall be labeled denoting origin (MDF/IDF), media type and port number assignment (i.e. I1-D-01) When a wireless access point or IP Camera outlet is installed above the accessible ceiling, a label with a black background and white lettering shall be permanently attached to the ceiling grid or electrical junction box, directly below the outlet

7.9 Testing

- A. Terminated fiber optic strands shall be tested bi-directionally end-to-end and certified (passed) in accordance with applicable industry standards and manufacturer certifications requirements with an OTDR field and Light Meter tester that is within their calibration period
- B. Terminated backbone copper cable links shall be tested and passed in accordance with applicable industry standards and manufacturer certification requirements for attenuation, continuity, and pin mapping with approved field tester(s) that are within their calibration period
- C. Terminated Category 6A UTP cable links shall be tested and passed in accordance

with applicable industry standards and manufacturer certification requirements for Category 6A compliance with approved field tester(s) that are within their calibration period. In addition, provide the Hubbell Premise Wiring Mission Critical Warranty and System Performance Warranty Program Customer Agreement, original documents only.

7.10 As-Built Documentation/Final Documentation

A. To Be Submitted upon completion

- a. Produce scaled drawings depicting the condition of the Structured Cabling System as installed produced in AutoCAD 2015 or higher, provided in hardcopy, and electronically in .DWG and .PDF Format. Include the exact dimensions and locations of MDF and IDF layouts, wall elevations, equipment cabinet elevations, cable runways, cable tray, sleeves, backbone and horizontal cable pathways, workstation locations and numbering and labeling scheme.
- b. A half size hard copy of the as-built drawings for the applicable region served by the MDF and/or IDFs shall be provided in MDF and each IDF for reference
- c. Produce cable records for the Structured Cabling System as installed to include a list of all horizontal and backbone cables produced in an Excel format and provided in hardcopy and electronic format indicating cable number, unique cable label, cable type, origin and destination, length, termination method and pass/fail result
- d. Produce (3) hard copies of all test results for each cable to include technician's name and date stamp, a list of tested cables, and the individual results for each cable tested. Test results shall be furnished on CD ROM or current standard media to include native file format and .PDF format

- e. Provide an electronic copy (PDF File) of Redline drawings and site plans
- f. Provide clear pictures of finished Fiber Backbone Installation (Crawl Space, Trenching and Above Ceiling)
- g. Provide 26 x 30 laminated MDF/IDF drawings that specify all areas supported by the equipment contained in the respective cabinet. The drawing should be sized to fully utilize the space and to allow proper visibility. The drawings should be affixed to the respective cabinet and/or wall space.
- h. The Contractor shall furnish the original Certificate of Certification/Warranty to the Architect/Engineer at the time of final systems acceptance
- i. Contractor shall provide warranty information to include the name, address, and phone number contacts for warranty call outs

PART 8 – ACCEPTABLE MANUFACTURERS/PRODUCTS

8.01 General

- A. The following list of manufactures/products is provided for reference only and is not all- inclusive. All manufacturers/products shall be verified by the designer for each project and confirmed with San Antonio Independent School District prior to issuing construction documents.

8.02 Fiber Optic Cable

- A. 50 µm Multi-mode 10Gig OM4 Grade 5 Laser Optimized
- B. 50 µm Multi-mode 10Gig OM4 Grade 5 Laser Optimized
 - a. Superior Essex – 6 Strand Plenum Interlock Armor Indoor Outdoor – Part# L4006PW01
 - b. Superior Essex – 12 Strand Plenum Interlock Armor Indoor Outdoor – Part# L4012PW01
 - c. Superior Essex – 24 Strand Plenum Interlock Armor Indoor Outdoor – Part# L4024PW01

8.03 Fiber Optic Innerduct

- A. PNA Corrugated Petro-Duct – PC100
- B. Premier Conduit Plenum Innerduct with Pull Tape – Part# P-100T

8.04 Fiber Optic Terminations

- A. Fiber Optic Enclosures
 - a. MDF Room
 - i. Hubbell OPTIchannel Rack Mount Enclosure (1RU) – Part#FPR3SP
 - ii. Hubbell OPTIchannel Rack Mount Enclosure (2RU) – Part#FCR2U6SP
 - iii. Hubbell OPTIchannel Rack Mount Enclosure (3RU) – Part#FCR3U12SP
 - iv. Hubbell OPTIchannel Rack Mount Enclosure (4RU) – Part#FCR4U12SP

- B. Fiber Optic Adapter Panels
 - a. Hubbell LC Quad Adapter Panel (12 Packs) – Part# FSPLCDM6AQ
 - b. Hubbell LC Quad Adapter Panel (24 Packs) – Part# FSPLCDM12AQ
 - c. Hubbell FSP Adapter Panel Blank Plate – Part# FSPB
- C. Fiber Optic Connectors
- 8.05 Hubbell LC Connectors – Part# FCLCM
- 8.06 High Pair Count Copper Cable
 - A. Hubbell CAT6A – 4 pair, Plenum, White, terminating to a 66 Block – Part# C6ASPDSB
 - B. OSP Data – Hubbell NEXTSPEED – CAT6A OSP Outdoor Cable Black – Part# C6SOPBK
- 8.07 Horizontal Category 6A 4-Pair Cable
 - A. OSP Data – Hubbell NEXTSPEED – CAT6 OSP Outdoor Cable Black – Part# C6SOPBK
 - B. Data – Hubbell Category 6A Cable – (Blue Sheath) – Part# C6ASPDSB
 - C. Wireless – Hubbell Category 6A Cable – (Blue Sheath) – Part# C6ASPDSB
 - D. Time Clock - Hubbell Category 6A Cable – (Blue Sheath) – Part# C6ASPDSB
 - E. Security – Hubbell Category 6A Cable – (Yellow Sheath) – Part# C6ASPDSYL
 - F. HVAC – Hubbell Category 6A Cable – (Blue Sheath) – Part# C6ASPDSB
- 8.08 Category 6A Copper Patch Cord
 - A. End User Patch Cord – 14 Foot NEXTSPEED Category 6A Universal Patch Cord – (Grey Sheath) – Part# HC6ALG14
 - B. Wireless HSB Surface Mount Box Patch Cord – 7 Foot NEXTSPEED Category 6A Ascent Patch Cord – (Black Sheath) – Part# HC6ABK07
 - C. MDF / IDF Room Patch Cord
 - a. Data – 1 Foot NEXTSPEED Category 6A Patch Cord (Blue Sheath) – Part# HC6AB01
 - b. Wireless - 1 Foot NEXTSPEED Category 6A Patch Cord (Black Sheath) – Part# HC6ABK01
 - c. Security - 1 Foot NEXTSPEED Category 6A Patch Cord (Blue Sheath) – Part# HC6AY01
 - d. HVAC - 1 Foot NEXTSPEED Category 6A Patch Cord (Blue Sheath) – Part# HC6AB01
 - e. Time Clock – 1 Foot NEXTSPEED Category 6A Patch Cord (Blue Sheath) – Part# HC6AB01
- 8.09 Copper Terminations
 - A. Lightning Protection
 - a. ITW Linx – CAT6A Solid-State Building Entrance Protector – Part# CAT6A-75
 - B. 110 Wiring Block with Legs

- a. Hubbell Field Termination Kit – 50 pair with 4 pair blocks – 110BLK50FTK4
 - C. Horizontal Category 6A 4-Pair Cable
 - a. Modular Rack Mounted Patch Panels
 - i. Hubbell NEXTSPEED 48-Port Category 6A Universal Modular Patch Panel – Part#HPJ48
 - b. Wireless Rack Mounted Patch Panels
 - i. Hubbell NEXTSPEED 48-Port Category 6A Universal Patch Panel – Part# HPJ48
 - D. Workstation Faceplates
 - a. Office / Classroom / Conference Room Locations
 - i. Hubbell IFP Single Gang Wall Plate 1-Port – Part# IFP110W
 - ii. Hubbell IFP Single Gang Wall Plate 2-Port – Part# IFP120W
 - iii. Hubbell IFP Single Gang Wall Plate 3-Port – Part# IFP130W
 - iv. Hubbell IFP Single Gang Wall Plate 4-Port – Part# IFP140W
 - v. Hubbell IFP Single Blank Wall Plate – Part# NP130W
 - vi. Hubbell IFP Double Gang Wall Plate 6-Port – Part# IFP260W
 - vii. Hubbell IFP Double Gang Wall Plate 9-Port – Part# IFP290W
 - viii. Hubbell IFP Double Gang Wall Plate 12-Port – Part# IFP2120W
 - b. Gymnasium
 - i. Hubbell Stainless Steel Single Gang Wall Plate with Label Fields 1-Port – Part#SSFL11
 - ii. Hubbell Stainless Steel Single Gang Wall Plate with Label Fields 2-Port – Part#SSFL12
 - iii. Hubbell Stainless Steel Single Gang Wall Plate with Label Fields 3-Port – Part#SSFL13
 - iv. Hubbell Stainless Steel Single Gang Wall Plate with Label Fields 4-Port – Part#SSFL14
 - v. Hubbell Stainless Steel Double Gang Wall Plate with Label Fields 4-Port – Part#SSFL24
 - vi. Hubbell Stainless Steel Double Gang Wall Plate with Label Fields 6-Port – Part#SSFL26
 - vii. Hubbell Stainless Steel Double Gang Wall Plate with Label Fields 9-Port – Part#SSFL29
 - viii. Hubbell Stainless Double Gang Wall Plate with Label Fields 12-Port Part#SSFL212
 - E. Category 6A Jacks
 - a. Data/Voice/HVAC – Hubbell NEXTSPEED Category 6A Jack – Part# HJU6AB
 - b. Security – Hubbell NEXTSPEED Category 6A Jack – Part# HJU6AY
 - F. Category 6A Jacks Wireless
 - a. Wireless – Hubbell NEXTSPEED Category 6A Jack – Part#HJU6ABK
- 8.10 Equipment Cabinets – Cabinets are not to be bolted to the floor
- A. Wall Mounted Cabinets

- a. Chatsworth 24-Inch x 24-Inch x 30-Inch Cube-iT Plus Cabinet System – Part# 12419-724
 - b. Chatsworth 24-Inch x 36-Inch x 30-Inch Cube-iT Plus Cabinet System – Part# 12419-736
 - c. Chatsworth 24-Inch x 48-Inch x 30-Inch Cube-iT Plus Cabinet System – Part# 12419-748
 - d. Chatsworth Fan Kit for Cube-iT Plus – Part# 12804-701
 - e. Chatsworth Transformer Spaced Power Strip – Part# 12301-719
- B. Four Post Racks
- a. Chatsworth – 50120-703
 - b. Chatsworth – Vertical Managers Part#14831-703
 - c. Chatsworth – Power Strip – Part# 12848-755
- C. IDF Four Post Racks
- a. Chatsworth – 50120-703
 - b. Chatsworth – Vertical Managers Part#14831-703
 - c. Chatsworth – Power Strip –Part# 12848-755
- D. Ladder Rack and All Required Accessories
- a. Chatsworth 12-Inch Universal Cable Runway – Part#10250-712
 - b. Chatsworth 18-Inch Universal Cable Runway – Part# 10250-718
 - c. Chatsworth Vertical Wall Bracket – Part# 10608-001
 - d. Chatsworth Protective End Caps for Runway – Part# 10642-001
 - e. Chatsworth Junction Splice Kit – Part# 11302-701
 - f. Chatsworth Runway Support Bracket – Part# 11408-001
 - g. Chatsworth 12-Inch Wall Angle Support Kit – Part# 11421-712
 - h. Chatsworth 18-Inch Wall Angle Support Kit – Part# 11421-718
- E. J-Hooks and All Required Accessories
- a. Cablofil J-Hook – Part# CJ12
 - b. Cablofil J-Hook – Part# CJ21H
 - c. Cablofil J-Hook – Part# CJ32H
 - d. Cablofil J-Hook – Part# CJ64H
 - e. Cablofil – Part# CJBC
 - f. Cablofil Extended J-Hook Angle Bracket – Part# CJH-BA
- 8.10 Plywood
- A. $\frac{3}{4}$ " x 8' h x 4' w Sheets of A/C grade Fire Rated Plywood with Fire Rated Stamp painted with white fire rated paint- Part#DOC4x8Backboard
- 8.11 Firestop
- A. Specified Technologies Intumescent Putty – Part# SSP100
 - B. Specified Technologies Intumescent Sealant – Part# SSS100
- 8.12 Ground Bus Bars

- A. Chatsworth BICSI & ANSI/EIA/TIA Grounding Busbar (2-Inch Wide x ¼ Inch High x 10-Inch Long) – Part# 13622-010
 - B. Chatsworth BICSI & ANSI/EIA/TIA Grounding Busbar (4-Inch Wide x ¼ Inch High x 20-Inch Long) – Part# 40153-020
 - C. Chatsworth Compression Lug – Part# 40162-901
- 8.13 Cable Ties
- A. Rip Tie – Fire Retardant Velcro Black Cable Wrap (1/2-Inch x 75 Feet) – Part# G-75-1RL-BK
 - B. Rip Tie – Fire Retardant Velcro Black Cable Wrap (3/4-Inch x 75 Feet) – Part# G-75-MRL-BK
- 8.14 Labeling
- A. Brady – Part# DAT-9-292-2.5
- 8.15 Electrical Pedestal
- A. (Large) Vista Point 5 column pedestal – Part #VFL662345CMGY24/HBL4750
- 8.16 Hubbell metal raceway and associated accessories
- A. Part# HBL4750
- 8.17 Wireless AP Mount when ceiling is above 12 feet or if a wall mount is needed
- A. OBERON Right-angle AP Mount with Universal T-bar Bracket and Cover Model 1011-00
 - B. Wireless AP mountings should not exceed 13 feet regardless of location unless approved by District Network and Communication representative
- 8.18 Wireless AP Mount when wall mounted in a Gymnasium
- A. OBERON NEMA 4 AP Enclosure: Screw-on clear cover, Right-angle – Model 1020-C-RAB
- 8.19 Wireless Surface Mount Box
- A. Hubbell Housing, Surface Mount, 1-Port, Office White – Part# HSB10W

PART 9 – SUMMARY OF STANDARDS

- 9.01 Summary
- A. All aspects of this San Antonio Independent School District’s Structured Cabling Infrastructure Standards shall be applied to the design process for both new and renovated facilities
 - B. A Division 27 specification and T-Series drawings shall be commissioned and issued by the Architect during the design phases of each facility or project

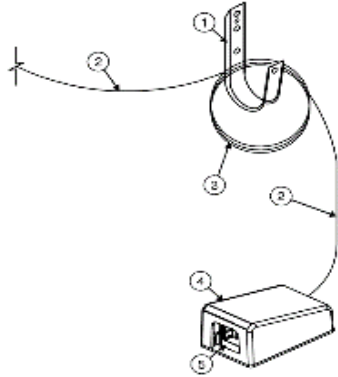
PART 10 – REFERENCE ITEMS

10.01 Sample Fiber Tag



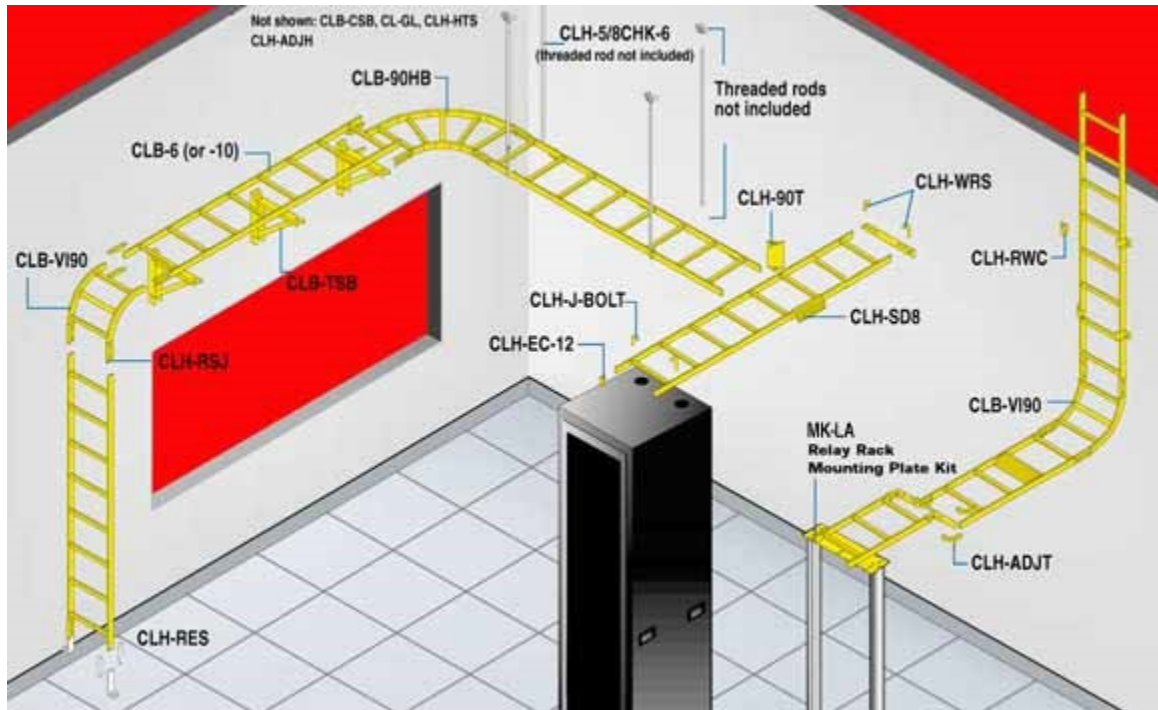
10.02 Sample HSB Surface Mount Box

- ① J-HOOK ABOVE ACCESSIBLE CEILING (BY DIM 27)
- ② DATA CABLE ABOVE ACCESSIBLE CEILING (BY DIM 27)
- ③ 20-FOOT SERVICE LOOP ABOVE ACCESSIBLE CEILING NEATLY COILED AND SECURED TO J-HOOK (BY DIM 27)
- ④ SURFACE MOUNT BOX ABOVE ACCESSIBLE CEILING AND SECURED TO BUILDING STRUCTURE. (BY DIM 27)
- ⑤ DATA INSERT (BY DIM 27)

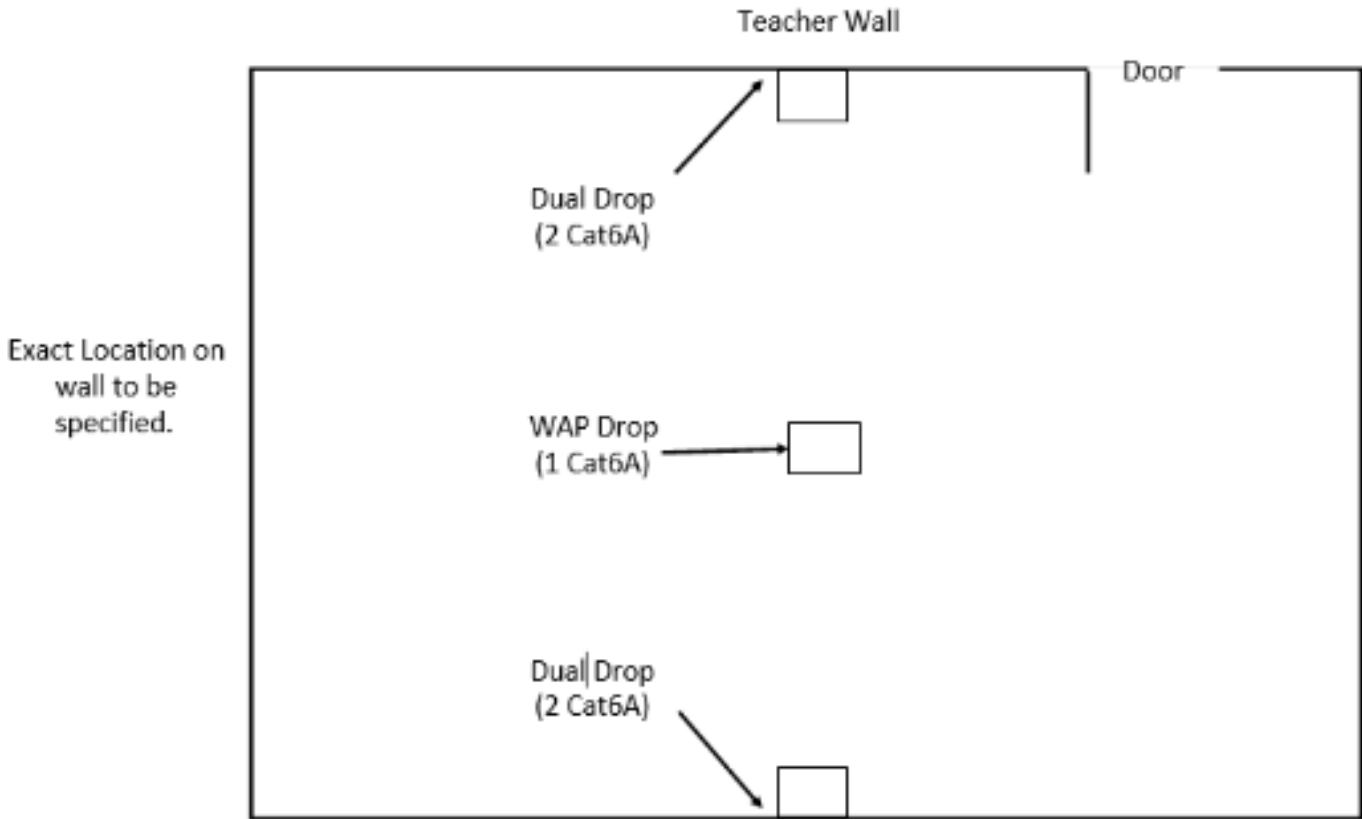


① **TYPICAL ABOVE ACCESSIBLE CEILING DATA OUTLET**
SCALE: N.T.S.

10.03 Ladders



10.04 Classroom Minimum Standard





10.05 Proper Ceiling Grid Labeling

END OF STANDARD

APPENDIX B

ENERG S STAINABILIT G IDELINES

Energy & Sustainability (E&S) Design Guidelines

1.1 GENERAL

SAISD strives to provide safe, comfortable, well-maintained schools that are conducive to student learning and staff productivity. The Energy & Sustainability division within the Facilities Services Department works to achieve this goal in support of the District's mission to transform SAISD into a national model urban school district where every child graduates so that he or she is prepared to be a contributing member of the community. This is done by focusing on lean operations and drawing from industry experts & best practices from peer ISDs in our region.

Energy and sustainability initiatives are implemented to maximize equipment efficiency with an understanding that occupant comfort and energy efficiency are not mutually exclusive. This is done by effectively using technology and based on experience and training in the areas of energy management, lean operations, and green building. Additionally, we recognize that our goals are not static, and we will constantly strive to improve our operations and performance in the areas of energy, sustainability, and facility operations.

To that end, Facilities Services partners with the Construction & Development Services Department to provide insights into how campuses undergoing major renovations or new buildings can most effectively incorporate green building practices and sustainability into the design to ensure that our facilities have lower long-term utility & maintenance costs, but also serve as living laboratories where instruction related to resource efficiency and sustainability are available for all end users.

1.2 *High-Performance Schools*

- A. SAISD has near and long-term goals for energy and water efficiency that are intended to ensure utility costs are minimized while providing buildings that are conducive to learning & instruction and also durable and easy to maintain. This approach to sustainability focuses not only on resource conservation but also in achieving buildings that can be operated efficiently throughout their useful lives.
- B. In addition to the energy, water, and resource efficiency requirement of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) certification, design professionals are encouraged to aspire to net-zero energy or near net-zero energy construction. Rather than provide a prescriptive roadmap to achieve this goal, SAISD encourages design professionals to pursue an energy use intensity (site EUI) of 25 kBtu/sq. ft. so that if solar photovoltaics or other on-site renewables are included in the project, there should be enough space on campus for an array or system that will offset most or all of the site's energy consumption. All-electric campuses should be considered to eliminate on-site fossil fuel consumption and battery backup is encouraged to serve, at a minimum, essential life and safety systems.
- C. Building performance during design shall be projected using an approved energy model by taking an iterative approach such that energy and water efficiency enhancements may be modeled at different stages of design (e.g., 50%, 90% CDs). The final selection of material and other building attributes impacting energy performance shall be chosen based on what will provide the greatest efficiency gains allowable within the project budget.
- D. Utility incentives make up an important source of revenue for SAISD so rebate eligibility is a factor that must be factored into the equipment selection process. High-efficiency equipment shall be selected whenever feasible to achieve available incentives but also to ensure long-term operational cost savings. Design professionals will work with the

Energy & Sustainability team as well as the utility's rebate implementation representatives to ensure all available incentives are captured while selecting equipment that is best suited for the specified application.

1.3 Green Infrastructure

- A. SAISD strongly encourages the adoption of Low-Impact Development (LID) within all major campus and site upgrades. This has myriad environmental benefits and can also help reduce, or eliminate entirely, fee in lieu and/or storm water fees if implemented in conformance with requirements by in the City of San Antonio's Unified Development Code, Section 35-210. This segment of the UDC also offers credit/offsets for incorporating LID into projects. Best practice, and technical support are available through the San Antonio River Authority (SARA), and financial assistance may be available if approved during the annual budget process by the SARA Board. You may contact Karen Bishop, (210) 302-3642, at SARA for more information.
- B. Design professionals are encouraged to contact SARA as early as possible during the design phase to ensure LID performance and benefit are maximized. All green infrastructure upgrades must be designed with long-term maintenance in mind to ensure projects do not create a maintenance or cost burden that could ultimately result in the SAISD's removal of green infrastructure improvements. Green infrastructure should also be treated as an educational opportunity to enrich and enhance student understanding of why this is a valuable practice in site development. Additionally, plant selection should include drought-tolerant varieties that do not require supplemental irrigation once established.
- C. Landscape design professionals should prioritize creating natural spaces that foster biodiversity and are encouraged to leverage resources available from the [National Wildlife Foundation \(NWF\)](#) for technical support and to ensure that these upgrades are presented as educational and student engagement opportunities at participating campuses.

1.4 Utility Tracking Technology

- A. Energy and water consumption represent significant annual costs for SAISD and the Energy Management staff actively tracks consumption to reduce costs and conserve resources. The District prefers to have real-time utility data to help with ongoing commissioning and energy management efforts. Technologies currently accepted by SAISD for utility tracking include the following:
 - i. Energy tracking - [eGauge](#)
 - ii. Water tracking - [WaterSignal](#)
 - iii. Alternate models may be considered to the above, subject to approval by Facilities Services

1.5 Dashboards and Educational Enhancements

- A. Real-time campus energy & water consumption data as well as energy production from renewable energy should be displayed on a dashboard that is available for viewing by campus personnel as well as visitors.
- B. Metrics should be displayed on one or more screens, located in a prominent area of the campus.
- C. Signs for recycling, composting, and other sustainability-related practices should be included within the design to highlight the various initiatives underway at each campus in furtherance of environmental stewardship.

1.6 LEED Requirements

- A. Each SAISD Project is required to meet LEED requirements for that particular

- campus, including the preparation of an Energy Performance Model.
- B. SAISD has selected the LEED credits that shall be given priority and this will be provided to the design professionals early during the design phase.
- C. While pursuing LEED is a priority, it is not an end in itself. The intent is to achieve high-performance buildings that serve as living laboratories showcasing best practices in sustainability.

1.7 **Building Commissioning**

- A. SAISD considers commissioning to be a valuable process in ensuring that buildings and systems perform as intended. In that spirit, the commissioning process shall entail more than simply filling out checklists and should instead consist of a collaborative process amongst all relevant professionals and trades. Additionally, commissioning should begin as early as possible and, when possible, during the initial building design phase.
- B. While specific technical provisions related to commissioning are outlined in other areas of this document, it is mentioned here to outline SAISD's goals and preferences for successful commissioning. At a minimum, all commissioned systems should operate according to the parameters outlined in the design drawings, including having their operation field verified and agreed upon by all parties involved.
- C. SAISD requires that all major mechanical, electrical, and plumbing (MEP) system undergo commissioning by a 3rd-party professional holding a certification by an industry-leading organization. Acceptable credentials include:
 - i. NEBB's Commissioning Process Professional (CxPP)
 - ii. AEE's Certified Building Commissioning Professional (CBCP)
 - iii. ASHRAE's Building Commissioning Professional (BCxP)

At least one member of the commissioning team for each project should hold one or more of these certifications. Other certifications may be considered as well but will be subject to written approval by SAISD. The certified professional(s) must regularly participate in commissioning activities, including at least weekly site visits and all project meetings during the commissioning process.

- D. SAISD prefers that building envelop commissioning be included in all new construction and major renovation projects. Ideally this will include building pressure testing following ASTM E779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization. This is vital to not only ensure comfortable, energy efficient spaces but also to minimize repairs over the life of buildings.

1.8 **Renewable Energy**

- A. The cost of solar photovoltaics (PV) has fallen drastically over recent years and SAISD would prefer to incorporate PV into all new construction and major renovation projects when technically feasible and cost effective. If possible, PV systems should be sized to offset all or most of the campus's expected energy consumption.
- B. PV systems do not necessarily need to be mounted on the roof of any building and may also serve as shade structures for parking lots, play areas, or other sections of the grounds.
- C. Any PV system shall be tied into a campus dashboard and provide real-time data about the system's production that can be used as a part of instructional and extra-curricular educational activities.
- D. Other on-site renewable energy sources such as wind power may be considered, provided they do not create excessive noise or a safety hazard.

1.9 **Indoor Environmental Quality**

- A. Indoor environmental quality (IEQ) is an essential facet of providing an environment that is conducive to instruction and learning. SAISD prefers that this include good air

- quality as well as appropriate acoustic and light levels for the types of activities that will be conducted within those spaces. Recommendations from the Illumination Engineering Society of North America (IESNA) shall serve as the basis of design for light levels unless another approved K-12 design standard is to be used. Acoustic quality should be maximized by designing around MEP systems that do not adversely impact acoustic quality and using materials that effectively absorb sound.
- B. Spaces should be outfitted with sensors that read temperature, relative humidity, and CO₂. District-approved temperature setpoints will be provided by the Project Manager so these may be programmed before the building is handed over to the owner. Relative humidity levels should be set to maintain interior spaces between 50%-60%. Design professionals are also encouraged to investigate the viability of sensors that monitor particulate matter (PM_{2.5}), total volatile organic compounds (TVOCs), and other respiratory irritants.
 - D. Material choice has a significant impact on IEQ and it is the District's preference that no materials known to off-gas formaldehyde, VOCs, and other respiratory irritants be used as part of construction projects. Additionally, carpets and fabric furniture should be avoided in favor of non-porous materials that will not trap dust or liquids. When possible, materials should meet one or more of the following certifications:
 - i. US Environmental Protection Agency (EPA)
 - ii. ENERGY STAR®
 - iii. Forest Stewardship Council (FSC)
 - iv. Green Seal
 - v. GREENGUARD
 - C. Reference Administrative Procedure C48 for details on acceptable materials and practices related to indoor environmental quality in SAISD facilities.

1.10 **Water Conservation**

- A. Water costs have increased rapidly over recent years and conserving this precious resource is a priority for the associated environmental benefits in addition to the utility cost savings.
- B. Water efficient, high-performance appliances and fixtures are preferred for interior applications, especially in high-usage areas such as kitchens and restrooms. The most water-efficient models shall be presented to SAISD staff during design review for consideration. These must be selected with durability in mind to minimize long-term maintenance costs.
- C. Irrigation presents one of the areas of greatest potential water savings for SAISD. Any sports field improvements shall include upgrading to artificial turf or another highly durable material that does not require irrigation or typical lawn maintenance.
- D. All decorative landscaping shall only include drought-tolerant, regionally appropriate plants, such as those recommended by the [San Antonio Water System Garden Style website](#) or the [Texas A&M's AgriLife Extension's Low Water Plant list](#). A list of utility-friendly [Trees for the San Antonio Region](#) is available from CPS Energy. Drought-tolerant plants shall be prioritized so that irrigation is needed only to establish healthy roots or used during periods of low precipitation once plants are established.
- E. Irrigation controls shall be available for remote scheduling. The preference is to tie the irrigation controls into the campus DDC system so watering schedules can be set through the building controls platform. An alternate approach would be to tie controls into a web-based controls platform. The latter approach is acceptable only if the platform is available without a licensing fee and with prior written approval by SAISD.
- F. Condensate and rainwater capture and reuse is encouraged when deemed economically and technically feasible. Preferred applications include, but are not necessarily limited to, cooling tower makeup, irrigation, and exterior maintenance upkeep. In cases where condensate will be recaptured for reuse, as many sources shall be consolidated and captured in one or multiple centralized reservoirs that are easy to access and service as needed. Condensate supply shall be monitored with a flow meter tied into the campus DDC system so its usage may be tracked in real time. Captured

condensate or rainwater used for any of these purposes must be properly treated to prevent fouling in a manner compliant with all applicable codes and approved by Facilities Services.

1.11 ***Ease of Maintenance and Operability***

- A. SAISD expects buildings to perform well over their useful lives, which necessitates proper operation and maintenance of equipment and systems. All MEP, food service, and life & safety systems shall be designed and installed with long-term maintenance in mind. All serviceable equipment shall be accessible for both preventive maintenance and major repairs. If water or power is needed to service equipment, receptacles shall be placed in a convenient and safe location for use by maintenance staff.
- B. This includes installing network switches in mechanical rooms to allow for ease of access as the District moves towards MEP systems that require IP connectivity (e.g. Power over Ethernet lighting). These installations shall be approved by both IT and Facilities Services personnel during the design review process.
- C. Any mechanical or controls upgrade shall include conversion of the entire campus to a unified direct digital control (DDC) system such that all systems may be seamlessly accessed using the same "front end." Multiple controls system "front ends" or standalone areas or buildings with legacy controls systems on a single campus will not be allowed. Additionally, this includes replacing all field equipment (sensors, thermostats, supervisory equipment, etc.) with the most current iteration that are fully compatible with the controls system being installed.
- D. Schools are often used for a variety of extra-curricular events, many of which are held after hours or on weekend. It is essential that Facilities staff be able to accommodate these requests while also being mindful of energy conservation. To achieve this, mechanical systems shall be configured to allow for zoning of high-use spaces and provide backup cooling or heating equipment (e.g. DX cooling coils) on units serving these areas so that an entire central plant is not run to condition a small space. Additionally, the DDC controls shall be configured such that end users may easily schedule overrides through a web-based calendar programmed in the controls.
- E. When possible, predictive analytics shall be used to assist with preventive maintenance. With approval from Facilities, these platforms shall be tied into the campus DDC system so that operational anomalies may be pinpointed before major equipment failures and to allow for more proactive maintenance practices.
- F. Fully accessible web-based DDC controls are the District's preference. Proprietary controls and other software platforms are highly discouraged but if they are essential, a license must be provided for each technician who will need access to the software as part of the project cost. Additionally, if proprietary diagnostic equipment is needed for maintenance, at least one unit shall be provided per device per project and training provided to Facilities Services staff.
- G. Any campus with outdated security lighting (e.g. fluorescent or HID technology) shall be updated to LEDs with controls tied into the campus DDC system to improve the safety and energy efficiency of the campus.
- H. To the extent possible, utility meters shall be consolidated so that no more than one meter of each service type serves a single building on a campus (e.g., one electric, one natural gas, and one water account). The intent is to avoid having multiple accounts to track and to minimize the fees associated with having multiple accounts open per service type. If possible, please provide one meter per service type per campus. For water service, separate domestic and irrigation accounts may be needed but the preference is to have no more than one of each account type per campus.
- I. Training on all controls and mechanical equipment shall be provided by factory-certified personnel at equipment start-up for mechanical upgrades and once commissioning and Tab are complete for controls. Preferably, ongoing controls training will be available as part of all major controls upgrades at no additional cost for the life of the equipment but at least 24 hours of controls training are required.
- J. The District prefers a 10-year warranty on all major mechanical equipment and at least a

5-year service agreement inclusive of quarterly inspections and one annual comprehensive preventive maintenance service by factory-certified technicians.

APPENDIX C

FACILITY ROOM NUMBERING STANDARD



SAISD Facility Space/Room Designation Standards

As of December 2021

PURPOSE

The purpose of this document is to provide the San Antonio Independent School District (SAISD/Owner) as well as the Design Professional with a cohesive set of standards and guidelines to create and maintain a consistent room designation for new and renovated facilities.

The design program shall be taken as a whole and shall be coordinated by the design professional to resolve the **most stringent interpretation** when a choice or conflict between sections or between the design program and codes occur. The proposed facilities must meet all applicable codes including, but not limited to, all federal (American with Disabilities Act 1990), State laws (**Elimination of Architectural Barriers Texas Government Code, Chapter 469 Administered by the Texas Department of Licensing and Regulation**), Texas Education Agency (TEA) rules, regulations and standards, and local codes and regulations. The City of San Antonio has jurisdiction over all SAISD sites and all designs must comply with City Building Codes (including but not limited to Fire, Mechanical, Electrical, Plumbing and ADA requirements) and their amendments.

The Texas Department of Licensing and Regulation has authority over existing facilities that are subject to the requirement for removal of barriers under Texas Government Code, Chapter 469. In addition, the U. S. Department of Justice has authority over existing facilities that are subject to the requirement for removal of barriers under title III of the ADA. Applicability of standards for removal of barriers under Title III of the ADA is solely within the discretion of the U. S. Department of Justice and is effective only to the extent required by regulations issued by the U. S. Department of Justice.

No provision herein shall alter the contractual or fiduciary responsibility of the consultant or of San Antonio Independent School District, as executed in the Owner-Consultant Agreement. Neither shall the absence of a particular instruction or detail relieve the consultant of the responsibility to deliver a comprehensive professional service or final product.

Building Signage - Accessibility Compliance

- This standard does NOT supersede ADA / Texas Accessibility Standards compliance guidelines. Designer is required to comply with all local, state and federal regulations.
- All signage shall comply with relevant accessibility requirements must be met as listed (but not limited) to the following:
 - Appropriate installation height and location (relative to door location/ opening)
 - Character height and proportions
 - Appropriate placement and size of sign
 - International Symbol of Accessibility and Pictogram symbols as appropriate for restroom signage
 - Finish and Contrast requirements
 - Raised Character requirements with associated Braille (Grade 2)
 - All other requirements.
- Applicable provisions include (but not limited) to the following
 - American with Disabilities Act Guidelines
 - 2012 Texas Accessibility Standards (Signs 703)
 - International Building Code (for all signage requirements)
 - Other Codes and ordinances not noted above

SAISD Space/Room Numbering Standard

- All spaces/rooms must be numbered
 - Classrooms, offices, storage area, corridors, stairwells, entries (if foyer present), all restrooms, areas of rescue, etc.
 - Large spaces that are used for multiple function shall be considered for separate numbering
- Internal spaces such as offices, storage, practice rooms shall end with a letter
- Exception to items that do not need to be numbered
 - Small classroom supply closets (if it is too small to walk into or large tagged equipment it does not get numbered)
- Kitchen functions (Pantry, Freezes, Dishwashing, Food Prep Area, etc.) and circulation should be labeled and numbered on the master plan, but signage is not to be installed if there are budget constraints. The exception is the kitchen office, the kitchen itself and the serving line and enclosed stairwells as required by code.

Corridors, Elevators, Stairwells

- Corridors should be on a separate 3-digit numbering sequence starting with the letter C and with the first number representing the floor. Example on the first floor start with C-100, C-101, C-102, on the 2nd floors C-200, C-201, C-202, 3rd floor C-300, C-301, C-302, etc.
- Stairwells should comply with building code and numbered sequentially starting with the letter S (example S-1, S-2, S-3), based on the number of stairwells in the building. The number should appear on all floors so stairwell 1 will have S-1 on all floors.
- Elevators should also comply with the building code and numbers sequentially starting with the ELEV-, example ELEV-1, ELEV-2, ELEV-3 for each elevator throughout the campus not just in one building. The number should appear on all floors so elevator 1 will have ELEV-1 on all floors.
- Vestibules should have numbers ending on 00' when possible, (example V-1500).

Elevators: "ELEV-" (+) 1 digit # (ex: ELEV-1)

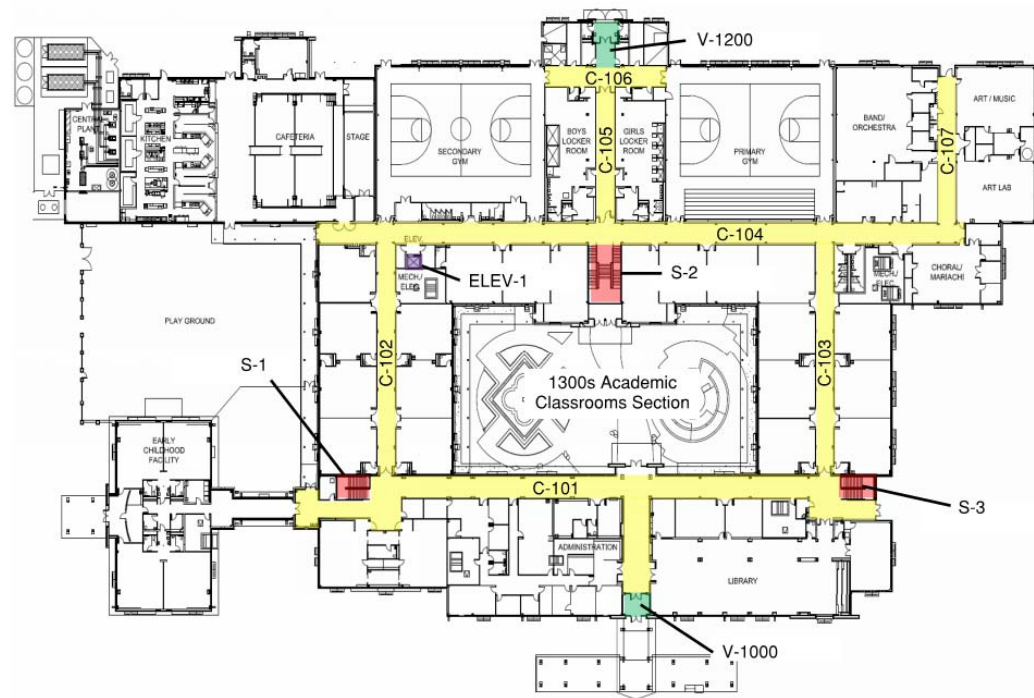
Stairs: "S-" (+) 1 digit # (ex: S-1)

Corridors/Halls/Ramps: "C-" (+) 3 digits #s (ex: C-107)

- First # is the floor
- Long corridors can be subdivided with letters at the end

Vestibules: "V-" (+) 4 digits #s (ex: V-1500)

- First # is the floor
- Second # is the wing
- Reserve 00's on last 2 digits for main lobbies
- Add letters at the end when appropriate



Exit Numbering

The Police Department has recommended that ALL exits be numbered to better indicate specific exits when planning building evacuations or for other emergency situations.

The process for numbering exits should begin with the PRIMARY entrance to a building. Each building will have its own set of exit numbers and can be duplicated in other buildings.

When master planning room numbering, start with the main entry as “1” use numeric only. Then work your way CLOCKWISE around the building numbering each exit sequentially. Remember to number exit area NOT exit doors.

This process should be followed for each building. Buildings with immediate exits (Gyms, Portables, Early Childhood Facility, etc.) DO NOT have to be numbered.

Signage is not required if you can place an adhesive number on the exit sign otherwise signage is needed.



Cross System Compatibility

The number designation for identifying spaces/rooms must consider if it can be used by multiple systems such as:

- Business Database System (Fixed Assets):
 - 8 digits, numbers only
- PA System:
 - 4 digits, first digit only alpha (A-1 only) numeric (1-9 only)
- Facilities Maintenance and Operations (Facilitron System):
 - 50 digits, numbers, and letters

Systems that do not need to relate to space/room numbers:

- VOIP Phone System

Room Identification Legend

A space/room identification must have FOUR to FIVE digits as illustrated below.

1001A

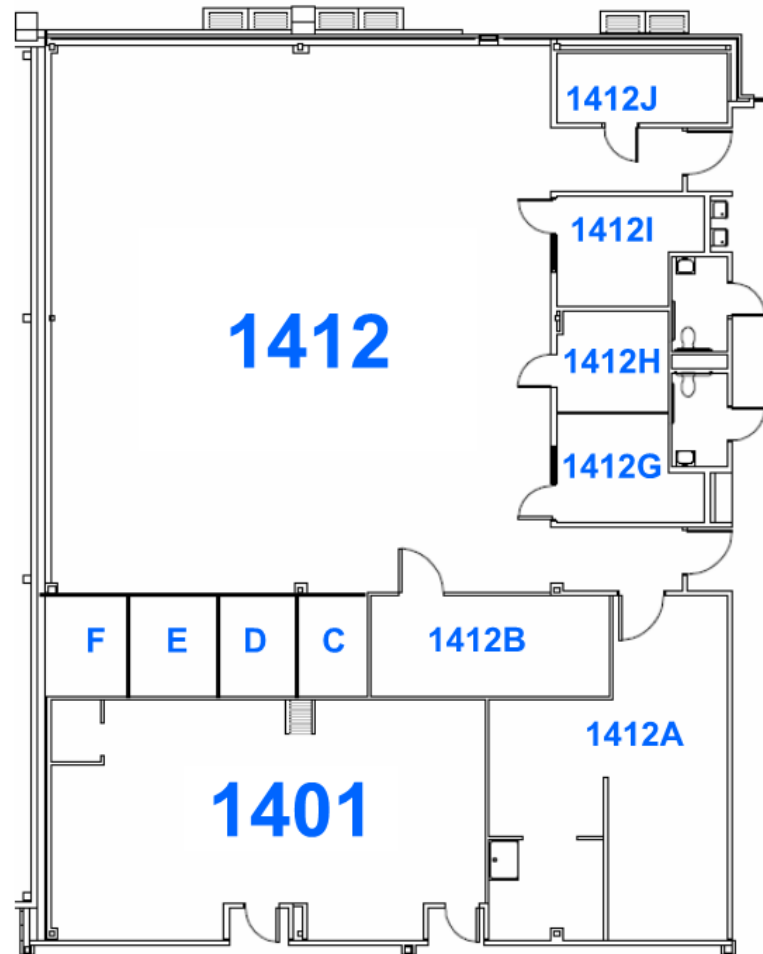
1	Floor Designation
0	Wing/Section Designation – to be divided by functions or physical location of the building such as north, south, east or west. See illustration 1 for detail. This should also follow a clockwise sequence as much as possible. For Cross System Compatibility, this number must not be duplicated from building to building. This digit starts at 0 up to 9.
01	Room Designation. This gives you a possibility of 100 rooms within each Wing/Section. Odd/Even numbers should be used for linear corridors when possible. Odd to the left and Even to the right. These two digits start at 00 up to 99.
A	Upper case letter – Internal Room Designation (Excluded if there are no internal spaces/rooms) Offices, Practice Rooms, walk-in large storage rooms, but not small classroom supply closets. Start at the main entrance to the room and work around clockwise to letter the sub rooms.

Example of Internal Space/Room Numbering

The primary designation for the space/room is 1412.

If there are TWO entries into a room only one door shall have signage.

All rooms accessed via this room shall be identified with the primary number followed by an upper-case letter.



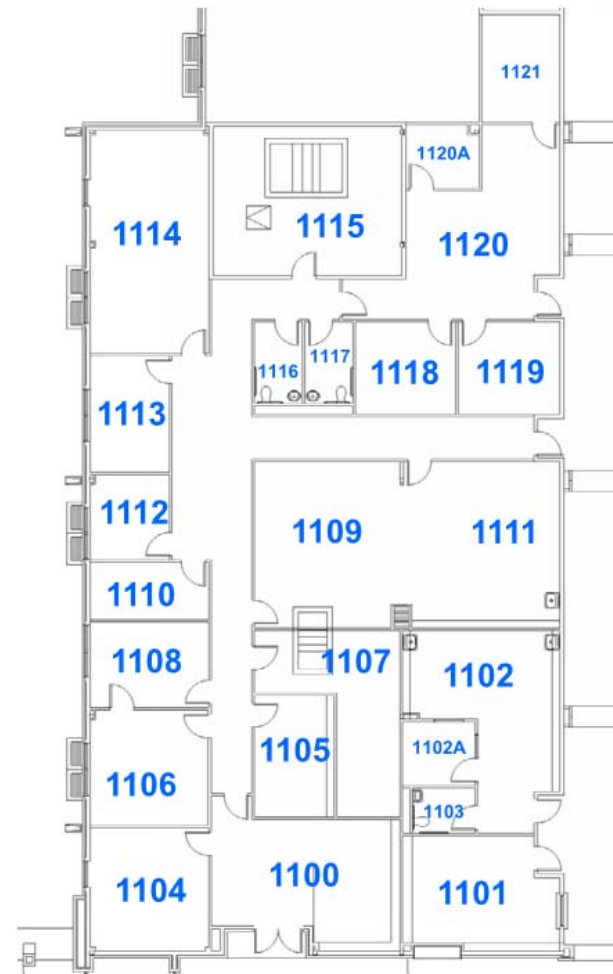
Example of Internal Space/Room Numbering (Administrative Wing)

In the previous example a primary number was used, and each internal space shared this number with a unique upper-case letter added on. However, in an administrative space, a unique primary number shall be assigned to each space or office.

In these cases all internal rooms/spaces must have its own designation and not a shared primary number.

There is some mixing of Whole numbers and Lettered numbers, whoever best practices shall be used to determine when it is appropriate which to use.

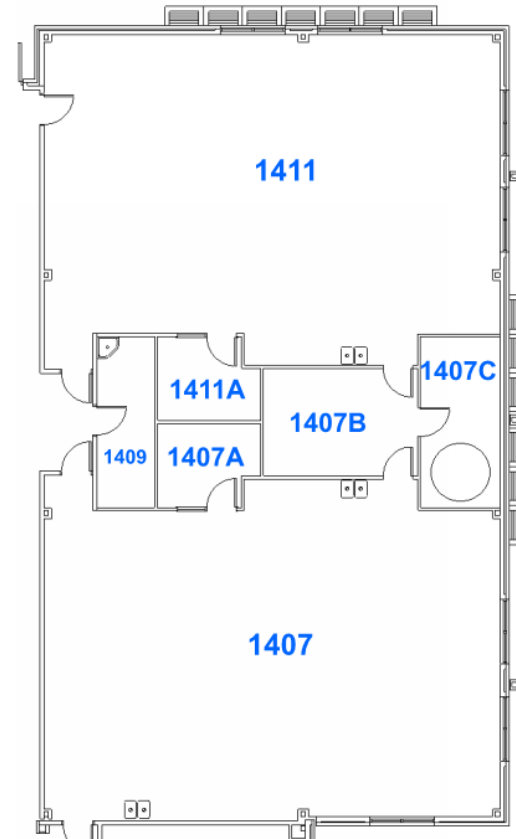
Note: 1109 and 1111 appear to identify the same space however there is a dividing wall that could divide the function of this space.



Example of Internal Space/Room Numbering (Adjoining Internal Rooms)

There are cases where you will have adjoining internal rooms.

The internal room in this case must share the primary number of the first number in the sequence.

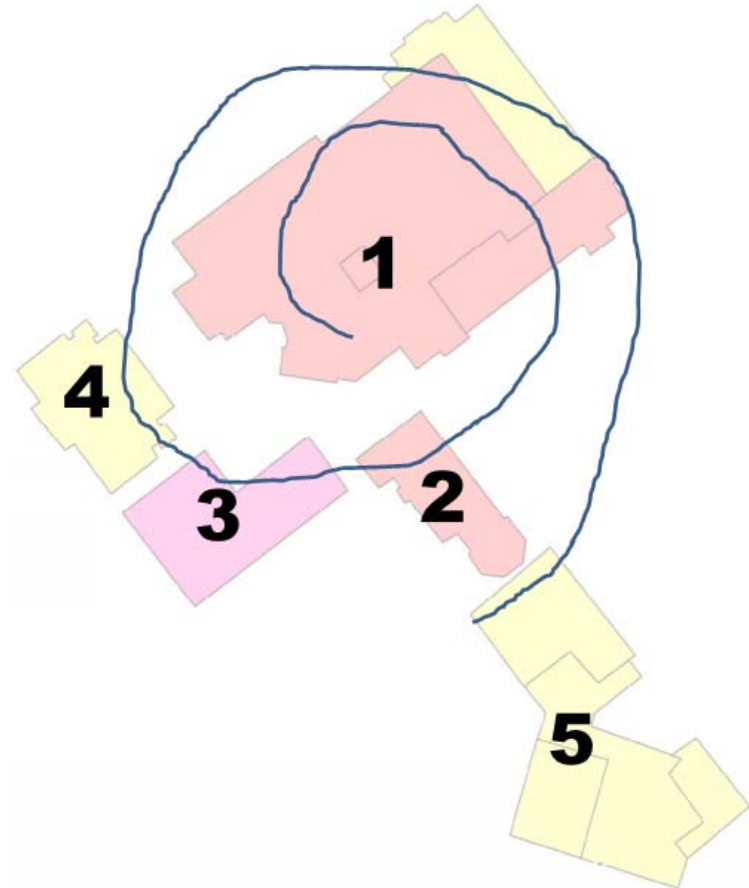


Example of Building Numbering

The sequence list here should be used for numbering buildings, the main building is designated Building 1 and following a clockwise spiral pattern each separate building should be numbered with the next sequence number as required by COSA. If there is only one building on site, the building is not required to be numbered. Buildings are considered separate if they are not attached.

Each entry is to have a sign indicating “Building #” installed with 2”x4” lettering. Sign type maybe vinyl lettering on glass or plastic weatherproof sign depending on the exterior material of the entry.

Source for building number is
COSA – City of San Antonio

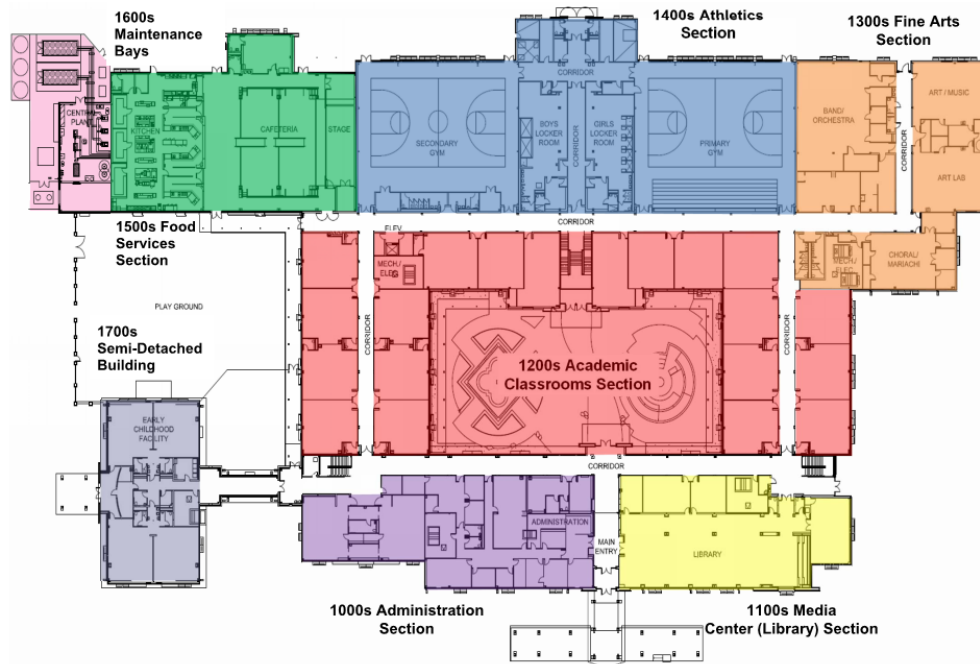


Wing/Section Designation

Consider the functions of the facility and how they are organized. *The illustration below is an EXAMPLE ONLY.*

Note: Each function below should be assigned together to the same section but not the specific number below. For example, the Food Services does not have to be 1600s it could be 1300s, what matters is that the function is assigned with the same section group.

*Central Plants and all exterior Utility Rooms shall also be identified/labeled as a separate Wing/Section.



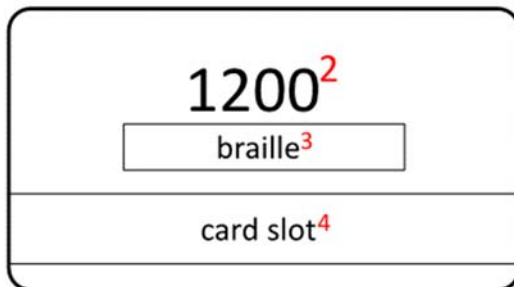
Signage Layout And Color Standards

General Signage Layout Examples

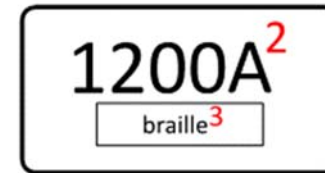
(Not to Scale)

The Police Department has recommended that ALL exits be numbered to better indicate specific exists when planning building evacuations or for other emergency situations.

Hallway/circulation signage



Internal space signage



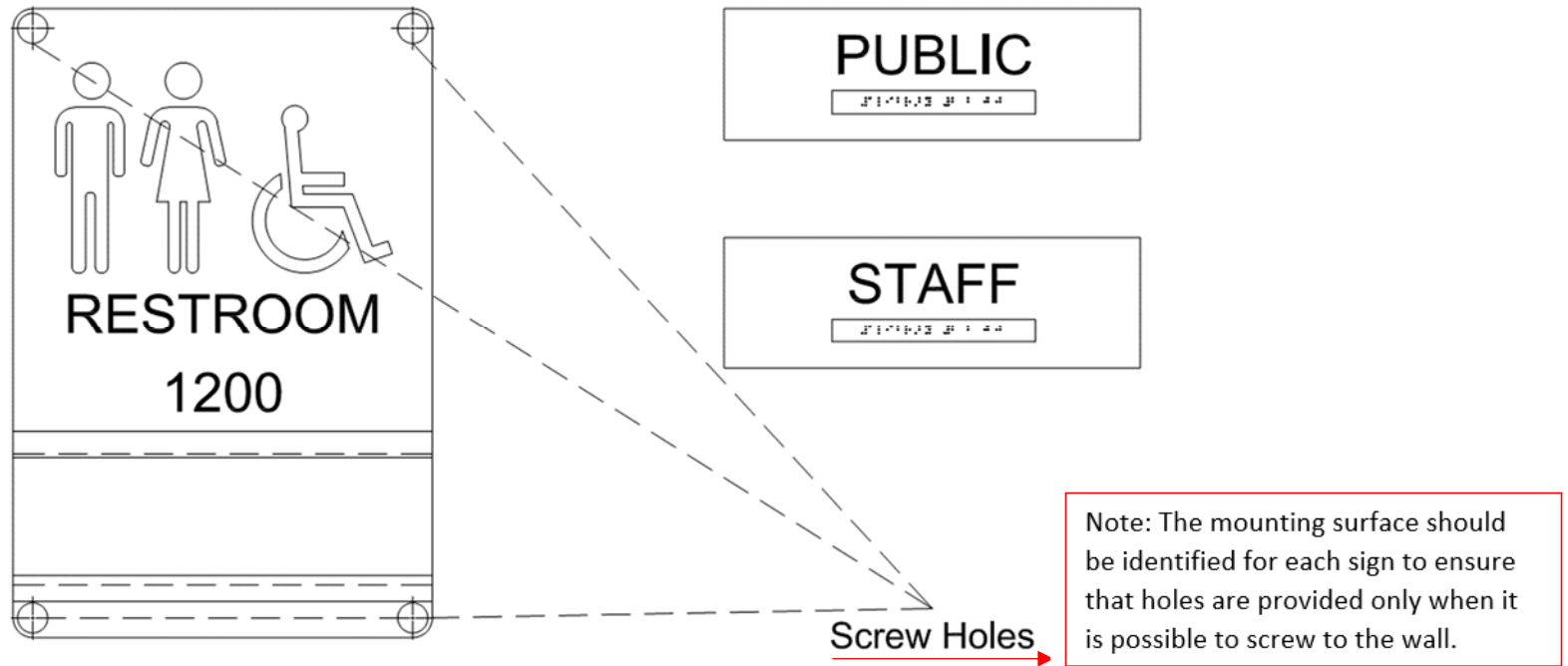
LAYOUT LEGEND

- 1 – Function
- 2 – Floor-Section-Room #-internal letter
- 3 – Braille Section
- 4 – Card Slot

Note: Character size, placement and sign size must abide by ADA requirements.

Signs should be NO larger than 6"x6" at any option. Restroom's sign must comply with ADA.

Unisex Restroom Signage Layout (Not to Scale)



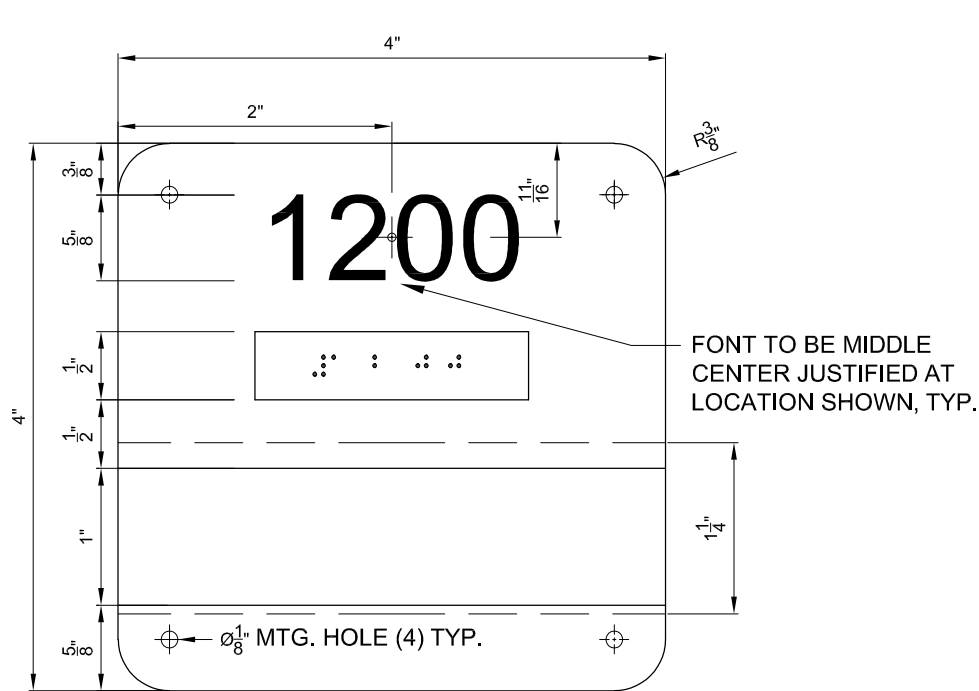
Unisex restroom signage shall follow the above layout. A slot shall be included to switch restroom designation between Public to Staff.

ROOM PLATE TYPE A

ADMIN

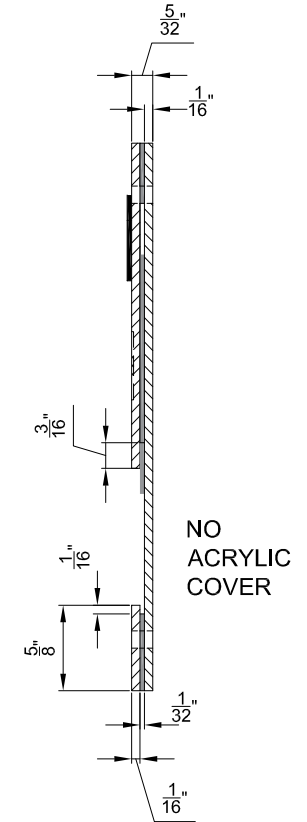
- OFFICES
- CONFERENCE ROOM
- BREAK ROOM
- WORK ROOM

Note: The mounting surface should be identified for each sign to ensure that holes are provided only when it is possible to screw to the wall.



FRONT VIEW

SCALE: NOT TO SCALE



SIDE VIEW

SCALE: NOT TO SCALE

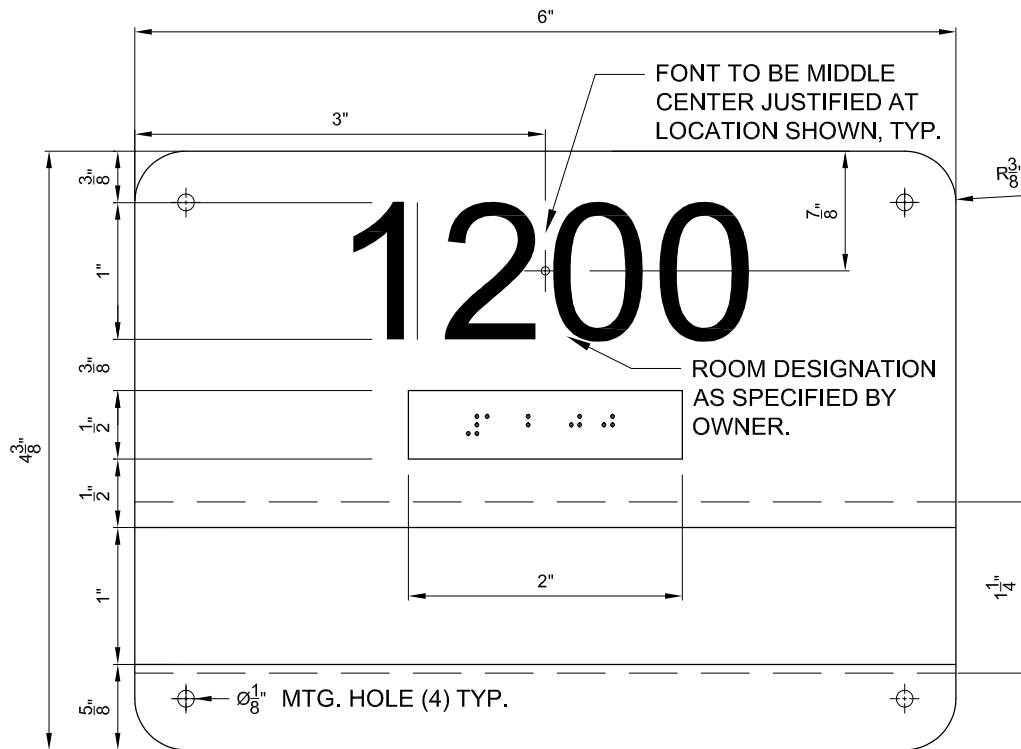
GENERAL NOTE:

ALL TEXT MARKER PLACEMENT AND OVERALL DESIGN OF THIS PLACARD SHALL CONFORM TO ADA REGULATION STANDARDS WHERE APPLICABLE.

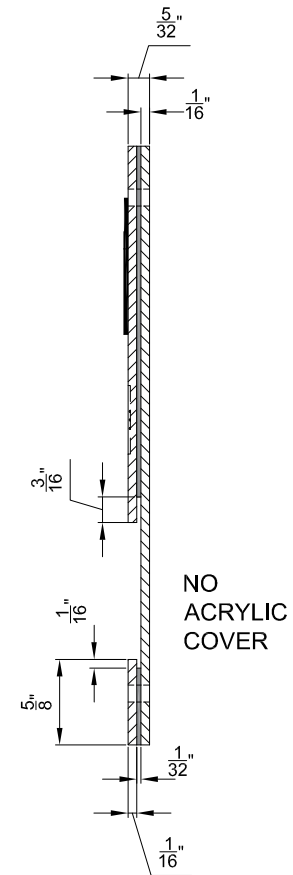
ROOM PLATE TYPE B

CLASSROOMS

Note: The mounting surface should be identified for each sign to ensure that holes are provided only when it is possible to screw to the wall.



FRONT VIEW
SCALE: NOT TO SCALE



SIDE VIEW
SCALE: NOT TO SCALE

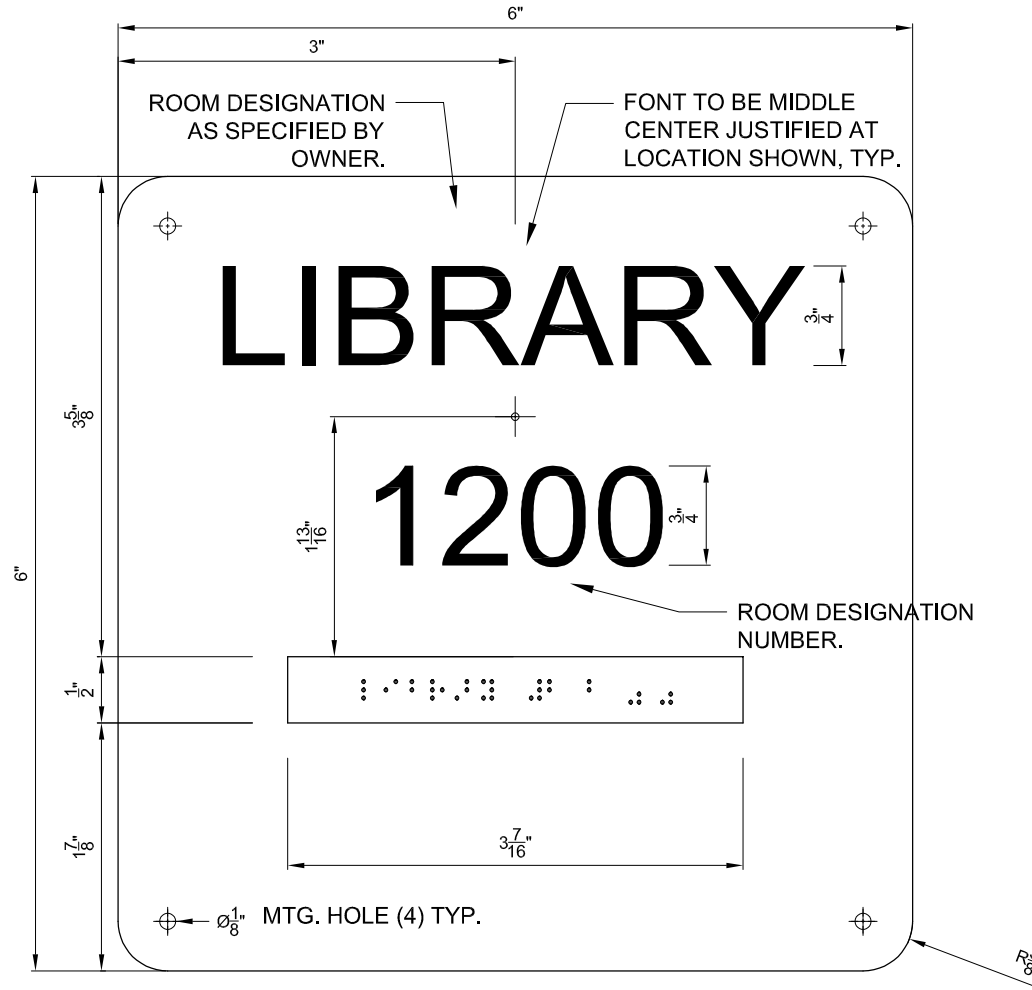
GENERAL NOTE:
ALL TEXT MARKER PLACEMENT AND OVERALL DESIGN OF THIS PLACARD SHALL CONFORM TO ADA REGULATION STANDARDS WHERE APPLICABLE.

ROOM PLATE TYPE C

SPECIALIZED AREAS

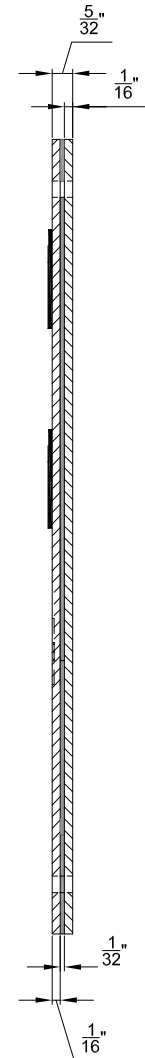
- ATHLETICS
- FINE ARTS
- MEDIA CENTER
- SCIENCE LAB
- CAFETERIA
- COMPUTER LAB
- CLINIC
- AUDITORIUM
- MAKER SPACE

Note: The mounting surface should be identified for each sign to ensure that holes are provided only when it is possible to screw to the wall.



FRONT VIEW

SCALE: NOT TO SCALE



SIDE VIEW

SCALE: NOT TO SCALE

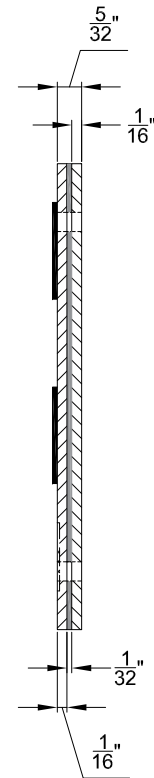
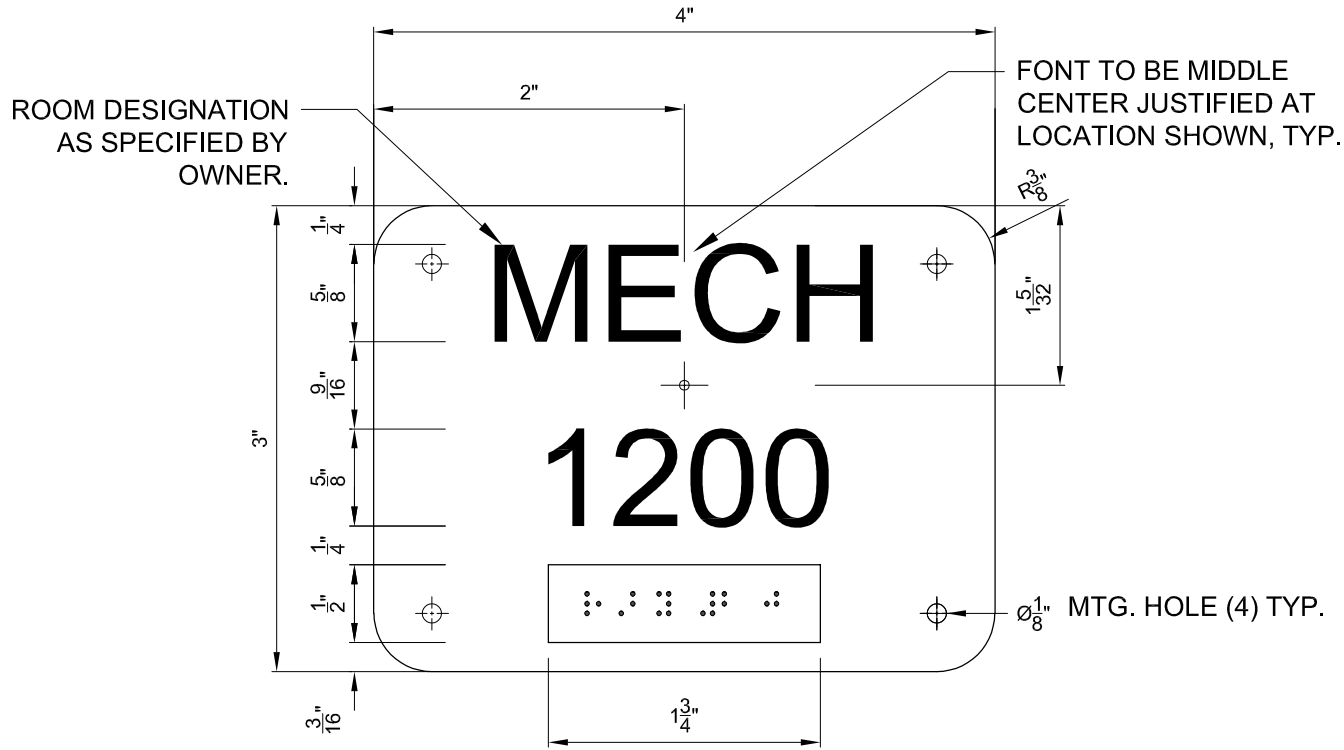
GENERAL NOTE:
ALL TEXT MARKER PLACEMENT AND OVERALL DESIGN OF THIS PLACARD SHALL CONFORM TO ADA REGULATION STANDARDS WHERE APPLICABLE.

ROOM PLATE TYPE D

MAINTENANCE ROOMS

- ELEC
- MECH
- IDF/MDF
- CUSTODIAN
- STORAGE
- ELEV
- BOOKS

Note: The mounting surface should be identified for each sign to ensure that holes are provided only when it is possible to screw to the wall.



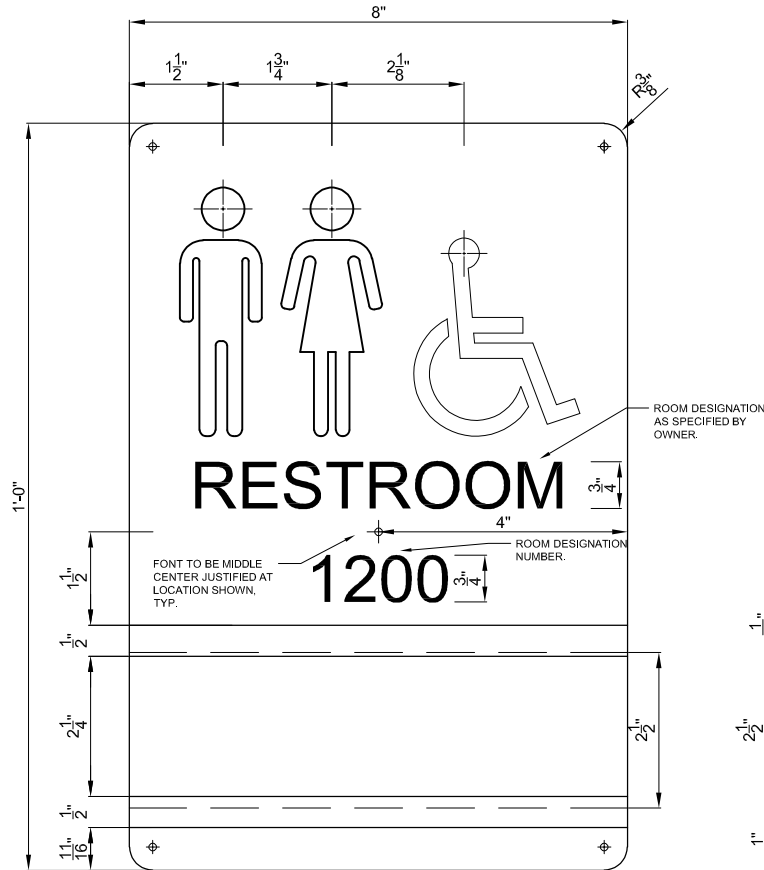
FRONT VIEW
SCALE: NOT TO SCALE

SIDE VIEW
SCALE: NOT TO SCALE

GENERAL NOTE:
ALL TEXT MARKER PLACEMENT AND OVERALL DESIGN OF THIS PLACARD SHALL CONFORM TO ADA REGULATION STANDARDS WHERE APPLICABLE.

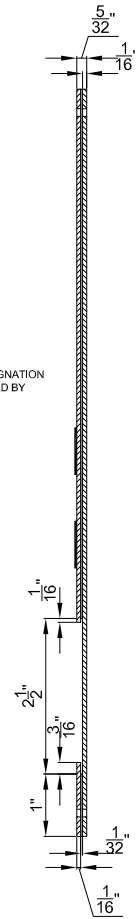
ROOM PLATE TYPE E

PUBLIC RESTROOM



FRONT VIEW

SCALE: NOT TO SCALE

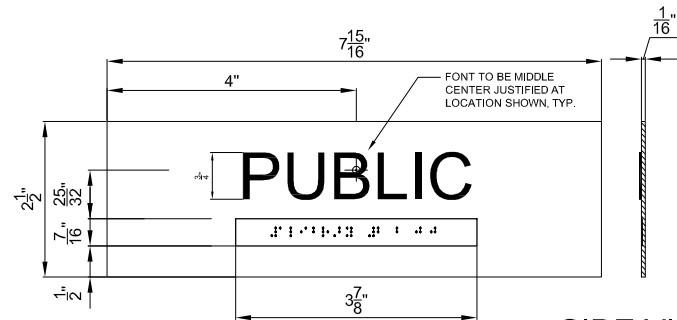


SIDE VIEW

SCALE: NOT TO SCALE

Note: The mounting surface should be identified for each sign to ensure that holes are provided only when it is possible to screw to the wall.

This restroom sign type is to be used for restrooms near public venues like Auditorium and Cafeterias **only** or if they are intended for public use.



FRONT VIEW

SCALE: NOT TO SCALE

SIDE VIEW

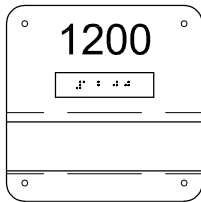
SCALE: NOT TO SCALE

GENERAL NOTE:
ALL TEXT MARKER PLACEMENT AND OVERALL DESIGN OF THIS PLACARD SHALL CONFORM TO ADA REGULATION STANDARDS WHERE APPLICABLE.

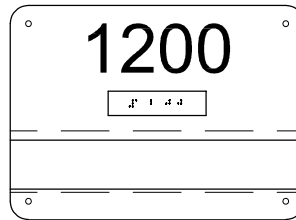
General Signage Examples

(Not to Scale)

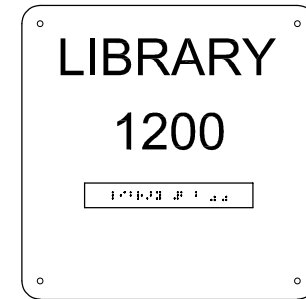
Type A - Admin



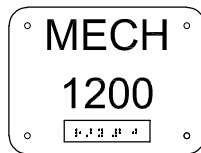
Type B - Classrooms



Type C - Specialized Areas



Type D - Maintenance Rooms



Type E - Public Restrooms



GENERAL NOTE:
ALL TEXT MARKER PLACEMENT AND
OVERALL DESIGN OF THIS PLACARD
SHALL CONFORM TO ADA REGULATION
STANDARDS WHERE APPLICABLE.

Functions NOT to Label on Signage

The following functions may not be labeled. Alternate names may be used instead.

NOT TO LABEL

- Life Skills
- Life Strides
- Special Education
- Isolation
- Quarantine

ALTERNATIVE LABELS

- Exam
- Testing

Color Standard for Signage

To prevent difficulty in replacing signs due to vandalism or other reasons, signs will be colored with WHITE lettering and BLACK background.

If alternate colors are requested, they must follow industry standard and ADA complaint colors shall be used, along with the following guidelines.

- No two-tone backgrounds
- Solid single-color backgrounds only
- All text must contrast with background color
- Only approved textured background maybe used for outdoor signage, must be weather resistant
- The color code must be provided to match the color for replacement signage in industry standard systems such as:
 - Pantone Matching System
 - RGB, HEX (Hexadecimal), CMYK, HSL, or HSV

APPENDIX D

CLARIFICATION OR DEVIATION FORM

Request For Clarification or Deviation Form



Requested By: _____

Firm's Name: _____

Date: _____

Project Name: _____

Trade impacted: **Mechanical / Plumbing / Electrical / Special Systems / Architectural / Other** _____

Enter the Design Guide or Master Spec section number if known: _____

Do the District's Standard provide guidance on this matter? Circle one **Yes / No**

Is the Design Professional proposing a deviation from the District's written standard(s)? Circle one **Yes / No**

Describe the issue, desired clarification or requested modification:

District's Response / Clarification: (Consultants do not write in this area)

Approved by: _____

Clarification Number: _____

Department: _____

___ 1) Attach supporting documentation

Date: _____

___ 2) Update / create impacted Standard