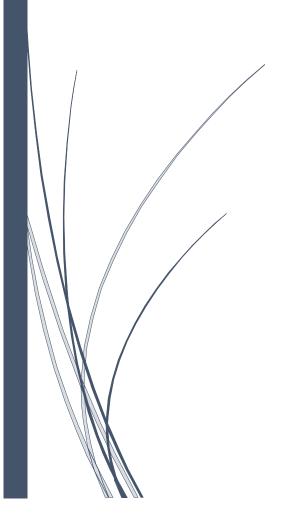
# Division 27

School District of Osceola County



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# SCHOOL DISTRICT OF OSCEOLA COUNTY DIVISION 27

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#### Section 27 00 00

#### COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communication Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County Technology Services Department (Attention: Technology Services Department Director).

#### 1.3 INTRODUCTION

- A. This document specifies School District of Osceola County (SDOC) requirements for a strategic direction for the physical connection of communications devices within SDOC facilities. A properly designed and constructed structured cabling system (SCS) will be adaptable to change over the life of SDOC facilities.
- B. The Contractor shall meet certain qualifications listed under Section 1.8 QUALIFICATIONS. The Contractor shall be responsible for the execution of all work to install a complete, warranted, structured cabling system. Execution of work includes delivery, storage, preparation, installation, field-testing, and project completion tasks.
- C. The Contractor shall comply with all current applicable codes, standards, and regulations for all the work performed.
- D. The structured cabling system will meet or exceed the performance requirements expressed in these documents. Contractors shall be responsible for testing 100% of the cable runs and submitting the results to the manufacturer for a twenty-five (25) year applications warranty.
- E. The design and construction of the telecommunications system will:
  - Provide telecommunications structure based on recognized standards to support efficient, longlasting, cost-effective operations.
  - Reduce the amount of time required to install new networks or to reconfigure existing local area networks.
  - Provide the flexibility to operate multiple high bandwidth technologies on a single structured cabling system.
  - 4. Eliminate the cost of installing non-standard, proprietary, vendor-specific cabling by providing standards-based cabling systems that will support a wide variety of equipment.
  - 5. Allow for the growth of anticipated high speed, high bandwidth Networks that may be required by future specialized applications.

#### 1.4 STANDARDS AND CODES

A. Effective telecommunications and networking cannot be accomplished without adherence to standards. Additionally, cabling infrastructure costs cannot be contained without adherence to sound installation and management practices. To ensure that the future telecommunications and connectivity needs of the School District of Osceola County are met in a cost-effective manner, these documents confirm the support of the ANSI/TIA and IEEE standards for telecommunications.

- American National Standards Institute, (ANSI) / Telecommunications Industry Association, (TIA) / Insulated Cable Engineers association, (ICEA) / Electronic Industries Alliance, (EIA)
  - a) ANSI/TIA-568.0-D

Generic Telecommunications Cabling for Customer Premises

b) ANSI/TIA-568.1-D

Commercial Building Telecommunications Infrastructure Standard

c) ANSI/TIA-568.2-D

Balanced Twisted-Pair Telecommunication Cabling and Components Standard

d) ANSI/TIA-568.3-D

Optical Fiber Cabling & Components Standard

e) ANSI/TIA-568.4-D

Coaxial Cabling Component Standard

f) ANSI/TIA/EIA-569-D

Commercial Building Standards for Telecommunications Pathways and Spaces

g) ANSI/TIA-607-C

Commercial Building Grounding and Bonding Requirements for Telecommunications

h) ANSI/TIA-942-A

Telecommunications Infrastructure for Data Centers

i) ANSI/TIA-1005-A

Industrial Telecommunications Infrastructure Standard

j) ANSI/TIA-4966

Telecommunications Infrastructure Standard for Educational Facilities

k) ANSI/TIA-5017

Telecommunications Physical Network Security Standard

I) ANSI/ICEAS-83-596

Fiber Optic Premises Distribution Cable

m) ANSI/TIA/EIA-598

Color Coding of Optical Fiber Cables

n) ANSI/ICEAS-87-640

Fiber Optic Outside Plant Distribution Cable

o) ANSI/TIA/EIA-492AAAC

Detail Specification for 850nm Laser-Optimized 50um Core Diameter/125 um Cladding Diameter Class 1a Graded Index Multimode Optical Fibers

p) ANSI/TIA-492AAAE

Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers with Laser-Optimized Bandwidth Characteristics Specified for Wavelength Division Multiplexing

q) ANSI/TIA/EIA-492CAAA

Detail Specification for Class Iva Dispersion-Unshifted Single Mode Optical Fibers

#### r) ANSI/TIA/EIA-758

Customer-Owned Outside Plant Telecommunications Cabling Standard

#### s) ANSI/TIA/EIA-526-7

Optical Power Loss Measurements of Installed Single Mode Fiber Plant: OFSTP-7

#### t) ANSI/TIA/EIA-526-14-A

Optical Power Loss Measurements of Installed Multimode Fiber Plant: OFSTP-14A

#### u) ANSI/TIA/EIA-TSB-125

Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning

#### v) ANSI/TIA/EIA-TSB-140

Additional Guidelines for Field Testing Length, Loss, and Polarity of Optical Fiber Cabling Systems

#### w) ANSI/TIA/EIA-606-B

Administration Standard for Commercial Telecommunications Infrastructure

#### x) ANSI/EIA-310-D

Cabinets, Racks, Panels, and Associated Equipment

#### y) ANSI/TIA/EIA-604(SERIES)

FOCIS Fiber Optic Connector Intermateability Standard

#### z) TIA-862-B

Structured Cabling Infrastructure Standard for Intelligent Building Systems

#### aa) TIA-TSB-5021

Guidelines for the use of Installed Category 5e and Category 6 Cabling to Support 2.5GBASE-T AND 5GBASE-T

#### National Fire Protection Association, Inc., NFPA 70

- a) National Electric Code (NEC), latest edition.
  - 1) NEC Article 250: Grounding
  - 2) NEC Article 386: Surface Metal Raceways
  - 3) NEC Article 388: Surface Non-Metallic Raceways
  - 4) NEC Article 800: Communications Circuits
  - 5) NEC Article 770: Optical Fiber Cables and Raceway

# 3. UNDERWRITER'S LABORATORY, INC. (UL)

- a) UL-5A: Standard for Non-Metallic Raceways and Fittings
- b) UL-5: Standard for Surface Metal Raceways and Fittings
- UL-5C: Standard for Surface Raceways and Fittings for use with Data, Signal, and Control Circuits
- d) UL-50: Standard for Enclosures for Electrical Equipment
- e) UL-94-VO: Tests for Flammability of Plastic Materials
- f) UL-498: Attachment Plugs and Receptacles

- g) UL-1479: Fire Tests of Through-Penetration Firestops (In Accordance with ASTM E814).
- h) UL-1863: Standard for Safety of Communications Circuit Accessories
- 4. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)
  - a) ANSI/NEMA WD-6-2002: Wiring Devices Dimensional Requirements
  - b) NEMA 250-2003: Enclosures for Electrical Equipment
- 5. INTERNATIONAL STANDARDS ORGANIZATION (ISO) / International Electrotechnical Commission, (IEC)
  - a) ISO/IEC 11801, Information Technology Generic Cabling for Customer Premises
  - ISO/IEC 18010, Information Technology Pathways and Spaces for Customer Premises Cabling
  - ISO/IEC 14763-1, Information Technology Implementation and Operation of Customer Premises Cabling – Part 1: Administration
- FEDERAL COMMUNICATIONS COMMISSION (FCC) Title 47, Code of Federal Regulations, Part 68: Connection of Terminal Equipment to the Telephone Network
- 7. U.S. PUBLIC LAW 336. 101ST CONGRESS, ADA: Americans with Disabilities Act of 1992.
- 8. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
  - a) IEEE 802.3AF, Data Terminal Equipment (DTE) Power Over Media Dependent Interface (MDI) 15.4 WATTS
  - IEEE 802.3AT, Data Terminal Equipment (DTE) Enhanced Power Over Media Dependent Interface (MDI) 25 WATTS
  - c) IEEE 802.3BT, Data Terminal Equipment (DTE) Enhanced Power Over Media Dependent Interface (MDI) 60 WATTS
  - d) IEEE 802.3BZ-2016: IEEE Standard for Ethernet Amendment 7: Media Access Control Parameters, Physical Layers, and Management Parameters for 2.5 Gb/S and 5 Gb/S Operation
  - e) IEEE 802.3BP 1000BASE-T1 Physical Layer Specifications and Management Parameters for 1 Gb/S Operation over a Single Twisted-Pair Copper Cable
  - f) IEEE 802.3BQ, IEEE Standard for Ethernet Amendment 3: Physical Layer and Management Parameters for 25 Gb/S and 40 Gb/S
  - g) IEEE 802.3AE, Specification for 10 Gbit/S Ethernet Operation Over Optical Fiber.
- Telecommunications Distribution Methods Manual, latest edition, Building Industry Consulting Services International (BICSI)
- 10. Information Technology Systems Installation Methods Manual latest edition, Building Industry Consulting Services International (BICSI).
- 11. Division 27 Design Guidelines Latest Edition at time of Conformed Documentation.

# 1.5 DESIGN CRITERIA

- A. School District of Osceola County requires the following design criteria / standards:
  - All Technology drawings shall be an integrative set, (T-sheets), utilizing SDOC approved master symbols and general notes – NO EXCEPTIONS.
  - 2. All structured cabling, pathways, spaces, devices, and assemblies shall be reflected

on Technology drawings including, but not limited to:

- a) IP camera locations interior and exterior
- Wireless Access Point locations ceiling space above 11 feet shall include WAP locations at 10 feet maximum – interior and exterior
- c) Intercom locations and components interior and exterior
- d) Classroom Amplification locations and components
- e) Audio-visual presentation systems
- f) Access Controls:
  - 1) Panellocations
  - 2) Door Controller locations
- g) Fire Alarm monitoring panel / locations / fiber optic or copper requirements
- h) HVAC monitoring including chiller plant control panels / auxiliary control panels / fiber optic or copper requirements / locations
- DAS / EMS systems including antenna locations / pathways / components / headend location / auxiliary locations
- j) Lighting sensor locations grayed out but present on all Technology drawings
- 3. It is the Technology Design Consultant's (RCDD) responsibility to coordinate with the electrical engineer to ensure all technology power and lighting requirements are integrated into the electrical drawings.
- 4. It is the Technology Design Consultant's (RCDD) responsibility to coordinate with the architect to ensure all technology furniture, fixture, and equipment (FF&E) requirements are integrated into the FF&E drawings.
- All climate-controlled spaces shall incorporate a minimum of one (1) D2 data outlet with an electrical outlet within 12 inches of data outlet unless otherwise noted (U.O.N).
- All electrical outlets shall incorporate a USB convenience outlet for student usage (minimum 3 outlets per classroom / office location) unless otherwise noted (U.O.N.).
- All electrical outlets associated with data outlets and / or electronic components shall not be controlled by occupancy sensors – NO EXCEPTIONS.
- 8. All materials, equipment, and installation shall be Contractor provided unless otherwise noted (U.O.N).
- All details associated with these standards are for reference purposes only. The details are NOT to be copied and pasted into the project Standards / Specifications.
  - a) The Technology Design Consultant (RCDD) shall insist all drawings associated with the project shall be original and relevant to the project and shall be in accordance with the School District of Osceola County Division 27 Standards and Specifications (latest version). No other Standards or Specifications shall be integrated into the project documents.

# 1.6 STRUCTURED CABLING SYSTEM (SCS)

A. The School District of Osceola County requires following the general cabling industry practice of using a SCS. Other cabling systems may be installed in addition to the SCS, but as a minimum, the School District of Osceola County requires that a SCS be installed. A properly designed SCS allows the Contractor to fulfill the telecommunications needs without knowing specifically what electronic equipment will be utilized. The SCS is geared for long-term stability and flexibility and is based on the idea of cabling buildings once. The SCS approach allows the cable and telecommunications outlets to remain unchanged as connections

and services vary.

B. There are typically five-major components of the SCS as follows:

1.	Section 27 00 00	Communications
2.	Section 27 10 00	Structured Cabling
3.	Section 27 20 00	Data Communications
4.	Section 27 40 00	Audio-Video Communications
5.	Section 27 50 00	Distributed Communications and Monitoring Systems

#### 1.7 SCOPE

A. The School District of Osceola County requires a uniform cabling plan in each building for data, wireless, signage and video distribution to allow for flexible changes, office renovations, equipment migrations and constant upgrades. This cabling system will be based on industry standard SCS's that are not proprietary and conform to current ANSI/TIA Commercial Cabling Standards.

#### 1.8 QUALIFICATIONS

- A. TelecommunicationsInstaller
  - 1. Qualifications for System Installer:
    - a) The Contractor shall have experience in the installation and testing of similar systems as specified herein and will have completed at least two projects of similar size and scope within the last 24 months. The Contractor shall provide references upon request (including the project name, address, date of implementation, client name, title, telephone number, and project description).
    - b) All members of the installation team must be certified by the manufacturer as having completed the necessary training to complete their part of the installation. All personnel will be adequately trained in the use of such tools and equipment as required.
    - c) The Contractor bidding on communication systems specified herein will be certified by the connectivity manufacturer to install, service, and warranty the specified product prior to the time of bid and throughout the duration of the installation. Manufacturer certifications will not be project specific and should be valid for all projects completed by Contractor.
    - d) The Contractor must be certified to install a certified fire-stop system.
    - e) The Contractor shall own and maintain tools, installation equipment, and test equipment necessary for successful installation and testing of optical and Category 6a premise distribution systems.
    - f) The Contractor must maintain a state Contractor's license as required by the state.
    - g) The Contractor installing the structured cabling will have a Registered Communication Distribution Designer (RCDD) and a Project Superintendent.
      - 1) The installation company will have an RCDD on staff performing the role of Project Manager, to be available for consultation and to attend project meetings. In addition, the Contractor shall appoint a site superintendent to provide onsite support and make decisions regarding the scope of work and changes required by the work. The same person may function as both.
    - h) The Contractor shall have an RCDD on staff that will ultimately be responsible for this project. The RCDD shall have sufficient experience in this type of project and be able to lend adequate technical support to the field forces during installation, during the warranty period and extended warranty periods or maintenance

- contracts. The credentials (current BICSI certification) must be available.
- The Contractors' Project Manager and site superintendent will act as primary points of contact for activities regarding this project.
- j) School District of Osceola County authorized personnel may, with full cooperation of the Contractor, visit installations to observe equipment operations and consult with references. Specified visits and discussion will be arranged through the Contractor; however, the Contractor's RCDD and Project Superintendent must both be in attendance to answer or discuss any questions or issues that are brought up. The Contractor shall make notes and distribute them to the School District of Osceola County authorized personnel within 48 hours.
- k) The site superintendent shall be required to make on-site decisions regarding the scope of the work and changes required by the work. The site superintendent shall be on the jobsite whenever work is being performed or workers are present.
- The Project Manager shall notify the Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)), and SDOC Technology Services Department Representative of change requests and inspections. Final approval for change requests must be obtained from Project Technology Designer (RCDD) and SDOC Technology Services Department Representative prior to commencement of work.
- m) The contractor's installation team will take pride and ownership of all aspects of the installation.

#### 1.9 QUALITY ASSURANCE

- A. The Contractor shall install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor shall have proper tools and test equipment to ensure a good and proper installation.
- C. Installed UTP and fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations.
- Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E. Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D ANDANSI/TIA/EIA-568-3.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of theinstallation.
- G. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according to ISO 9001.
- H. Installed products will be manufactured by an ISO9001 certified facility.
- I. Installed products will be free from defects in material or workmanship from the manufacturer and will be of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Inspection schedule shall be requested a minimum of three (3) business days prior to inspection date.
- L. Installed products will be lot-traceable by date code.

#### 1.10 SUBMITTALS

- A. The Contractor will submit shop drawings, a bill of material and product data to the Project Technology Designer, School District of Osceola County Project Manager, and School District of Osceola County Technology Services Department Representative for review and approval prior to commencement of work.
- B. The Contractor will submit two (2) project references.
- C. The Contractor will submit the RCDD's credentials.
- D. The Contractor will submit a list of JLA cleared employees that will be on-site for the project. This list will be updated to accommodate fluctuations in the workforce.
- E. All JLA cleared employees will be registered with the School District of Osceola County's Human Resources Department.
- F. The Contractor will submit the certificates from the Manufacturer for each worker that will be working on the project.
- G. The Contractor will indicate installation details, cable routing, system configuration, and outlet numbering on shop drawings.
- H. The Contractor will submit appropriate product data for each component to be supplied.
- I. The Contractor will submit manufacturer's installation instructions.
- J. The Contractor will submit three copies and an electronic PDF file of a complete, bound, project record manual consisting of the following:
  - 1. Product cut sheets for products supplied.
  - 2. The certificate of calibration for each tester used on the project, dated no more than one (1) year from the date of use.
  - 3. Test reports for horizontal cabling
  - 4. Test reports for backbone cabling
  - 5. Manufacturer's warranties
  - 6. As-built drawings
    - a) The As-built drawings will accurately record location of service entrance conduit, termination backboards, outlet boxes, cable raceways, cable trays, pull boxes, and equipment racks electronically using AutoCAD's latest version.

#### 1.11 WARRANTIES

- A. The Contractor will furnish a manufacturer's warranty of products, applications, and workmanship for 25 years from the date of acceptance by School District of Osceola County. Products and workmanship will carry warranties equal to or greater than the warranty from the date of acceptance by the state.
- B. Materials and workmanship will be fully guaranteed by the Contractor for 25 years from transfer of title against defects. The defects which may occur, as the result of faulty materials or workmanship within 25 years after installation and acceptance by the School District of Osceola County will be corrected by the Contractor at no additional cost to the School District of Osceola County.
- C. The Contractor will promptly, at no cost to the School District of Osceola County, correct or re-perform (including modifications or additions as necessary) nonconforming or defective work within 25 y e a r s after completion of the project.

- D. The Contractor will procure equipment and materials that carry warranties against defects and workmanship whenever available. The Contractor will transfer to School District of Osceola County additional warranties offered by the manufacturers, at no additional cost to School District of Osceola County.
- E. The Contractor's obligation under its warranty is limited to the cost of repair of the warranted item or replacement thereof, at the Contractor's option. Insurance covering said equipment from damage or loss is to be borne by the Contractor until full acceptance of equipment and services.
- F. At the end of the project, the telecommunications Contractor will provide one set of the revised as-built drawings accurately showing all termination locations, cable routing, and labeling.
- G. As-Built Document Requirements: (1) Hard Copy of the Drawings and Test Reports as well as (1) Complete Data File of the Drawings and Test Reports including the Summary Reports on a Flash Drive

#### 1.12 MATERIALS

- A. Contractor will be an authorized installing agent / company with full warranty privileges for the following premise distribution enterprise cabling systems (and approved partners) solutions:
  - 1. Hubbell Premise Wiring
- B. Product substitutions from other manufacturers will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.
- C. All materials will be UL or ETL listed and verified and will be marked as such.
- D. Products will be regularly catalogued items of the manufacturer and will be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- E. All materials used on this project will be new. Used and refurbished equipment is not permitted. Provide equipment to the site in original packaging whenever practical.

# 1.13 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material will be delivered to the site in the original packing.
- B. Materials delivered to the construction site will be stored in a dry, secure area, preferably indoors. Storage temperature of materials will adhere to manufacturer's recommendations. Movement of packaged materials will be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, will have permission of School District of Osceola County Staff, and will not interfere with other construction activity.
- C. Installation of Category rated cable will be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor will replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by School District of OsceolaCounty.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

#### 1.14 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines will take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines will not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues will be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor approved corrections, any adjustments will be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.
  - Will ensure that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
  - 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
  - 6. Will coordinate sleeve selection specified in Division 26.
  - Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
  - 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION 27 00 00

#### Section 27 05 26

#### **GROUNDING & BONDING FOR COMMUNICATIONS SYSTEMS**

#### PART 1 GENERAL:

#### 1.1 INTRODUCTION:

- A. The purpose of this section is to enable the installation of generic telecommunications bonding systems within a premise that will allow for the safest and best way to protect the telecommunications system and equipment.
- B. The bonding and grounding systems within a building are intended to have one electrical potential for the safety of people and equipment throughout the facility.
- C. Whereas the primary purpose of the electrical grounding system is safety, the telecommunication's grounding system is intended to provide enhanced equipment protection and system performance.
- D. While the bonding and grounding of the electrical service entrance is outside the scope of the referenced standard, coordination between electrical and telecommunications bonding systems is essential for the proper application of this standard.
  - Electrical rooms, electrical panel board(s) and connection to the Electrical Distribution Panel are not part
    of the telecommunications infrastructure, but they are depicted in this standard because they are
    integral to the telecommunications bonding system.

#### 1.2 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.	Section 27 00 00	Communications
2.	Section 27 05 28	Pathways for Communications Systems
3.	Section 27 05 36	Cable Trays for Communications Systems
4.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
5.	Section 27 13 13	Communications Copper Backbone Cabling
6.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
7.	Section 27 15 13	Communications Copper Horizontal Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access Point Systems
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

#### 1.3 STANDARDS AND CODES:

- A. Refer to Section 270000 Communications
- B. Refer to Division 1 Reference Standards and General Conditions of the Contract
- C. Complies with both ANSI/TIA-607-C and NEC Article 250. The most stringentrules apply.

# 1.4 APPROVED PRODUCT MANUFACTURERS:

- A. The manufacturer of the materials in this section, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1. Hubbell Premise Wiring

B. Product substitutions from other manufacturers shall require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.5 SUBMITTALS

- A. Shop Drawings:
  - Shop drawings shall show the locations where cables are to be routed and where terminating hardware is to be installed.
- Submit Manufacturer's Cut Sheets for the following: Refer to Section 270000 Communications Submittal.
  - 1. Major items not included in the product section of the specification.
  - 2. Submit Manufacturer's Cut Sheets for the following:
    - a) PBB busbar (TMGB)
    - b) SBB busbar (TGB)
    - c) RBB busbar (rack busbars)
    - d) UL497 Primary Protector for Communication Circuits
    - e) Advanced Solid-state primary telecommunications five pin surge protection module
    - f) Advance High speed fused solid state secondary surge protection module
    - g) Irreversible Crimp Style Two-hole lugs
    - h) No. 750 kmil to No. 6 AWG conductors (products used in system)
    - i) Report of field tests and observations.

#### 1.6 QUALITY ASSURANCE

#### A. Manufacturers:

1. Firms regularly engaged in manufacture of electrical connectors, terminals and fittings of types and rating required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods and plate electrodes, whose products have been in satisfactory use in similar service for not less than 3 years.

#### B. Installer:

- Qualified with at least 3 years of successful installation experience on projects with technology groundwork similar to that required for this project.
- C. Listing and labeling:
  - Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electric Code, Article 100.
- D. Listing and Labeling Agency Qualifications:
  - 1. A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- E. Component Standard:
  - 1. Components and installation shall comply with NFPA 70, "National Electric Code" (NEC).
- F. UL Compliance:
  - Comply with applicable requirements of UL Standards Nos. 467 and 869 pertaining to electrical and electronic grounding.
- G. IEEE Compliance:
  - Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical and electronic grounding.

#### 1.7 DEFINITION:

- A. TBC (Telecommunications BondingConductor):
  - 1. The TBC bonds the PBB to the service equipment (power) ground.
- B. PBB (Primary Bonding Busbar):
  - 1. The PBB serves as the dedicated extension of the building grounding electrode system for the

telecommunications infrastructure. The PBB also serves as the central attachment point for the TBB(s) and equipment. Typically installed in the entrance facility or entrance room, and is bonded to the service equipment (power) ground by the TBC (Telecommunication Bonding Conductor).

#### C. SBB (Secondary Bonding Busbar):

1. The SBB is the bonding connection point for telecommunications systems and equipment in the area served by a distributor. A copper ground reference busbar, typically installed in telecommunication closets (TR) and is bonded to the PBB by the TBB. The SBB references metallic entities in the TR space to ground.

#### D. RBB (Rack Bonding Busbar)

The RBB is a busbar that is placed inside or on the equipment cabinets or racks. It is used to bond the
cabinets/rack/active electronics/shielded products to the system. It is connected to the system by being
attached to the RBC.

#### E. TBB (Telecommunications BondingBackbone)

An insulated copper conductor extending from the PBB to each SBB. The TBB is a conductor that
interconnects all SBBs with the PBB. The intended function of a TBB is to reduce or equalize potential
differences.

#### F. TEBC (Telecommunications Equipment Bonding Conductor)

1. The TEBC connects the busbar to equipment racks/cabinets. More than one TEBC may be installed in a distributor. The TEBC shall be a continuous copper conductor that is sized not less than a 6 AWG or as the largest size equipment grounding conductor in the ac branch power circuit(s) serving the racks/cabinet lineup.

#### G. BBC (Backbone Bonding Conductor)

1. When there are multiple TTBs, the BBC is employed to interconnect them through the associated busbars, either on the same floor in a multi-story building or in the same general area of a single-story building.

#### H. RBC (Rack Bonding Conductor)

1. A conductor, typically 6 awg that attaches from the TEBC to RBB.

#### I. Primary Surge Protection (Building Entrance Application)

1. A device whose primary function is to protect building entrance terminations from surge voltage usually incorporating a 110-block style connection system and 5-pin module fuse system for analog copper cabling applications.

# J. Secondary Surge Protection (Intra-Building Application)

A device whose primary function is a secondary surge protection termination from surge voltage usually
incorporating a 66-block style connection system and cross pin module fuse system for analog copper cabling
applications.

#### 1.8 WARRANTIES:

A. Refer to Section 27 00 00 for general details.

#### 1.9 MATERIALS:

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
  - A. All materials used on this project will be new. Used and refurbished equipment is not permitted. Provide equipment to the site in original packaging wherever practical.

#### 1.10 DELIVERY, STORAGE AND HANDLING LOGISTICS:

- A. Material shall be delivered to the site in the original packaging.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the owner, and shall not interfere with other construction activity.

- C. Installation of cables shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended. Cables should only be installed in facilities that are not exposed to the elements.
- D. The contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The contractor shall replace any damaged or stolen equipment. The contractor is responsible for all equipment until final project acceptance by owner.
- E. The contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

#### 1.11 COORDINATION WITH OTHER TRADES:

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department representative for approval before proceeding with the work.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 representative, Project Technology Designer, SDOC Technology Services Department representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.
  - 4. Will that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
  - Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
  - 6. Will coordinate sleeve selection and application with selection and application of fire stopping specified in Division 07 and Division 26
  - 7. Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08.
  - 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.

#### PART 2 PRODUCTS:

#### 2.1 REFERENCE PART NUMBERS:

- A. Bidder shall confirm all reference part numbers, listed within Division 27, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.
- 3. All materials associated with reference parts shall be included so as to constitute a complete and functional system, whether or not specifically identified, itemized, and quantified.

#### 2.2 COMPONENTS:

#### A. Busbars:

- 1. Primary Busbar (PBB):
  - a) The PBB must be provided with holes for use with correctly matched listed lugs and hardware. No solid busbars that the contractor drills the holes will be permitted.
  - b) The busbars shall be made of copper or copper alloys having a minimum of 95% conductivity when annealed as specified by the International Annealed Copper Standard (IACS). Aluminum or Tin-plated busbars are not allowed.

- c) Dimensions: 4.0"W X 20"L X.25"T
- d) The busbar must be UL listed and tested by a Nationally Recognized Testing Laboratory.
- e) The busbar will be insulated from its support and maintain a 2" minimum clearance from the wall.
  - 1) Hubbell Premise Wiring:
    - Part Number: HBBB14420J
- 2. Secondary Busbar (SBB):
  - a) The SBB must be provided with holes for use with correctly matched listed lugs and hardware. No solid busbars that the contractor drills the holes will be permitted.
  - b) The busbars shall be made of copper or copper alloys having a minimum of 95% conductivity when annealed as specified by the International Annealed Copper Standard (IACS). Aluminum or Tin-plated busbars are not allowed.
  - c) Dimensions: 2.0"W X 10"L X.25"T
  - d) The busbar must be UL listed and tested by a Nationally Recognized Testing Laboratory.
  - e) The busbar will be insulated from its support and maintain a 2" minimum clearance from the wall.
    - 1) Hubbell Premise Wiring:
      - Part Number: HBBB14210A
- 3. Rack Busbar (RBB):
  - a) The RBB must be provided with holes for use with correctly matched listed lugs and hardware. No solid busbars that the contractor drills the holes will be permitted.
  - b) The busbars shall be made of copper or copper alloys having a minimum of 95% conductivity when annealed as specified by the International Annealed Copper Standard (IACS). Aluminum or Tin-plated busbars are not allowed.
  - c) The busbar must be UL listed and tested by a Nationally Recognized Testing Laboratory.
  - d) No copper tapes will be allowed.
    - 1) Hubbell Premise Wiring PartNumber:
      - Vertical: HBBBVR36KT
      - Horizontal: HBBBHR19KT
- B. Primary / Secondary Surge Protection System
  - 1. Primary Surge Protection (Building EntranceTermination):
    - a) UL497 Primary Protector for Communication circuits.
    - b) 16 AWG Powder Coated Steel Construction
    - c) Equipped with an internal 26 AWG FuseLink
    - d) External Ground Connectors Accept 6 14 AWGwire
    - e) Industry Standard 5 Pin Design
    - f) Exceeds UL497 Primary ProtectionStandards
    - g) 110 Connector Accepts 22 26 AWG wire
      - 1) Circa Telecom
        - Model 1880ENA1/NSC-25 (25 Pair indoor 110/110 no cover)
        - SRA 5-pin module
  - $2. \quad \mbox{Secondary Surge Protection (Intra-Building Termination):} \\$

- a) Exceeds UL497B isolated loop circuit protector
- b) Used in conjunction with Primary Surge Protection (UL497)
- C) Protection modules elements switch from normal high impedance state to low impedance state upon detection of surge – returns to high impedance state after surge passes.
- d) Modules require MGB ground rail (66 block application)
  - 1) EDCO Protection Products
    - COHP Series
    - H Series

#### C. Lugs:

- 1. All lugs will be solid copper construction and tin plated.
- 2. UL and CSA Listed.
- 3. All lugs will be long barrel, color coded, irreversible crimp style, and have two holes.
- 4. Hubbell Premise Wiring PartNumber:

a)	6 awg	Blue	HGBL06D (SBB)
b)	6 awg	Blue	HGBL06DA (PBB)
c)	4 awg	Gray	HGBL04DA
d)	2 awg	Brown	HGBL02DA
e)	1 awg	Green	HGBL01DA
f)	1/0	Pink	HGBL10DA
g)	2/0	Black	HGBL20DA
h)	3/0	Orange	HGBL30DA
i)	4/0	Purple	HGBL40DB
j)	250 kcmil	Yellow	HGBL250DB
k)	300 kcmil	White	HGBL300DB
I)	350 kcmil	Red	HGBL350DB
m)	500 kcmil	Brown	HGBL500DB
n)	600 kcmil	Green	HGBL600DB
o)	750 kcmil	Black	HGBL750DB

#### D. Cable:

- 1. Color: Green
- 2. All bonding conductors shall be copper and may be insulated. When conductors are insulated, they shall be listed for the application (plenum or riser).
- 3. Bare copper conductors may be used in plenum areas, but they must be protected.
- 4. Bend radius 8 inches.
- 5. A minimum angle of 90° shall be used.

#### PART 3 EXECUTION:

#### 3.1 PLACEMENT OF SURGE PROTECTION SYSTEMS:

- A. Primary Surge Protection:
  - 1. The desirable location of the Primary Surge Protector is in the telecommunication entrance room or space.
  - 2. There should be a single Primary Surge Protector per building.

- 3. For buildings with more than one primary analog copper cable entrance, the user is urged to consult with a licensed engineer for guidance on locating the Primary Surge Protector.
- 4. A practical location for the Primary Surge Protector is at the entrance location of the analog copper cable entrance (where provided) and clear of other cabling and grounding infrastructure.
- 5. The vertical location of the Primary Surge Protector should be determined by considering whether the bonding conductors are routed in an access floor or overhead cable support.
- The placement of the Primary Surge Protector should be installed for the shortest and straightest
  practical routing to the Telecommunications Bonding Conductor (TBC) and the primary protector
  grounding conductor.

#### B. Secondary Surge Protection:

- 1. The desirable location of the Secondary Surge Protector is in the telecommunication room or space.
- 2. There should be a single Secondary Surge Protector perfloor.
- 3. For buildings with more than three secondary analog copper cable entrances, the user is urged to consult with a licensed engineer for guidance on locating the Secondary Surge Protector.
- 4. A practical location for the Secondary Surge Protector is at the entrance location of the analog copper cable entrance (for each floor) and clear of other cabling and grounding infrastructure.
- 5. The vertical location of the Secondary Surge Protector should be determined by considering whether the bonding conductors are routed in an access floor or overhead cable support.
- The placement of the Secondary Surge Protector should be installed for the shortest and straightest practical routing to the Telecommunications Bonding Conductor (TBC) and the primary protector grounding conductor.

#### 3.2 PLACEMENT OF BUSBARS:

#### A. PBB (TMGB):

- 1. The desirable location of the PBB is in the telecommunications entrance room or space.
- 2. There should be a single PBB perbuilding.
- 3. For buildings with more than one electrical service entrance, each of which serves telecommunications equipment, the user is urged to consult with a licensed engineer for guidance on locating the PBB.
- 4. The PBB shall be located at least 3 feet away from the panel board (electrical power panel) and shall be installed to maintain clearances required by applicable electrical codes.
- 5. A practical location for the PBB is off to the side of the panel board (where provided) and clear of other cabling and groundinginfrastructure.
- 6. The vertical location of the PBB should be determined by considering whether the bonding conductors are routed in an access floor or overhead cable support.
- When a panel board for telecommunications equipment is not installed in the telecommunications
  entrance room or space, the PBB should be located near the backbone cabling and associated
  terminations.
- 8. Its placement should provide for the shortest and straightest practical routing of the Telecommunications Bonding Conductor (TBC) and the primary protector grounding conductor.
- 9. The PBB shall be insulated from its support using an insulator that is listed for the purpose by a Nationally Recognized Testing Laboratory (NRTL).
- 10. A minimum of 2 inches separation from the wall is recommended to allow access to the rear of the busbar.
- 11. The PBB should serve telecommunications equipment that is located within the same room or space.
- 12. The PBB serves as the central bonding busbar for the telecommunications bonding infrastructure.
- 13. All equipment located in the entrance facility will be attached to the PBB.
- 14. All cables that enter the Entrance Facility with an armored jacket will be bonded to the PBB.
- 15. All ladder rack(s), Basket tray(s) and conduit(s) that leaves the entrance facility will be bonded to the PBB.
- 16. The busbar shall be cleaned, and an antioxidant should be applied prior to fastening connectors to the

busbar.

17. All hardware (bolts, washers and nuts) that attaches to the PBB will be stainless steel.

#### B. SBB (TGB):

- 1. The desired location of the SBB is in the telecommunication distribution room.
- The SBB shall be located at least 3 feet away from the panel board (electrical power panel) and shall be installed to maintain clearances required by applicable electrical codes.
- The vertical location of the SBB should be determined by considering whether the bonding conductors are routed in an access floor or overhead cable support.
- 4. When a panel board for telecommunications equipment is not installed in the telecommunications entrance room or space, the SBB should be located near the backbone cabling and associated terminations.
- 5. The SBB shall be insulated from its support using an insulator that is listed for the purpose by a Nationally Recognized Testing Laboratory (NRTL).
- 6. A minimum of 2 inches separation from the wall is recommended to allow access to the rear of the busbar.
- 7. The SBB should serve telecommunications equipment that is located within the same room or space.
- 8. Where a panel board is located in the same room or space as the SBB that panel board's ACEG bus (when equipped) or the panel board enclosure shall be bonded to the SBB.
- 9. When a panel board for telecommunications equipment is not in the same room or space as the SBB, that SBB should be bonded to the panel board that feeds the distributor.
- 10. The TBBs and other SBBs within the same space shall be bonded to the SBB with a conductor the same size as the TBB. In all cases, multiple SBBs within a room shall be bonded together with a conductor the same size as the TBB or with splice bars.
- 11. Where a backbone bonding conductor (BBC) is required, it shall be bonded to the SBB.
- 12. The TEBC will be attached to the SBB.
- 13. All metallic pathways for telecommunications cabling located within the same room or space as the SBB shall be bonded to the SBB.
- 14. All ladder rack(s), Basket tray(s) and conduit(s) that are used within the distributor will be bonded to the SBB.
- 15. The busbar shall be cleaned, and an antioxidant should be applied prior to fastening connectors to the busbar.
- 16. All hardware (bolts, washers and nuts) that attaches to the SBB will be stainless steel.

# C. RBB:

- 1. The RBB shall be installed horizontally or vertically on the rack using insulators which provide a minimum of 0.75 in separation.
- The RBB shall be bonded to either the rack bonding conductor or to the Telecommunications Equipment Bonding Conductor and to the rack.
- 3. All the equipment within the rack or enclosure will be bonded to the RBB. Any shielded products that enter the rack or enclosure will be bonded to the RBB.
- The busbar shall be cleaned, and a compatible antioxidant should be applied prior to fastening connectors to the busbar.
- All hardware (bolts, washers and nuts) that attaches to the RBB will be stainless steel.

#### 3.3 INSTALLATION OF TBC (TELECOMMUNICATIONS BONDING CONDUCTOR):

- A. Must be done by licensed electrician.
- B. Must be size to the largest cable used in the bonding system.
- C. Cable runs from the Electrical Distribution Panel to the PBB.
- 3.4 INSTALLATION OF THE TBB (TELECOMMUNICATION BACKBONE):

	•	ПА
	TBB/GE-	LENGTH TABLE
	Linear Length	Size
	Less than 13	6
	14 - 20	4
	21 - 26	3
	27 - 33	2
	34 - 41	1
р	42 - 52	1/0
3.	53 - 66	2/0
	67 - 84	3/0
	85 - 105	4/0
	106 – 125	250 kcmil
	126 - 150	300 kcmil
	151 – 175	350 kcmil
	176 – 250	500 kcmil

- A. Determine the length from the PBB to the farthest SBB. You may have multiple risers, with varying lengths.
- B. Multiple TBBs are permitted.
- C. Use the table and size the conductor for each TBB (Table 1).
- D. Run the cable from the PBB to the farthest SBB on an individual run. Terminate both sides with a lug and attach to the busbars.
- E. At each level, where there is a busbar along that length: use c-tap or h-tap to join a cable to the TBB (of equal size of the TBB) and run to the SBB. Terminate a lug on the end and attach to the SBB.
- F. TBB conductors shall be protected from physical and mechanical damage. All joints shall be adequately supported and protected from damage.
- G. The TBB conductors should be installed without splices, however, where splices are necessary, the number of splices should be minimized.
- H. Splices shall be accessible and be located in telecommunications spaces. Joined segments of a TBB shall be joined by means of a listed exothermic weld, listed irreversible compression-type connectors, or equivalent.
- I. Metallic cable shield(s), concrete reinforced steel, water pipe or any metal pathway for cable (e.g., conduit) shall not be used as a TBB.
- J. Structural metal is bonded to the building's grounding electrode system it may be used in place of a TBB.

TABLE 1

600 kcmil

750 kcmil

251 - 300

301+

- Before utilizing structural metal in place of a TBB, ensure the structural metal is electrically continuous or can be made so.
- 2. A two-point continuity test should be performed on the structural metal to verify electrical continuity and acceptable resistance along the paths used as bonding conductors.
- K. Concrete reinforcing steel shall not be used as a TBB or a BBC.
- 3.5 INSTALLATION OF THE TEBC (TELECOMMUNICATIONS EQUIPMENT BONDING CONDUCTOR):
  - A. The TEBC connects the PBB/SBB to the RBB in the equipment racks/cabinets.
  - B. More than one TEBC may be installed.
    - 1. The TEBC shall be a continuous copper conductor that is sized not less than a 6 AWG or as the largest size equipment grounding conductor in the ac branch power circuit(s)
      - ow.
    - 2. Cable will be run from the SBB to the farthest rack or cabinet in the row.
      - The TEBC will be terminated, with a listed irreversible crimp style two-hole long barrel lug, to the RBB.
  - C. Cable shields, metal conduits, cable runways or ladders, or any other metallic cable pathways do not satisfy the requirements for aTEBC.
  - D. The TEBCs will be routed on the outside of ladder rack or cable tray.
    - 1. Supported at 3-foot intervals.
  - E. An alternative method to running TEBCs overhead is to route them under an access floor.
  - F. TEBCs shall be separated a minimum of 2 inches from conductors of other cable groups such as power or telecommunications cables.
    - An exception may be when conductors are grouped together to enter or exit a cabinet or enclosure. Grouping only at this point is acceptable, provided the conductors are suitably separated on either side of the opening.
  - G. TEBCs shall be separated from ferrous material by a distance of at least 2 inches.



#### 3.6 INSTALLATION OF THE RBB:

- A. The RBB will be attached to the TEBC.
- B. The RBB will be mounted horizontally or vertically to the equipment rack or cabinet.
- C. The busbar shall be cleaned, and an antioxidant should be applied prior to fastening connectors to the busbar. The antioxidant will be cleaned off after the bolts are tightened.
- D. All hardware (bolts, washers and nuts) that attaches to the RBB will be stainless steel.
- E. The rack or enclosure will be bonded to the RBB.
- F. All electronic equipment will be bonded to the RBB.
- G. All doors and side panels will be bonded with a bonding jumper.
  - 1. The jumper shall be a minimum sized conductor of 12 AWG stranded, high strand count, insulated copper conductor with green or green with yellow stripe jacket.
  - 2. The bonding jumper should have a solderless quick connect to facilitate detaching and attaching the panel or door.

#### 3.7 BONDING LADDER RACK OR CABLETRAY:

- A. Ladder rack or cable tray will be bonded from the PBB/SBB.
- B. Joints will be bonded with a 9-inch strap. A 2-hole long barrel lug will attach the strap to the ladder rack/cable tray.
- C. The paint or finish will be removed prior to termination to the ladder rack or cable tray and an antioxidant should be applied prior to fastening connectors to the busbar. The antioxidant will be cleaned off after the bolts are tightened.

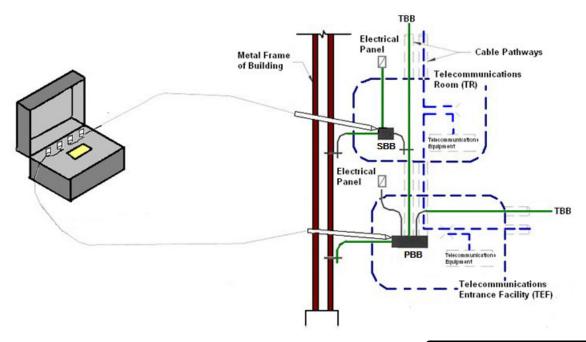
#### 3.8 ARMORED FIBER OPTIC CABLES:

A. All armored fiber optic cables will be bonded per NEC 700.100.

#### 3.9 TESTING:

- A. Prior to two-point ground testing, a visual inspection shall be performed to verify that the bonding system is installed according to the guidelines of ANSI/TIA-607C.
- B. Due to the possibilities of ground faults traveling through the telecommunications bonding system, a voltage test should be performed prior to conducting the two-point continuity test and verified with the test equipment manufacturer's instructions.
- C. Testing requirements require a Two-point ground/continuity testing:
  - 1. Helps to determine if there is an acceptable level of resistance between any point in the telecommunications bonding system and the building's electrical grounding electrode system.
  - 2. The test is performed using an earth ground resistance tester that is configured for a continuity test, otherwise known as a two-point test or a "dead earth" test.
  - 3. The test is typically performed by connecting one test lead to the nearest building's electrical grounding electrode and the other test lead to a specific point on the telecommunications bonding system such as the PBB. This same test can also verify continuity between any two points of the telecommunications bonding system such as between the PBB and a SBB.
  - 4. It is recommended that this test be performed in the following areas:
    - a) PBB/SBB to the electrical ground in Distributors
    - b) PBB/SBB to the structural metal (if present)
    - c) PBB to SBB
    - d) Structural metal (if present) to the electrical ground.
- D. Consult with other contractors to ensure other electrical work does not interfere with this test.
- E. In order for this test to be valid it should be done before the telecommunications equipment is installed otherwise parallel paths may invalidate test results.

F. The recommended maximum value for resistance between any point in the telecommunications bonding system and the building's electrical grounding electrode system is 100 milliohms.



#### 3.10 ADMINISTRATION:

- A. Each telecommunications bonding conductor shall be labeled at its points of termination.
- B. Labels shall be located on conductors as close as practical to their points of termination in a readable position.

IF THIS CONNECTOR OR CABLE IS
LOOSE OR MUST BE REMOVED,
PLEASE CALL THE BUILDING
TELECOMMUNICATIONS
MANAGER

END OF SECTION 27 05 26

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# Section 27 05 28 PATHWAYS FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

#### 1.3 INTRODUCTION

- A. Telecommunications Space Overview:
  - The design of spaces to house telecommunications cabling and equipment shall be in accordance with the ANSI/TIA-569-D: commercial building standard for telecommunications pathways and spaces and addenda to this standard.
  - 2. This section covers the design and installation of telecommunications:
    - a) Spaces:
      - 1) Entrance facilities
      - 2) Telecommunications rooms and enclosures
      - 3) Pull boxes
      - 4) Floor boxes and poke throughs
    - b) Pathways:
      - 1) Ladder rack
      - 2) Cable tray
      - 3) Conduit
      - 4) J-hooks
      - 5) Inner duct

# 1.4 RELATED DOCUMENTS

A. Division 27 Specifications, apply to this Section:

1.	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 36	Cable Trays for Communications Systems
4.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
5.	Section 27 13 13	Communications Copper Backbone Cabling
6.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
7.	Section 27 15 13	Communications Copper Horizontal Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords

- Section 27 21 33 Wireless Access PointSystem
   Section 27 41 16 Classroom Amplification Systems
- 12. Section 27 51 50 Educational Intercom / Public Address / Bell Signaling Systems

#### 1.5 SUBMITTALS

- A. Shop drawings shall show the locations where cables are to be routed and where termination hardware is to be installed.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal
  - 1. Major items not included in the Productsection.
  - 2. Submit product data for the following:
    - a) Ladder rack
    - b) Cable tray
    - c) J-hooks
    - d) Pull boxes
    - e) Ceiling or zone enclosures
    - f) Floor boxes, poke through and accessories

#### 1.6 QUALITY ASSURANCE

- A. Manufacturers:
  - 1. Firms regularly engaged in manufacture of the materials called out for in this section
- B. Materials:
  - 1. Will have accessories that will make the installation safe and useful. Electrical connectors, terminals and fittings shall have the rating required.
- C. Installer:
  - 1. Qualified with at least 3 years of successful installation experience on projects with technology infrastructure work similar to that required for this project.
- D. Listing and labeling:
  - 1. Provide products specified in this section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electric Code, Article 100.
- E. Listing and labeling agency qualifications:
  - 1. A "nationally recognized testing laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- F. Component standard:
  - 1. Components and installation shall comply with NFPA 70, "NATIONAL ELECTRIC CODE" (NEC).
- G. Installation:
  - 1. If there is a conflict between the code and the standards, the most stringent rule shall apply.

#### PART 2 PRODUCTS

#### 2.1 APPROVED MANUFACTURERS

- A. Subject to compliance with requirements, the following is the basis of design:
  - 1. Hubbell Premise Wiring

B. Product substitutions from other manufacturers shall require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 2.2 REFERENCE PART NUMBERS

- A. Bidder shall confirm all reference part numbers, listed within Division 27, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.
- B. All materials associated with reference parts shall be included so as to constitute a complete and functional system, whether or not specifically identified, itemized, and quantified.

#### 2.3 LADDER RACK

- A. Ladder rack is the effective and widely used cable runway that supports and delivers bundles of cable between cabinets, racks, and closets, along walls, and suspended from ceilings.
- B. The ladder rack system features light, rugged, tubular steel construction. It is designed for mechanical support and strain relief in long runs of cable and creates a smooth gradual bend for cable. Rail and stringer material is 16 GA steel tubing.
- C. Ladder rack shall be manufactured from 16 GA Tubular steel.
  - 1. Stringers will be made from 3/8" wide by 1-1/2" high tubular steel.
  - 2. Cross members will be made from 1" wide by 1/2" high tubular steel.
  - 3. Cross members will be welded in between stringers on 9" centers.
- D. The ladder rack is available in gray and black finishes.
- E. The ladder rack system features a broad line of sizes and fittings required for proper installation.

#### 2.4 CABLE TRAY - WIRE MESH

- A. Clean and attractive pre-galvanized steel finish
- B. No post-production chemical cleaning and plating. All surfaces are to be free of zinc whiskers, oils, solvents, and soot from welding operation.
- C. All wire trays are UL classified and can be used in grounding.
- D. Available for overhead or under-floor applications
- E. 100% recycled steel content
- F. The wire basket cable tray systems provide superior cable management and protection for data communications cabling.
- G. The wire basket cable tray system features a broad line of sizes and fittings required for proper installation.
- H. Layouts, installations, and changes are quickly and easily configured to requirements with wire cutting tools. Basket tray installs faster than conduit systems and offers more flexibility and capacity.
- I. Individual tray sections shall be 10 ft.long.
- J. The cable tray system is available in 4", 6", 8", 12", 16", 18", 20" or 24" widths.
- K. The cable tray system sidewalls are available with 2", 4" or 6".

### 2.5 J-H00KS

- A. The J-Hooks will have a wide base design and smooth beveled edges to provide a large bending radius for current and future high-performance data cables and fiber optics.
- B. J-Hooks offer a solution that meets industry standards for Cat 6A and easily accommodates large-

- diameter fiber optic, innerduct and coax cable.
- C. The J-Hooks are designed to provide a strong and stable pathway support installation.
- D. Provides optimal support for high-performance data cable, up to and including Cat 5e, Cat 6, Cat 6A, and fiber optic cables.
- E. Rounded edges on J-Hooks provide proper bend radius support for high performance data cables.
- F. Multiple color options aid in the identification and organization of pathway application.
- G. Provides superior fill capacity and load rating over most other non-continuous cable support alternatives:
  - 1. Category 5e 50 Cables
  - 2. Category 6 35 Cables
  - 3. Category 6A 25 Cables
- H. Compliant with UL® 2043 and suitable for use in air handling (plenum) spaces.
- I. J-hooks do not require to be grounded.
- J. Meets ISO®/IEC 14763-2, ANSI/TIA 568 and ANSI/TIA 569
- K. Erico/Caddy Cat 32

#### 2.6 CONDUIT SYSTEMS

- A. Conduit:
  - 1. Approved manufacturers:
    - a) For galvanized rigid conduit (GRC), intermediate metallic conduit (IMC), and electrical metallic tubing (EMT) are:
      - 1) Triangle
      - 2) Allied
      - 3) Wheatland
- B. Datacom/AV/Electrical box:
  - 1. Gangable AV Wall Boxes are a solution for in wall applications requiring AV, data and power integration.
  - Concentric 1"- 2" knockouts combined with a 4-inch depth facilitates easy installation of AV cables
    incorporating pre-connectorized heads and bend radii required for high performance Category 6 and
    6A cables.
  - 3. Designed to be installed independently or ganged together to receive any number of devices, allowing them to accept any standard wall plate.
  - 4. The Gangable AV Wall has a built-in adjustable sheetrock locating bracket to adjust to the depth of the sheetrock.
  - 5. The Gangable AV Wall can be installed in 2, 3, 4, and 6 gang applications.
  - 6. A ground screw available in each gang so that regardless of what services are brought into the box there is a means of grounding readily available.
  - 7. The metallic low voltage partition is available to separate electrical from low voltage and can be use used to divide other low voltage applications.
  - 8. A metallic low voltage partition is available for both boxes and is adjustable to accommodate any number of gangs.
  - 9. Approved manufacturer of Datacom/AV/Electrical box is:

- a) 2 gang Hubbell HBL985
- b) 3 gang Hubbell HBL986

#### PART 3 EXECUTION

#### 3.1 LADDER RACK

#### A. Horizontal Ladder Rack:

- Provide all components of the ladder rack system (ladder rack, turns, splices, supports, and accessories) from a single manufacturer.
- Ladder rack shall be installed with side stringers facing down so that the ladder forms an inverted U- shape and so that welds between the stringers (sides) and cross members (middle) face away from cables.
- Ladder rack shall be secured to the structural ceiling, building truss system, wall, floor, or the tops
  of equipment racks and/or cabinets using the manufacturer's recommended supports and
  appropriate installation hardware and methods as defined by local code or the authority having
  jurisdiction (AHJ).
- 4. Ladder rack splices will be made in mid-span, not over a support, with the manufacturer's recommended splice hardware.
- Install at 84" A.F.F. per manufacturer's recommendations and secured to the top of equipment racks.
- 6. Ladder rack shall be supported every 5' or less in accordance with TIA-569-D. Ladder rack shall be supported within 2' of every splice and within 2' on both/all sides of every intersection. Support ladder rack within 2' on both sides of every change in elevation. Support ladder rack every 2' when attached vertically to awall.
- 7. When the pathway is overhead, ladder rack shall be installed with a minimum clearance of 12" above the ladder rack. Leave a minimum of 12" in between ladder rack and ceiling/building truss structure. Leave a minimum of 3" in between ladder rack and the tops of equipment racks and/or cabinets. Multiple tiers of ladder rack shall be installed with a minimum clearance of 12" in between each tier of ladder rack. When located above an acoustical drop ceiling, leave a minimum of 3" clearance between the top of the drop ceiling tiles and the bottom of the ladder rack.
- 8. Within each telecommunications room, ladder rack should be bonded together, electrically continuous, and bonded to the PBB or SBB, unless otherwise noted in the specifications and contract documents. Ladder rack and turns shall be bonded across each splice with a bonding kit. Ladder rack shall be bonded to the Telecommunications bonding Busbar using an approved ground lug on the ladder rack and a minimum #6 grounding wire or as recommended by the AHJ. Remove paint from the ladder rack where bonding/ground lugs contact the ladder rack so that the lug will contact bare metal. Use antioxidant joint compound in between the bare metal on the ladder rack and ground lug. Use antioxidant joint compound in between the bus bar and the ground lug. Verify continuity through the bonds at splices and intersections between individual ladder rack sections and turns and through the bond to the PBB or SBB.
- 9. The quantity of cables within the ladder rack will not exceed a whole number value equal to 50% of the interior area of the ladder rack divided by the cross-sectional area of the cable. The interior area of ladder rack will be considered to be the width of the ladder rack multiplied by a height of 2", unless cable retaining posts are added to the ladder rack. The interior area of ladder rack equipped with cable retaining posts will be considered to be the width of the ladder rack multiplied by a height of 6". Actual cable fill for ladder rack that is not equipped with cable retaining posts will not exceed 2" in height. Actual cable fill for ladder rack equipped with cable retaining posts will not exceed 6" in height.
- 10. The combined weight of cables within the ladder rack will not exceed the stated load capacity of the ladder rack as stated in the manufacturer's product specifications or load/design tables.
- 11. Cables (cable bundles) will be secured to the cross members of ladder rack with  $\frac{3}{4}$ " wide reusable School District of Osceola County Pathways for Communications Systems

- straps. Straps are not required when ladder rack is equipped with cable retaining posts.
- 12. Add 8" high cable retaining posts to the open sides of ladder rack when cable fill exceeds 2" in height or when cable bundles cannot be secured directly to the ladder rack cross members with a strap. Cable fill within any ladder rack should not exceed 6" in height.
- 13. When a single ladder rack supports different types of cable media, each type of cable media and divided area of the ladder rack separately when determining cable fill limits.
- 14. Use a radius drop to guide cables wherever cable exits overhead ladder rack to access a rack, cabinet or wall-mounted rack and cabinet or termination field. Provide a moveable cross member also to attach and align the radius drop in between the welded cross members of a ladder rack.
- Cover the exposed ends of cable runway that do not terminate against a wall, the floor or the ceiling with end caps or an end closingkit.
- 16. Whenever possible, maintain a 2' separation between ladder racks used for communications cables and pathways for other utilities or building services.
- 17. The installer will provide touch-up paint color-matched to the finish on the ladder rack and will correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process prior to delivery to the School District of Osceola County.
- 18. If a component is cosmetically damaged to the extent that correction in the field is obvious against the factory finish, the component will be replaced with a new component finished from the factory. If a component is physically damaged due to mishandling or modification during the installation process, it shall not be used as part of the ladder rack system.
- 19. The ladder rack shall be supported at three-foot intervals with triangular support brackets from the walls and securely attached to the equipment.
- Cable radius waterfalls shall be attached to the ladder rack to maintain cable bending radius where cables enter and exit the ladder rack.
- 21. Cable shall be secured to the ladder rack using reusable Velcro® type cable wraps to arrange cables in logical bundles.
- Telecommunications grounding and bonding shall be in accordance with applicable codes, standards and regulations. Comply with ANSI/TIA-607-C and the NEC. The more stringent requirements shall be used.

#### B. Vertical Ladder Racks:

- 1. Vertical ladder rack shall be installed by the Contractor.
- The vertical ladder rack shall be installed on the wall above/below sleeves from the floor to the ceiling above. Stand offs shall be installed as necessary to support the required ladder rack.
- 3. The anchoring system provided shall be suitable for the type of wall and the weight to be supported by the ladder rack.
- Cable shall be secured to the ladder rack using reusable Velcro® type cable wraps to arrange cables in logical bundles.

#### 3.2 J-H00KS

- A. Do not space more than 60" apart
- B. Acceptable sag from the bottom of the j-hook is between 4" and 12"
- C. Do not exceed the recommended fill ratio of the j-hook. Consult the manufacturer.
- D. Provide Velcro® type tie wraps for structured cabling.

#### 3.3 WIRE MESH CABLE TRAY

A. Provide all components of the tray system (tray, supports, splices, fasteners, and accessories) from a

- single manufacturer.
- B. Wire mesh cable tray shall be secured to the structural ceiling, building truss system, wall or floor using manufacturer's recommended supports and appropriate hardware as defined by local code or the authority having jurisdiction(AHJ).
- C. When the pathway is overhead, wire mesh cable tray shall be installed with a minimum clearance of 12" above the tray. Leave 12" in between the tray and ceiling/building truss structure. Multiple tiers of wire mesh cable tray shall be installed with a minimum clearance of 12" in between the trays. When located above an acoustical drop ceiling, wire mesh cable tray shall be installed a minimum of 3" above the drop ceiling tiles.
- D. When installed under a raised floor, wire mesh cable tray shall be installed with a minimum 3/4" clearance between the top of the tray and the bottom of the floor tiles or floor system stringers, whichever are lower in elevation. Maintain a 3" clearance between trays wherever trays cross over.
- E. Wire mesh cable tray shall be supported every 6' of span or less. Support wire mesh cable tray within 2' of every splice and intersection. Support intersections on all sides. Support wire mesh cable tray on both sides of every change in elevation/direction. The weight of the load on the cable tray must not exceed the stated limits per span in the manufacturer's published load table. Use additional supports where needed.
- F. Secure wire mesh cable tray to each support with a minimum of one fastener. Follow the manufacturers' recommended assembly, splice, and intersection-forming practices.
- G. Use installation tools and practices recommended by the manufacturer to field fabricate wire mesh cable tray intersections and changes in elevation. Use side-action bolt cutters with an offset head to cut wire mesh cable tray.
- H. Wire mesh cable tray shall be bonded to the grounding busbar in the room (PBB or SBB) using an approved ground lug on the wire basket tray and a minimum #6 grounding wire or as recommended by the AHJ. Follow UL classified splicing methods recommended by the manufacturer, ground the tray per NEC and ANSI/TIA-607-C requirements and verify bonds at splices and intersections between individual cable tray sections. Cable pathway should be electrically continuous through bonding and attached to the SBB or PBB.
- I. The quantity of cables within the tray will not exceed the recommended capacity by the manufacturer,
- J. The combined weight of cables within the tray will not exceed stated load capacity in manufacturer's specifications.
- K. Cable trays shall be utilized as main pathways entering or exiting CD (MDF) / FD (IDF) locations and shall be incorporated as pathways for cable bundles over twenty-five cables. No open top cable supports shall be used for cable bundles over twenty-five cables.
- L. Separate different media type within the tray. Treat each type of media separately when determining cable fill limits.
- M. When pathways for other utilities or building services are within 2' of the wire mesh cable tray, cover the tray after cables are installed.

# 3.4 FIRESTOPPING AND SEALING CONDUITS / TRAYS

- A. The telecommunications Contractor shall be responsible for sealing and firestopping of all penetrations and conduits used and un-used in the telecommunications system.
- B. The fire and smoke wall penetrations will be sealed promptly in all active walls so as not to diminish the level of life safety.
- C. Seal around conduits, sleeves and other wiring raceways passing through floors, fire rated walls, or partitions which extend to underside of the structure above in strict conformance with Project drawings.

#### 3.5 CONDUIT SYSTEMS

A. Conduit and boxes: comply with requirements in Division 26 Section "Raceway and Boxes for Electrical

Systems".

- B. All telecommunication conduits required for installation in the building floor slabs and above ceilings shall be furnished and installed by the electrical Contractor under Division 26– Electrical. These conduits are to be routed as shown on Division 27 Telecommunications drawings.
- C. Installation costs are to include all necessary equipment for a turnkey job, such as hangers, fittings set screw, connector ends, bushings, and color coding, as well as the repainting/cleanup of drywall area around each new outlet box. Also, it shall be the Contractor's responsibility to make and restore all firewall penetrations.
- D. Flexible metal conduit shall not be used.
- E. All station conduits shall be routed out of the box to the telecommunications Cable Tray, (under Division 26 00 00). Station conduits shall be 1-1/4" EMT conduit with bushing.
- F. Conduits fewer than 30 ft. in length do not require grounding (under Division 26 00 00).
- G. The telecommunications Contractor will be responsible for fire stopping all the firewall penetrations or fire barriers, conduit wall sleeves, cable trays, riser sleeves, and conduits.
- H. All conduits shall be thoroughly cleaned before installation. During the construction process and after the duct line is complete; the ends of the conduits shall be plugged to prevent entry of any foreign matter. Particular care shall be taken to keep the conduits free of concrete or any other substance during the course of the construction process. Where it is necessary to cut the tapered end on a piece of conduit at the site, the cut shall be made with a tool or lathe designed for that specific purpose. After the duct line has been completed, a mandrel, not less than twelve inches (12") long, having a cross section of approximately one-quarter inch (1/4") less than the inside cross section of the conduit, shall be pulled through each conduit. Afterward, a brush with stiff bristles and swabs shall be pulled through the conduit to make certain that no foreign materials have entered.
- I. The Contractor shall install pull cords in each conduit. The Contractor shall install a polyolefin pull line, of two hundred pound (200lbs) Tensile Strength, in each conduit (under Division 26 00 00).
- J. Galvanized rigid steel (GRC) or intermediate grade steel conduit (IMC): use for 1-1/4" diameter and larger; for circuit's exposed to weather or moisture; in hazardous locations; run underground or in concrete. Terminate with double locknuts and OZ type BLG grounding type bushing in dry locations and watertight hubs in Wet locations. Join with threaded fittings. Do not use split fittings underground.
- K. Electrical metallic tubing (EMT): use in dry locations only; use for branch Circuits; auxiliary and control circuits; telephone circuits. Join and terminate with rain-tight compression insulated throat fittings except auxiliary, control, and telephone circuit's 1-1/4" diameter and larger use all-steel setscrew insulated throat Fittings.
- Liquid-tight flexible steel conduit (LT) shall have the same construction as flexible steel conduit above, except with PVC coating by anaconda (steatite). Use in Exterior and wet locations for final connections to vibrating equipment. Terminate With galvanized steel compression fittings approved for grounding.
- M. PVC conduit shall be PVC as required by local codes. Connections shall be fully bonded and sealed, using approved epoxy cement.
- N. All conduits are to be placed above and below the lay-in ceilings as required for the type Systems and must be supported from the overhead with Unistrut and supported to wall structure.
- Conduit supports: use approved straps, rods, hangers, and trapeze channels. Conduit shall not be supported with wire or perforatedstraps.
- P. The conduit installation work is to comply with the latest edition of the National Electrical Code, national electrical safety code, standard building code, local ordinances and other standards indicated herein.
- Q. Electrical pull box covers must be labeled with the name of the feeder source and the feeder load.
- R. The labeling must be done in painted stencil letters. These conduits shall be installed as indicated on the construction drawings and to the School District of Osceola County / architect's satisfaction.

- S. Support all boxes from structure. Support outlet boxes in metal stud walls with caddy type h metal supports. Locate adjacent power, telephone, and data telecommunication outlets side by side in the same electrical box.
- T. Electrical and data portions of the box will be separated by a divider. The box and divider will be bonded to an approved ground.
- U. Thread-less rigid or intermediate grade fittings shall not be used. Fittings must be steel or malleable bushings shall be iron, galvanized, with smooth 1050-rated phenolic ring with grounding lug where required.
- V. Electrical metallic tubing, thread-less type connectors and couplings, etc., use galvanized steel, concrete tight, insulated throat, set screwtype.
- W. Connectors for flexible steel conduit shall be UL approved for grounding, galvanized steel, thread-less type, with insulated throat.
- X. Where ground conductor is installed in conduit 11/4" and larger, provide insulated ground bushings and bond full size ground wire from bushings to box or cabinet with self-tapping screw and appropriate lug.
- Y. Conduit penetrations through roof shall be made in pipe flashings / seal approved by SDOC Staff / architect and shall be located adjacent to the equipment served.
- Z. All exterior 4-inch conduit (between vaults and buildings) shall have installed two (2) MaxCell Edge detectable three (3) cell (MXED86383) fabric innerduct in each conduit.

END OF SECTION 27 05 28

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#### **SECTION 27 05 36**

#### CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

#### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School Board of Osceola County.

#### 1.3 INTRODUCTION

- A. Telecommunications Cable Tray:
  - The work covered by this section of the Specifications includes all labor necessary to perform and
    complete such construction, all materials and equipment incorporated or to be incorporated in such
    construction and all services, facilities, tools, and equipment necessary or used to perform and
    complete such construction. The work of this section shall include, but is not limited to, the following:
    - Telecommunications cable trays and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

#### 1.4 RELATED DOCUMENTS

A. Division 27 Specification Sections, apply to this Section:

1.	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
5.	Section 27 13 13	Communications Copper Backbone Cabling
6.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
7.	Section 27 15 13	Communications Copper Horizontal Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access PointSystem
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

# 1.5 STANDARDS AND CODES

- A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations in Section 27 0000.
  - 1. ASTM B 633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel
  - 2. ASTM A 653 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process
  - 3. ASTM A 123 Specification for Zinc (Hot Galvanized) Coatings on Iron and Steel
  - 4. ASTM A 510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

- 5. NEMA VE 1-2002 Metal Cable TraySystems
- 6. NEMA VE 2-2006 Cable Tray Installation Guidelines
- 7. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
- 8. ASTM A 580 Standard Specification for Stainless Steel Wire
- 9. ASTM D 769 Standard Specification for Black Oxide Coatings
- B. Pathways and distribution facilities shall adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations.
- C. Where applicable, all equipment, components, accessories, and hardware shall be UL listed for the intended purpose of theinstallation.
- D. Installed products shall be manufactured by an ISO9001 certified facility.
- E. Installed products shall be free from defects in material or workmanship from the manufacturer and shall be of the quality indicated.
- F. All methods of construction that are not specified in the contract documents shall be subject to control and approval by the School District of Osceola County or the School District of Osceola County's Representative.
- G. Refer to section 27 00 00 for general details

# 1.6 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturer of the materials in this section, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1. Hubbell Premise Wiring
- B. Product substitutions from other manufacturers shall require the approval of the Project Technology
  Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and
  SDOC Technology Services Department Representative 10 business days prior to bid opening.

# 1.7 SUBMITTALS

- A. Refer to Section 27 00 00 for general details.
- B. Shop Drawings:
  - 1. Coordinated cable tray layout drawings. Show routing of all telecommunications cable tray.
  - 2. Show locations of related fire stops, expansion joints and connections to conduits or other pathways of similar size.
- C. Submit Manufacturer's Cut Sheets for the following:
  - Any products not specifically listed in the Products section shall require a submittal of the manufacturer's cut sheets.

# 1.8 IDENTIFICATION

- A. None Required
- 1.9 DEFINITIONS
  - A. N/A
- 1.10 WARRANTY
  - A. Refer to Section 27 00 00 for general details.

#### PART 2 PRODUCTS

#### 2.1 WIRE TRAY

- A. Provide wire basket of types and sizes indicated, with all required splicing and mounting hardware.
- B. Pre-Galvanized Zinc: Straight section shall be made from pre-galvanized steel meeting the minimum mechanical properties of ASTM A641.
- All straight section longitudinal wires shall be constructed with a continuous top wire safety edge. Safety
  edge must be T-welded on all traysizes.
- D. Wire basket shall be made of high strength steel wires and formed into a standard 2 inch by 4-inch wire mesh pattern with intersecting wires welded together. All mesh sections must have at least one bottom longitudinal wire along entire length of straight section.
- E. Straight sections shall be furnished in standard 118-inch lengths.
- F. Wire basket shall have a 4-inch usable loading depth by 24 inches wide.
- G. When multiple mediums are used in the same tray, a divider must be used for separation. The dividers must be grounded.
- H. All fittings shall be field formed, from straight sections, in accordance with the manufacturer's instructions.
- I. All Tray sections and splicing assemblies shall be UL Classified as an Equipment Ground Conductor (EGC).

## 2.2 CABLE TRAY ACCESSORIES:

- A. Fittings: Tees, crosses, risers, elbows, and other fittings should be of the same materials and finishes as cable tray, and from the samemanufacturer.
- B. Cable tray supports and connectors including bonding jumpers, as required by cable tray manufacturer.
- C. Cable tray fittings that are used for changing of direction or elevation shall be factory made expressly for that purpose. No field improvised fittings are to be used.

# PART 3 EXECUTION

## 3.1 GENERAL

- A. Coordinate location of cable trays with other trades to avoid conflicts and maintain accessibility.
- B. Wire baskets / cable trays shall be utilized where cable bundles exceed twenty-five cables and as main pathways exiting / entering CD (MDF) / FD (IDF) locations.
- C. Quantities of cable trays and associated accessories shown on the drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of materials to construct a system that meets the intent of these Specifications and the relevant codes.
- D. Where installed above an accessible ceiling, cable trays shall be not less than 12 inches above the bottom of the finished ceiling.
- E. Vertical clearance above the tray shall be a minimum of 12 inches; clearance to at least one side of the cable tray shall be not less than 3 feet.
- F. Conduits entries and all other transition points shall only occur in accessible locations.
- G. Install wire basket as indicated; in accordance with recognized industry practices (NEMA VE-2 2000), to ensure that the cable tray equipment complies with requirements of NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.
- H. Coordinate wire basket with other electrical work as necessary to properly interface installation of wire basket runway with other work.

I. Provide required space encompassing wire basket to permit access for installing and maintaining cables.

#### 3.2 INSTALLATION

- A. Cable tray shall be one continuous structure and installed level.
- B. All transitions shall use radius fittings.
- C. Install cable tray so that it is accessible:
  - 1. Installation in open ceiling areas and above lay-in accessible ceilings is generally acceptable.
  - 2. Installation above "hard" ceilings, within a chase, behind a wall or where obstructed by ducts, pipes, etc. is not acceptable.
- D. Where the cable tray crosses an inaccessible area, place a minimum of four 4" conduits, with reamed and bushed ends, to connect the accessible segments together. The 4" conduits must extend beyond the edge of the inaccessible area on bothsides.
  - Exception: Relatively short (10 foot maximum) straight sections (no transitions) of cable tray may be routed over hard ceilings or through similar inaccessible areas provided that good access to the cable tray is maintained at both ends of the short inaccessible run.
- E. Where conduits are used in lieu of a section of cable tray, they must join the cable tray from the end at an equal height, not from the side or above. Transitions of this type require the use of a Straight Reducer Fitting.
- F. Install expansion joints and related fittings where required to accommodate the expected environmental ambient temperature range of 50 to 80 degrees F.
- G. Each end of the tray shall be equipped with a finished lip and drop off to reduce damage to cables.
- H. Manufactured offsets shall be used to change height or direction of rigid cable trays. Cable tray vertical transitions or transitions from a cable tray to other pathways must be designed such that unsupported cable does not exceed 2 feet.
- I. Cable tray offsets shall utilize 30-degree angles, and distance between transitions shall be no less than two times the offset distance.
- J. Cable trays are to be clean and debris free before the placement of cable.

#### K. Firestopping:

- 1. Where cable tray encounters a fire rated assembly (wall, floor, shaft, etc.), install a listed fire stop system to maintain the fire rating of the assembly. Firestop systems must be of a re-enterable type EZ Path mechanical Fire Rated/SmokeRatedpathway.
- 2. All firestop systems must be accessible for future maintenance.

## L. Support:

- Supports shall be 3/8" threaded rod trapeze style hangers, threaded rods with rail clips as
  recommended by the cable tray manufacturer and as suitable for the specified cable tray NEMA
  Load/Span Designation.
- 2. Side rails shall bear on the supports; rungs shall not bear on the supports.
- 3. Cable tray supports shall not be used to mount any other structures.

## 3.3 GROUNDING & BONDING

- A. Cable tray shall be electrically continuous. Where a cable tray run is interrupted at a fire rated assembly, an expansion joint or is otherwise rendered electrically discontinuous, provide bonding jumpers.
- B. Where cable tray enters telecommunication room or equipment room, bond the cable tray to the TGB in that room.

- C. Where conduits or other conductive raceways connect to a cable tray system, bond them together with connection suitable for the purpose.
- D. Refer to Section 27 05 26 for additional details.

# 3.4 TESTING

A. Test wire basket support systems to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

#### 3.5 ACCEPTANCE

- A. Once the installation and testing of all pathways have been completed and the Project Technology Designer (Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and SDOC Technology Services Department Representative are satisfied that all work is in accordance with the Contract Documents, the Technology Designer will notify the School District of Osceola County (SDOC) Project Manager in writing or via email of acceptance.
- B. No cables shall be installed in the cable trays until School District of Osceola County Technology Services Department Representative has given acceptance.

END OF SECTION 27 05 36

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# SECTION 27 11 10 TELECOMMUNICATION SPACES, EQUIPMENT AND FITTINGS

# PART 1 GENERAL

# 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

## 1.3 INTRODUCTION

- A. Telecommunications Spaces:
  - The work covered by this section of the Specifications includes all labor necessary to perform and
    complete such construction, all materials and equipment incorporated or to be incorporated in such
    construction and all services, facilities, tools, and equipment necessary or used to perform and
    complete such construction. The work of this section shall include, but is not limited to, the following:
    - Telecommunications spaces and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

# 1.4 RELATED DOCUMENTS

A. Division 27 Sections apply to this Section:

1.	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 13 13	Communications Copper Backbone Cabling
6.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
7.	Section 27 15 13	Communications Copper Horizontal Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access PointSystem
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

## 1.5 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturer of the products and materials in this section, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1. Hubbell Premise Wiring
- B. Product substitutions from other manufacturers shall require the approval of the Project Technology

  Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and

  SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

#### A. Shop Drawings:

- Shop drawing will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1. Major items not included in the Product Section.
  - Submit for approval in accordance with specified submittal procedures:
    - a) Racks
    - b) Enclosures
    - c) Patch panels.
    - d) Cable Management
    - e) Ladder Rack
    - f) Cable Tray
    - g) Fire Rated / Smoke Rated Mechanical Appliances
    - h) Vertical Cable Managers
    - i) Horizontal Cable Managers
    - ) HVAC system for CD / FD locations

## 1.7 QUALITY ASSURANCE

- A. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunication Cabling Standards, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed UTP and fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and Specifications, and applicable codes, standards, and regulations.
- Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E. Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D ANDANSI/TIA/EIA-568-3.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of theinstallation.
- G. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according to ISO 9001.
- H. Installed products will be manufactured by an ISO 9001 certified facility.
- Installed products will be free from defects in material or workmanship from the manufacturer and will be
  of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and School District of Osceola County

  Telecommunication Spaces, Equipment, and Fittings

approval by the Project Technology Designer and SDOC Technology Services Department Representative.

K. Installed products will be lot-traceable by date code.

#### 1.8 DEFINITION

- A. Campus Distributor Room CD(MDF):
  - 1. The School District of Osceola County (SDOC) established standard for all newly constructed, retrofitted, and renovated CD (MDF) locations will be a minimum of twenty (20) linear feet long by ten (10) linear feet wide (rectangular shape ONLY), free of any liquid, HVAC, and electrical conveyance (excluding fire protection and space requirements). CD (MDF) locations shall not support more than 10k square feet of space. No drop ceiling shall be installed in any CD (MDF) location and all flooring shall "Luxury Vinyl Flooring (LVT) covering "ONLY" (no other finish shall be installed). Floor covering shall be installed prior to rack placement. "No Storage Allowed" placard shall be displayed at entrance of space. Roof access not permitted in any CD (MDF) space NO EXCEPTIONS.
  - 2. The Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) will provide, supervise, and ensure all CD (MDF) entrance locations are located within the main building enclosure, primary access (no secondary room access) opening into an open corridor (no exterior access), consisting of a forty-eight (48) inch door configuration, and keyed appropriately for access by SDOC Technology Services Department authorized Representatives and designates. Access Control shall be installed, at the entrance, to properly identify, permit / deny access, and accurately record any / all visitors within the space NO EXCEPTIONS.
  - 3. The Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) will provide, supervise, and ensure that all backboards (white in color) are provided and installed by the selected Electrical Contractor, are mounted on all walls as indicated by SDOC predesignated locations and identified as indicated by SDOC approved details.
  - 4. The Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) will provide, supervise, and ensure that one (1) NEMA 5-20R power receptacle, provided and installed by the selected Electrical Contractor, are mounted BEHIND equipment racks #1 and #5 at eighty (80) inches above finished floor (A.F.F.), unless otherwise noted (U.O.N.) at SDOC predesignated locations. Installation of these power receptacles shall be coordinated with and approved by Project Technology Designer and SDOC Technology Services Representative to ensure proper placement prior to installation.
  - 5. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected Electrical Contractor provides and installs a minimum of two (2) 208 VAC NEMA L6-30R power receptacles for every three (3) free standing systems equipment racks installed at SDOC predesignated locations. SDOC Technology Services Department Representative and Project Technology Designer reserve the right to increase quantities (site dependent) as necessary / required. All technology work areas shall have dedicated breaker panels (load centers).
  - 6. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected Electrical Contractor provides and installs minimum of one (1) light fixture in front of rack locations and one (1) light fixture to the rear of rack locations with a minimum of 50 foot candle of lighting at cable termination locations. SDOC Technology Services Department Representative and Project Technology Designer reserve the right to increase quantities (site dependent) as necessary / required. All technology work areas shall have dedicated breaker panels (load centers).
  - 7. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected Electrical Contractor provides and installs minimum of one (1) 120 VAC NEMA 5-20R quad power receptacle on each wall at 18" A.F.F., on Fire Alarm identified backboard, on Security identified backboard, on DAS identified backboard, and installed at SDOC predesignated locations. SDOC Technology Services Department Representative and Project Technology Designer reserve the right to increase or decrease quantities (site dependent) as necessary / required. All technology work

- areas shall have dedicated breaker panels (load centers).
- 8. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected electrical Contractor provides and installs minimum of four (4) 3" square mechanical fire rated / smoke rated raceways on each wall's cable entrance into the CD (MDF) location EMT sleeving and fire putty is not an acceptable substitution for mechanical fire rated / smoke rated raceway.
- 9. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected HVAC Contractor provides and installs a cooling system capable of maintaining continuous temperatures between 68° and 72° Fahrenheit. Temperature within this space will at no time exceed 82° Fahrenheit

#### B. Floor Distributor Room - FD(IDF):

- 1. The School District of Osceola County (SDOC) established standard for all newly constructed, retrofitted, and renovated FD (IDF) locations shall be a minimum of ten (10) linear feet long by eight (8) linear feet wide (rectangular shape) free of any liquid, HVAC, and electrical conveyance (excluding fire protection and space requirements). FD (IDF) locations shall not support more than 10k square feet of space. No drop ceiling shall be installed in any CD (MDF) location and all flooring shall "Luxury Vinyl Flooring (LVT) covering "ONLY" (no other finish shall be installed). "No Storage Allowed" placard shall be displayed at entrance of space. Roof access not permitted in any FD (IDF) space NO EXCEPTIONS.
- 2. FD (IDF) locations shall be sized based upon the number of racks employed to service the maximum 10k square feet area:
  - a) Rooms with 2 or less racks shall require an area of ten (10) linear feet long by eight (8) linear feet wide creating a rectangular shaped area.
  - b) Rooms with 3 racks shall require an area of ten (10) linear feet long by ten (10) linear feet wide, creating a square shaped area.
  - c) Rooms with 4 racks shall require an area of ten (10) linear feet long by twelve (12) linear feet wide, creating a rectangular shaped area.
  - d) Rooms with 5 racks shall require an area of ten (10) linear feet long by fourteen (14) linear feet wide, creating a rectangular shaped area.
  - e) All designs shall incorporate square or rectangular shapes ONLY. No other shapes shall be considered in the creation of Floor Distributor Rooms FD(IDF)
- 3. The Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) will provide, supervise, and ensure all CD (MDF) entrance locations are located within the main building enclosure, primary access (no secondary room access) opening into an open corridor (no exterior access), consisting of a forty-eight (48) inch door configuration, and keyed appropriately for access by SDOC Technology Services Department authorized Representatives and designates. Access Control shall be installed, at the entrance, to properly identify, permit / deny access, and accurately record any / all visitors within the space NO EXCEPTIONS.
- 4. SDOC Technology Services Department Representative and Project Technology Designer reserve the right to increase quantities (site dependent) as necessary / required. All technology work areas shall have dedicated breaker panels (load centers).
- 5. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected Electrical Contractor provides and installs minimum of one (1) 120 VAC NEMA 5-20R quad power receptacle on each wall at 18" A.F.F., on Fire Alarm identified backboard, on Security identified backboard, on DAS identified backboard, and installed at SDOC predesignated locations. SDOC Technology Services Department Representative and Project Technology Designer reserve the right to increase or decrease quantities (site dependent) as necessary / required. All technology work areas shall have dedicated breaker panels (load centers).

- 6. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected electrical Contractor provides and installs minimum of four (4) 3" square mechanical fire rated / smoke rated raceways on each wall's cable entrance into the CD (MDF) location EMT sleeving and fire putty is not an acceptable substitution for mechanical fire rated / smoke rated raceways.
- 7. The Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) will provide, supervise, and ensure the selected HVAC Contractor provides and installs a cooling system capable of maintaining continuous temperatures between 68° and 72° Fahrenheit. Temperature within these spaces will at no time exceed 82° Fahrenheit.

## 1.9 WARRANTIES

A. See Section 27 00 00 for details.

## 1.10 MATERIALS

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

## 1.11 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of the cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

## 1.12 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, the School District of Osceola County, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all other concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.
- $C. \quad \hbox{Coordinate locations, arrangement, mounting, and support of all communications provisions with \ Division}$

26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:

- Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
- Will provide for ease of disconnecting the equipment with minimum interference to other installations.
- 3. Will allow right of way for piping and conduit installed at required slope.
- Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
- 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- 6. Will coordinate sleeve selection specified in Division 26
- Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.
- D. Low Voltage Contractor shall furnish and install the following:
  - 1. Racks & Accessories
  - 2. Enclosures & Accessories
  - 3. Patch Panels
  - 4. Ladder Rack
- E. Electrical Contractor shall furnish and install the following:
  - 1. Power circuits to telecommunications spaces and equipment.
  - 2. Grounding to telecommunications spaces.
  - 3. Fire rated / Smoke rated appliances and accessories
  - 4. Cable Trays and accessories
  - 5. Backboards and accessories
  - Contractor shall coordinate location of electrical receptacles to be installed inside walls or cabinets. Surface mounted conduit and boxes are not an acceptable installation for new construction – NO EXCEPTIONS
- F. Unless noted otherwise, the following items will be the responsibility of SDOC Technology Service Department Representative and the School District of Osceola County:
  - 1. All electronics and active data networking equipment, etc.
  - 2. Telephones, etc.
  - 3. PC's, printers, video display terminals (desktop), flat panel displays (desktop), etc.
- G. Contractor will coordinate with SDOC Technology Services Department Representative for network and computer equipment specifications and / or installation requirements before starting Work.
- H. Contractor will coordinate with the Project Technology Designer, General Contractor, and SDOC Technology Services Department Representative for location and type of blocking to be installed in the walls to support wall mounted equipment.

# PART 2 PRODUCTS

# 2.1 PATCH PANELS

A. UTP Patch Panels, Category 6A

- 1. Acceptable Manufacturer:
  - a) Hubbell Premise Wiring HPJ24 (24 Port)
  - b) Hubbell Premise Wiring HPJ48 (48 Port)
- 48-port and 24-port as indicated on Drawings.
- 3. Non-keyed, unshielded, 4-pair
- 4. 8-position, 8-wire (RJ-45)
- 5. Accommodates T568A wiring
- 6. Useable bandwidth beyond 500MHz
- 7. Nose Contacts:
  - a) Beryllium copper with a minimum of 50-micro inch gold plating over nickel
- 8. Insulation displacement terminals
- 9. 110 blocks: Polycarbonate
- 10. Jack Contacts: Phosphor bronze with 100 micro-inch tin lead 60/40 over nickel under plating
- 11. Terminates 22-24 AWG solid conductors
- 12. Minimum Contact Force: 100 grams with FCC compliant 8-position plug
- 13. Mating Cycles: 2000+ with FCC compliant 8-position plug
- 14. Component Performance shall exceed ANSI/TIA-568-2.D Category 6A component requirements,
- 15. Panel shall be constructed of 14-gauge steel, rolled edge construction with black powder coat finish.
- 16. Panel shall be standard 19-inch rack mount.
- 17. Includes rear cable management to the panel
- B. UTP Patch Panels, Category 6
  - 1. Acceptable Manufacturer:
    - a) Hubbell Premise Wiring HPJ24 (24Port)
    - b) Hubbell Premise Wiring HPJ48 (48 Port)
  - 2. 48-port and 24-port as indicated on Drawings
  - 3. Non-keyed, unshielded, 4-pair
  - 4. 8-position, 8-wire (RJ-45)
  - 5. Accommodates T568A
  - 6. Useable bandwidth beyond 250MHz
  - 7. Nose Contacts:
    - a) Beryllium copper with a minimum of 50-micro inch gold plating over nickel
  - 8. Insulation displacementterminals
  - 9. 110 blocks: Polycarbonate
  - 10. Jack Contacts: Phosphor bronze with 100 micro-inch tin lead 60/40 over nickel under plating
  - 11. Terminates 22-24 AWG solid conductors
  - 12. Minimum Contact Force: 100 grams with FCC compliant 8-positionplug
  - 13. Mating Cycles: 2000+ with FCC compliant 8-position plug

- 14. Component Performance shall exceed ANSI/TIA-568-2.D Category 6 component requirements,
- 15. Panel shall be constructed of 14-gauge steel, rolled edge construction with black powder coat finish.
- 16. Panel shall be standard 19-inch rack mount.
- 17. Includes rear cable management to the panel

## 2.2 FLOOR MOUNT RACKS

- A. Acceptable Manufacturer:
  - 1. Chatsworth Standard CPI 55053-X15
- B. Extruded aluminum construction, black powder coated finish
- C. 19 inches mounting width by 84 inches height with 24-inch full width base
- D. 1000lb. static weight capacity
- E. 12/24 tapped holes, EIA/ECA-310-E Universal Mounting Pattern
- F. 45 rack mount units, +1 on rear for Horizontal Busbar
- G. 10-inch-deep mountingrails
- H. Ladder rack mounting plateattached
- I. Furnish and install rack isolationkit
- J. Furnish and install vertical wire management channels on both sides of rack, type as specified.
- K. Furnish and install horizontal wire management units, quantity and type as specified.
- L. Furnish and install ground terminal block/lug for each rack and #6 ground wire to room ground bus bar.

## 2.3 ENCLOSURES

- A. Network Cabinets:
  - 1. Acceptable Manufacturer:
    - a) Tripp Lite SRW18UHD
- B. Constructed of Cold RolledSteel
- C. 12-gauge vertical rails
- D. 14-gauge sides and doors
- E. Black Powder Coating
- F. Integrated lock on the side panels, front and reardoor
- G. 2000lb static load capacity
- H. EIA-310-D Universal holepattern
- Perforated front and rear doors to optimize air flow
- J. Have attachment points for mounting power strips or other accessories
- K. #12-24 threaded hole configuration
- L. 18 Rack Units (RU)
- M. 37"H X 37"W X 25"D
- N. Seismic units available where required

# 2.4 SERVER CABINETS

A. Acceptable Manufacturers:

- 1. Schneider Electric APC Netshelter SX 42U AR3100
- B. Constructed of Cold RolledSteel
- C. 12-gauge vertical rails
- D. 14-gauge sides and doors
- E. Black Powder Coating
- F. Integrated lock on the side panels, front and reardoor
- G. 2000lb static load capacity
- H. EIA-310-D Universal holepattern
- I. Perforated front and rear doors to optimize air flow
- J. Have attachment points for mounting power strips or other accessories
- K. #12-24 threaded hole configuration
- L. Minimum 42 Rack Units (RU)
- M. Minimum 80"H X 24"W X 42"D
- N. Seismic units available where required

# 2.5 EQUIPMENT RACK & ENCLOSURE ACCESSORIES

- A. Power Strip:
  - 1. Approved Manufacturer:
    - a) Hubbell Premise Wiring CPS1220RMS
  - 2. Electrical Specifications: 20A-120V
  - 3. Receptacle Type: NEMA 5-20R
  - 4. 12 Outlets
  - 5. Surge protected
  - 6. ON-OFF switch
- B. Horizontal Cable Management:
  - 2RU front management only
    - a) Acceptable Manufacturers:
      - 1) Chatsworth CPI-30130-719
    - b) 4" front ring depth
    - c) metal construction
    - d) Front cover
    - e) Pass-thru holes from front to rear

# 2.6 VERTICAL CABLE MANAGEMENT

- A. Equipment Racks:
  - 1. Acceptable Manufacturer:
    - a) Chatsworth 30162-703
  - 2. 84"H X 6"W X 10"D
  - 3. 14-gauge cold rolled steel

- 4. Door with dual hinge and positive latch
- 5. Steel rod support members all steel construction
- 6. Black powder coated

## 2.7 19" FILLER PANELS

- A. 1RU 1.75" H MCCBP175
- B. 2RU 3.5" H MCCBP350
- C. 4RU 7.0" H MCCBP700

## 2.8 LADDER RACK

- A. Acceptable Manufacturer:
  - 1. Hubbell Premise Wiring HLS1018B
- B. 16-gauge tubular steel
- C. Black powder coating
- D. Stringer dimensions: 0.375"W X1.5"H
- E. Rung Spacing 9.0"
- F. RoHS Compliant
- G. Size: 18"
- H. Accessories:
  - 1. Butt Splice HLBSK
  - 2. Cable Radius Drop HLCD18
  - 3. Foot Kit HLRF
  - 4. J-Bolt Kit HLJB
  - 5. Protective End Caps HLECPK2
  - 6. Swivel Splice Kit HLSS
  - 7. T-Junction Splice Kit HLTK
  - 8. Triangle Wall Supports HLTSB18B
  - 9. Wall Angle Support HLX1518
  - 10. Vertical Wall Bracket HLVWBK
  - 11. Ground Strap, Splices HGRKTD9D
  - 12. TEBC Bracket HGBTEBCBRKL

# 2.9 PLYWOOD BACKBOARDS

- A. Acceptable Manufacturer:
  - 1. Ready Spec
- B. An AC grade or better, void-free plywood backboard, 8 ft. high with a minimum thickness of 0.75 in, securely fastened with the grade C surface facing the supporting wall.
- C. Treated with two coats of white, nonconductive, fire-resistant coating.
- D. Mounted 6" off the finishedfloor
- E. All walls shall be finished with identified backboard.
- F. Backboard installation shall be complete before equipment installation begins.

#### 2.10 BONDING

#### A. Rack & Enclosure:

- 1. Acceptable Manufacturer:
  - a) Hubbell Premise Wiring HGRKTHC
- 2. Includes:
  - a) 19" busbar
  - b) Insulators
  - c) Mounting hardware
  - d) 6awg cable with lugattached
  - e) 4mm banana plug
  - f) Antioxidant

#### B. Ladder Rack Splice:

- 1. Acceptable Manufacturer:
  - a) Hubbell Premise Wiring HGRKTD9D
- 2. Includes:
  - a) 9" strap with double hole lugs on each end
  - b) Stainless steel mounting hardware
  - c) Tube of antioxidant

## PART 3 EXECUTION

## 3.1 INSTALLATION

- A. All termination hardware shall be installed in accordance with manufacturer's recommended installation procedures.
- B. All hardware shall be placed to make efficient use of available space in coordination with other uses. All wiring and associated hardware shall be placed to not impair or impede the use or capacity of other building systems, equipment, or hardware placed by others (or existing).
- C. Hardware shall be installed as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, equipment, mechanical equipment access doors and covers, switches or electrical panels, and lighting fixtures. Hardware shall be installed to maintain a minimum 36 inch working clearances in the front and rear of all racks and cabinets wherever possible.
- D. Contractor shall attach all floor mount racks and cabinets to building structure with hardware as required by manufacturer, 3/8-inch hardware minimum. Furnish and install seismic rated hardware where required by local codes. Furnish and install raised floor mounting kits where racks and cabinets are installed on raised floors.
- E. Contractor shall attach all wall mount racks and cabinets to building structure with hardware as required by the manufacturer. All wall mount racks and cabinets shall be mounted on plywood backboards. Wall mount racks and cabinets on gypsum wall board walls shall be attached through the plywood and fastened to steel (or wood) studs or steel (or wood) blocking in the wall (where applicable).
- F. Rack configurations indicated on Drawings are typical and may not reflect final installation in all telecommunications spaces. Contractor shall coordinate final rack layouts with fiber termination enclosures, patch panels, and wire management panels with Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to securing. Violation of this procedure may result in additional cost, provided by Contractor, to correct any deviations to the satisfaction of Project Technology Designer

- and SDOC Technology Services Department Representative.
- G. Furnish and install quantity of Velcro wraps as required for proper cable bundling, organization and support. Plastic or nylon cable ties and tape are not acceptable for use on any category rated cable.
- H. Contractor shall coordinate with Project Technology Designer and SDOC Technology Services Department Representative for placement of blocking in walls where wall mount cabinets are to be installed.
- I. Furnish and install 3/4-inch-wide hook and loop fasteners to bundle all cables in telecommunications spaces and other areas of telecommunications cable termination, minimum 8 inches in length.

## 3.2 PLYWOOD BACKBOARDS

- A. Plywood backboards shall be installed on all walls of telecommunications rooms.
- B. Plywood backboards in larger spaces shall be installed as indicated on Drawings.
- C. Plywood backboards shall be installed from corner to corner with no gaps between boards.
- D. Plywood backboards shall be attached across a minimum of three wall studs. Install plywood backboards in a horizontal orientation where possible to span more than three wall studs.
- E. Install plywood backboards in telecommunications rooms at 6 inches AFF to the bottom edge of the backboard and 102 inches to the top edge of the backboard.
- F. Plywood backboards in telecommunications spaces shall be painted front and back and all edges with two coats of white fire-retardant paint.
- G. Plywood backboards in areas other than telecommunications spaces shall be painted front and back and all edges with two coats of white colored fire-retardant paint. Coordinate paint color with Architect, Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.

END OF SECTION 27 11 10

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## **SECTION 27 13 13**

# COMMUNICATIONS COPPER BACKBONE CABLING

## PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A Refer to other Sections in Division 27 00 00 - Communications

## 1.2 SUMMARY

A These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

# 1.3 INTRODUCTION

# A Copper Backbone Cabling:

- The work covered by this section of the Specifications includes all labor necessary to perform and
  complete such construction, all materials and equipment incorporated or to be incorporated in such
  construction and all services, facilities, tools, and equipment necessary or used to perform and
  complete such construction. The work of this section shall include, but is not limited to, the following:
  - Voice copper backbone cabling and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

## 1.4 RELATED DOCUMENTS:

A Division 27 Sections apply to this Section

1.	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
7.	Section 27 15 13	Communications Copper Horizontal Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access Points System
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

# 1.5 APPROVED PRODUCT MANUFACTURERS

- A The manufacturers of the copper cabling, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1. Hubbell Premise Wiring
- B. Product substitutions from other manufacturers shall require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

## A Shop Drawings:

- Shop drawing will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1. Major items not included in the Productsection.
  - Submit Manufacturer's Cut Sheets for the following:
    - a) Cable
    - b) Connections
    - c) Enclosures
    - d) Inner Duct
    - e) Vaults

## 1.7 QUALITY ASSURANCE

- A The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed UTP cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards and regulations.
- Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E Where applicable, all equipment, components, accessories and hardware will be UL listed for the intended purpose of theinstallation.
- F. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according to ISO 9001.
- G. Installed products will be manufactured by an ISO9001 certified facility.
- H. Installed products will be free from defects in material or workmanship from the manufacturer, and will be of the quality indicated.
- I. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- J. Installed products will be lot-traceable by date code.

# 1.8 DEFINITION

- A CMP: Communications Plenum Cable
- B. CMR: Communications RiserCable

- C. MPP: Multipurpose Plenum Cable
- D. PE: OSP Cable

## 1.9 WARRANTIES

A Refer to Section 27 00 00 for general details.

#### 1.10 MATERIALS

- A All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

## 1.11 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of the cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

## 1.12 COORDINATION WITH OTHER TRADES

- A Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.
- Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

- Will provide for ease of disconnecting the equipment with minimum interference to other installations.
- 3. Will allow right of way for piping and conduit installed at required slope.
- 4. Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
- Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- 6. Will coordinate sleeve selection specified in Division 26
- Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.

## PART 2 PRODUCTS

## 2.1 CABLES

- A PE Polyethylene insulated cabling
  - 1. Outside Plant Telephone cable
  - 2. Solid copper conductors
  - External layer of solid, high-density polyethylene insulation with distinctive color code conforming to telephone industry standards. Conductors are twisted pairs then bundled together in round groups
  - 4. Internal core filled with ETPR compound.
  - 5. Black polyethylene innerjacket.
  - 6. Corrugated aluminum tape shield over inner jacket.
  - 7. Meets ANSI/ICEAS-84-608

# PART 3 EXECUTION

# 3.1 GENERAL

- A. Backbone Copper cables are for use between telecommunications facilities within the same building.
- B. Backbone copper cables are used between buildings within the same campus inside conduit and MaxCell edge detectable three (3) cell fabric inner duct. Distance from CD (MDF) / FD (IDF) location and between communication vaults shall not exceed 500 feet.
- C. Location, pair count and placement detail for all copper cables shall be as shown on the Drawings.
- D. Provide 10' slack loops at the CD (MDF) end of all backbone copper cables.
- E. EMT Conduits of the proper rating shall run between each closet w/ two (2) MaxCell three (3) cell fabric inner ducts in each conduit.
- F. Label each end of each cable as to source and destination. Terminate pairs in consistent, consecutive manner at each end. Place all material in inner-duct. Label copper raceway cable with yellow "caution copper cable" tags every 10 feet. Leave 10 feet of slack at each copper termination point.
- G. Copper backbone cable terminations shall utilize enclosures and components in quantities consistent with the required pair counts at each end of each segment.
- H. All copper backbone cabling shall have proper primary and secondary lightning protection installed.
- I. Using approved methods, pull cable into conduit, or place into raceway or cable tray as specified. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

- J. Each copper riser cable shall be placed within one cell of innerduct.
- K. Fiber cables and copper cables shall not share conduit or innerduct.
- L. Do not install patch cables until after the copper test reports have been accepted by Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.

#### 3.2 OUANTITIES

- A. Quantities of system elements shown on the drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of materials to construct a system that meets the intent of these Specifications and the relevant codes.
- B. Typical quantities of cabling are as follows:
  - 1 Twelve pair of appropriate type (CMP, CMR, PE) copper homerun cabling shall be installed between CD (MDF) and each FD (IDF)location.

# 3.3 INSTALLATION

#### A. Copper Backbone Cables:

- All copper installations shall be installed using open cabling methods. Limit cable-bending radius to 10 times the cable diameter during installation, and 10 times the diameter after installation. Provide all required tools, materials, consumables, and equipment necessary for field mounting of connectors.
- 2. Provide support for vertical runs of copper riser cables.
- 3. Route copper cables together as a single bundle, not to be combined with fiber or coax cabling.
- 4. Do not exceed the maximum pull tension specified by the cable manufacturer. Use appropriate lubricants as required to reduce pulling friction. Avoid kinking and twisting of cables during installation.
- 5. During installation of copper cabling, do not allow pulling tension to exceed cable manufacturer's specification for the cable being installed. Only the strength member of the cable shall be subjected to the pulling tension.
- 6. Follow all manufacturers' specifications for installation.

## 3.4 IDENTIFICATION

- A. All copper backbone and riser cables must be labeled with a self-laminating label within 12 inches of the termination.
- B. All cable tags shall be easily accessible, both physically and visually, upon completion of the job.

## 3.5 GROUNDING & BONDING

- A. Any use of armored cable shall require the bonding of that shield to the PBB/SBB with a #6 AWG copper bonding conductor.
- 3. Refer to Section 27 05 26 for additional details.

# 3.6 TESTING

# A. GENERAL:

- 1. The Contractor shall test, as described below, all copper cables installed under these Specifications.
- Visually inspect all cables, cable reels, and shipping cartons to detect cable damage incurred during shipping and transport. Return visibly damaged items to the manufacturer.

- Testing shall not be performed until after all hardware is installed and attached, and all labeling and identification has been completed.
- 4. Any cable that does not pass all required testing shall be removed, replaced, and retested.
- 5. Remove and replace any defective cables from pathways system. Do not abandon cables in place.
- Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution
  Designer (RCDD)) and SDOC Technology Services Department Representative reserve the right to
  observe all portions of the testingprocess.
- 7. Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative further reserve the right to conduct "Proof of performance testing", using Contractor equipment and labor, a random retest of at least ten percent (10%) of the cable plant to confirm documented test results.
- 8. Perform all tests as required by the manufacturer in support of the structured cabling system warranty.

## B. ACCEPTANCE:

- All test results and corrective procedures are to be documented and submitted in Microsoft Excel or CSV format to the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative within five (5) working days of test completion.
- 2. Each test report shall contain the following general information:
  - a) Date of Preparation
  - b) Date of Test
  - c) Project Name
  - d) Contractor's Name
  - e) Media Type
  - f) Make, Model and Serial Number of test equipment used
  - g) Date of Last Calibration
  - h) Names of Test Crew.
- 3. Submit the following information regarding the copper cable testing:
  - a) Cable Number
  - b) Pair Count
  - c) Connector Types
  - d) Number of Connectors / Patches
  - e) Length of Run
- 4. Test result shall be recorded per cable and identical copies placed on three removable media devices (USB Flash Drive) for delivery to the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.
- 5. Once the testing has been completed and the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative are satisfied that all work is in accordance with the Contract Documents, the Representative will notify the Contractor and/or project manager in writing or via email.

- C. RECORD (AS BUILT) DRAWINGS:
  - 1. The Project Record Drawings shall show the types and locations of all copper cabling and copper termination points. Drawings should include identifying information from the cable identification tags.

END OF SECTION 27 13 13

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## **SECTION 27 13 23**

#### COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

#### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

## 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola Count.

#### 1.3 INTRODUCTION

- A. Optical Fiber Backbone Cabling:
  - 1. The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:
    - a) Technology Fiber Optical cabling and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

## 1.4 RELATED DOCUMENTS

A. Division 27 Sections apply to this Section

1.	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communications Copper Backbone Cabling
7.	Section 27 15 13	Communications Copper Horizontal Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access PointSystem
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

# 1.5 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturers of the fiber optical cabling, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1. Corning Optical Communications
  - 2. Hubbell Premise Wiring
- B. Product substitutions from other manufacturers shall require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

# A. Shop Drawings:

- Shop drawing will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1. Major items not included in the ProductSection.
  - 2. Submit for approval in accordance with specified submittal procedures:
    - a) Cable
    - b) Cassettes
    - c) Connections
    - d) Enclosures
    - e) Adapter Panels
    - f) Inner Duct
    - g) Vaults

## 1.7 QUALITY ASSURANCE

- A. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards and regulations.
- Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D ANDANSI/TIA/EIA-568-3.D.
- E. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of theinstallation.
- F. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according to ISO 9001.
- G. Installed products will be manufactured by an ISO9001 certified facility.
- H. Installed products will be free from defects in material or workmanship from the manufacturer and will be of the quality indicated.
- I. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- J. Installed products will be lot-traceable by date code.

# 1.8 DEFINITION

A. CMP: Communications PlenumCable

- B. CMR: Communications RiserCable
- C. MPP: Multipurpose Plenum Cable
- D. OFNP: Optical Fiber Nonconductive Plenum Cable
- E. OFCP: Optical Fiber Conductive Plenum Cable
- F. LSZR: Low Smoke Zero Halogen Rated Cable
- G. OM1: Defined by ISO 11801 & TIA-492-AAAA, 62.5/125µm multimodefiber.
- H. OM2: Defined by ISO 11801 & TIA-492-AAAB, 50/125µm multi-mode fiber.
- I. OM3: Defined by ISO 11801 & TIA-492-AAAC, laser-optimized 50/125µm multi-mode fiber
- J. OM4: Defined by TIA-492-AAAD, laser-optimized 50/125µm multi-mode fiber
- K. OS1: Defined by TIA-492CAAA / OS1, 9/125µm single mode fiber
- L. OS2: Defined by TIA-492CAAB / OS2, 9/125µm single mode fiber

#### 1.9 WARRANTIES

A. Refer to Section 27 00 00 for general details.

#### 1.10 MATERIALS

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

# 1.11 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of the cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of OsceolaCounty.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

# 1.12 COORDINATION WITH OTHER TRADES

A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the

- attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with thework.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.
  - 4. Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
  - 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
  - 6. Will coordinate sleeve selection specified in Division 26
  - Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwiseconcealed.
  - 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.

## PART 2 PRODUCTS

## 2.1 CABLES

- A. FIBER OPTIC CABLES GENERAL
  - 1. Cable jacket marking must be legible and shall contain the following information:
    - a) Manufacturer's name and trademark
    - b) Strand count
    - c) Cable Type
    - d) Pair Count
    - e) UL listing
    - f) Sequential distance markings, in one-foot (or meter)increments

# B. OPTICAL FIBER RISER CABLE:

- 1. Single mode cable consisting of a minimum of 24 fibers in one jacket (unless otherwise noted).
- 2. Multimode cable consisting of a minimum of 6 fibers in one jacket (unless otherwise noted).
- 3. All single mode shall be OS2, 9µm loose tube single mode fiber.
  - a) Standard wavelengths 1310 nm and 1550nm.
- 4. All multimode shall be OM3 or OM4, 50µm loose tubefiber.
  - a) Standard wavelengths 850 nm and 1300nm.
- 5. Non-Armored, Riser rated, OM3 or OM4 Distribution Cable

- 6. Jacket color shall be aqua (OM3 or OM4).
- 7. Manufacturer/Product:
  - a) Corning Optical Communications
  - b) Hubbell Premise Wiring

#### C. OSP ARMORED OPTICAL FIBER CABLE:

- 1. Outdoor Armored Loose Tube
  - a) Jacket color shall be black.
- 2. Single mode cable consisting of a minimum of 24 fibers in one jacket (unless otherwise noted).
- 3. Multimode cable consisting of a minimum of 6 fibers in one jacket (unless otherwise noted).
- 4. All single mode shall be OS2, 9µm loose tube single mode fiber.
  - a) Standard wavelengths 1310 nm and 1550nm.
- 5. All multimode shall be OM3 or OM4, 50µm loose tubefiber.
  - a) Standard wavelengths 850 nm and 1300nm.
- 6. Non-Armored, Riser rated, OM3 or OM4 Distribution Cable
- 7. Jacket color shall be aqua (OM3 or OM4).
- 8. Manufacturer/Product:
  - a) Corning Optical Communications
  - b) Hubbell Premise Wiring

## 2.2 CONNECTORS, FIBER OPTIC

- A. LC Pre-polished
  - 1. Aqua Housing
  - 2. Precision low-loss, factory polished connector with integral splice and fiber clamp
  - 3. Simple and fast connector termination, with no adhesives or field polishing required
  - 4. Provisions for visual light source verification to achieve optimal splice transmission
  - 5. Wide operating temperature range for thermally stable optical performance
  - 6. Insertion loss: 0.5dB
  - 7. Multimode return loss: 35dB Typical, 22dBmin
  - 8. Operating temperature range: -40°C to+75°C
  - 9. Mating durability: 500 cycles < 0.1 dB change
  - 10. Zirconia ferrule: UPC polish

## 2.3 FIBER OPTIC ENCLOSURE

- A. 1U Rack Mount Enclosure
- B. Full 17" Depth, with Slide-Out InnerDrawer
- C. One-Piece Removable Cover and LatchingDoor
- D. Accepts all Standard FSP-Series Panels
- E. Accepts all plug and playcassettes

F. Material: 16-gauge cold rolledsteel

G. Finish: Black powder coated

H. FSP Panel Capacity 3

I. Splice Tray Capacity 2

J. Max LC Port Capacity 72

K. Dimensions: 1.75 (44) x 17 (432) x 17 (432)

#### PART 3 EXECUTION

## 3.1 GENERAL

- A. Backbone fiber optic cables are for use between telecommunications facilities within the same building.
- B. Backbone fiber optic cables are used between buildings within the same campus inside conduit and MaxCell edge detectable three (3) cell fiber innerduct. Distance from CD (MDF) / FD (IDF) location and between communication vaults shall not exceed 500 feet.
- C. Location, fiber count and placement detail for all fiber optic cables shall be as shown on the Drawings.
- D. Provide 10' slack loops at the CD (MDF) end of all backbone fiber optic cables.
- E. Provide 36" of stripped strands fiber wrapped neatly at each fiber cabinet.
- F. All strain relief shall be braided and secure properly to LIU in accordance with manufacturers' provided strain relief bracket.
- G. Ensure no fiber optic cables installed are subject to strain, and that correct bend radiuses are maintained at all times.
- H. EMT conduits shall run between each closet or telecommunications room. One for current installation with three additional conduits for future installations or changes.
- I. EMT Conduits of the proper rating shall run between each closet w/ two (2) MaxCell three (3) cell fabric inner ducts in each conduit.
- J. Label each end of each cable as to source and destination. Terminate optical fibers in consistent, consecutive manner at each end. Place all material in inner duct. Label optical fiber raceway cable with yellow "caution optical fiber cable" tags every 10 feet. Leave 10 feet of slack at each fiber termination point. Neatly coil slack optical fiber cable on top of rack above optical fiber patch panel enclosure at each rack location.
- K. Optical fiber cable terminations shall utilize enclosures and components in quantities consistent with the required fiber counts at each end of each segment.
- Clean all optical fiber connector tips prior to inserting them into mating receptacles or bulkheads. Install all dust covers.
- M. Using approved methods, pull cable into conduit, or place into raceway or cable tray as specified. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- N. Do not combine terminations of fiber optic cables leading to different endpoints into a single cabinet. Each distribution, riser, OSP or Fire Alarm serving cable shall require their own, dedicated fiber termination cabinet (unless otherwise specified by Project Technology Designer).
- O. Each fiber optic riser cable shall be placed within one cell of fiber innerduct.
- P. Fiber optic cables and copper cables shall not share conduit or fiber innerduct.
- Q. Do not install patch cables until after the fiber optic test reports have been accepted by Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.

## 3.2 QUANTITIES

- A. Quantities of system elements shown on the drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of materials to construct a system that meets the intent of these Specifications and the relevant codes.
- B. Typical quantities of cabling are asfollows:
  - 1 Twenty-four strand single mode (OS2) loose tube fiber optic homerun cabling shall be installed between CD (MDF) and each FD (IDF) location.
  - 2. Six (6) strand multi-mode (OM3) loose tube fiber optic homerun cabling shall be installed between CD (MDF) and each FD (IDF)location.

## 3.3 INSTALLATION

## A. Optical Fiber Backbone Cables:

- All optical fiber installations shall be installed via conduit and fiber innerduct. Limit cable-bending radius to 20 times the cable diameter during installation, and 10 times the diameter after installation. Provide all required tools, materials, consumables, and equipment necessary for field mounting of connectors.
- 2. Provide support for vertical runs of fiber optic riser cables.
- Route fiber optic cables together as a single bundle, not to be combined with copper or coax cabling.
- 4. Do not exceed the maximum pull tension specified by the cable manufacturer. Use appropriate lubricants as required to reduce pulling friction. Avoid kinking and twisting of cables during installation.
- 5. During installation of optical fiber cable, do not allow pulling tension to exceed cable manufacturer's specification for the cable being installed. Only the strength member of the cable shall be subjected to the pulling tension.
- 6. Follow all manufacturers' specifications for installation.

## B. Connector Installation:

- Do not terminate fiber until after the rack locations and elevations of fiber cabinets have been accepted by Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.
- Terminate both ends, fibers will be terminated in strict compliance with the manufacturer's printed instructions.
- 3. Termination (fusion splice) all Fiber Optic cabling to LC fiber cassette for installation in all LIU applications per manufacturer's specifications.
- 4. Breakout kits will be required on all Fiber Optic cables installed per manufacturer's specifications.
- 5. All Fiber Optic connectors shall be factory manufactured and fiber spliced per manufacturer's specifications.
- 6. Unacceptable flaws in the terminations will include, but not limited to, scratches, full or partial cracks, bubbles, pits, epoxy residual, dirt, dust, oil, moisture, grinding and sanding debris. The acceptable termination will show a connector tip that is free of all imperfections in 100% of the core and 80% of the cladding. All unacceptable connectors shall be inspected after rework.
- 7. Maximum length deferential between terminated strands per bundle shall be 6". If the length does not meet this requirement the entire bundle must be re-terminated.

# C. Slack Loop:

1 Slack loop shall be mounted on the ladderrack.

## 3.4 IDENTIFICATION

- A. All fiber optic backbone and riser cables must be labeled with a self-laminating label within 12 inches of the termination.
- B. Fiber enclosures shall have 3/8" to 1/2" high lettering and shall be labeled with the telecommunication room number followed by an alphanumeric character of the rack/cabinet and the enclosure number (i.e. tr1-b-1 represents the first enclosure, second rack/cabinet in telecommunication room #1). Additionally, each strand of fiber shall be identified with the termination location of the opposite end and the fiber position number on the outside (or inside) front cover and top, left-hand corner of the enclosure under the enclosure label.
- C. All cable tags shall be easily accessible, both physically and visually, upon completion of the job.

#### 3.5 GROUNDING & BONDING

- A. Any use of armored cable shall require the bonding of that shield to the PBB/SBB with a #6 AWG copper bonding conductor.
- B. Refer to Section 27 05 26 for additional details.

#### 3.6 TESTING

## A. GENERAL:

- The Contractor shall test, as described below, all fiber optic cables installed under these Specifications.
- Visually inspect all cables, cable reels, and shipping cartons to detect cable damage incurred during shipping and transport. Return visibly damaged items to the manufacturer.
- 3. Where post-manufacturer test data has been provided by the manufacturer on the reel or shipping carton: submit copies to the Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to installing cables.
- 4. Test fully entire reel prior to installation of product.
- 5. Test fully completed systems only. Piecemeal testing is not acceptable.
- Testing shall not be performed until after all hardware is installed and attached, and all labeling and identification has been completed.
- 7. Any cable that does not pass all required testing shall be removed, replaced, and retested.
- 8. Remove and replace any defective cables from pathways system. Do not abandon cables in place.
- Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution
  Designer (RCDD)) and SDOC Technology Services Department Representative reserve the right to
  observe all portions of the testingprocess.
- 10. Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative further reserve the right to conduct "Proof of performance testing", using Contractor equipment and labor, a random retest of at least ten percent (10%) of the cable plant to confirm documented test results.
- 11. Perform all tests as required by the manufacturer in support of the structured cabling system warranty.

## B. TESTERS:

- 1 Optical Time Domain Reflectometer Testing:
  - a) All OTDR testing procedures and field test instruments shall comply with applicable requirements of: TIA/EIA 455-78 and TIA/EIA 455-133

- OTDR test jumpers must meet the criteria for reference jumpers specified in TIA/EIA-455-171.
- c) A launch cable shall be installed between the OTDR and the first link connection.
- d) A receive cable shall be installed after the last link connection.
- e) All cables shall be OTDR tested at 850 nm and 1300 nm (for Multi-mode) or at 1310 and 1550 (single mode) operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
- f) All fiber links shall be tested in both directions.
- g) Optical Return Loss (ORL) for each link shall be measured.
- h) Fiber Length shall be measured and documented.
- Perform a high resolution OTDR test with tracing printouts noting each optical fiber and buffer tube color designation.

## Optical Power Loss Testing:

- a) All fiber optic cables are to be tested via the One-Jumper Reference Method, formerly Method B.
- b) Perform end-to-end, bi-directional attenuation (loss) test for each fiber strand at 850nm and 1300nm (multi-mode) or at 1310 and 1550 (single mode) wavelengths.

## Other Tests:

a) After installation of connectors, visually inspect each fiber end-face at 200x magnification for multimode fiber and 400x magnification for single mode fiber. Refinish fibers with visible defects and/or striations in the corearea.

## C. ACCEPTANCE:

- All test results and corrective procedures are to be documented and submitted in Microsoft Excel or CSV format to the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative within five (5) working days of test completion.
- 2. Each test report shall contain the following general information:
  - a) Fiber Inspection Scope
  - b) Date of Preparation
  - c) Date of Test
  - d) Project Name
  - e) Contractor's Name
  - f) Media Type
  - g) Make, Model and Serial Number of test equipment used
  - h) Date of Last Calibration
  - i) Names of Test Crew.
- 3. Submit the following information regarding the optical fiber cable testing:
  - a) Cable Number
  - b) Fiber Count
  - c) Individual Fiber Numbers
  - d) Connector Types

- e) Number of Connectors / Patches
- f) Calculated Maximum Link Loss
- g) Length of Run
- h) Results of Each Test for Each Fiber
- i) Measured Link Loss for Each Fiber.
- 4. Test result shall be recorded per cable and identical copies placed on three removable media devices (USB Flash Drive) for delivery to the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.
- 5. Once the testing has been completed and the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative are satisfied that all work is in accordance with the Contract Documents, the Representative will notify the Contractor and/or project manager in writing or via email.

## D. RECORD (AS BUILT) DRAWINGS:

1 The Project Record Drawings shall show the types and locations of all optical fiber cabling and termination points. Drawings should include identifying information from the cable identification tags.

END OF SECTION 27 13 23

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# Section 27 15 13 COMMUNICATIONS HORIZONTAL COPPER CABLING

## PART 1 GENERAL:

## 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

## 1.3 INTRODUCTION

- A. Horizontal Premise Cable:
  - 1 The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:
    - Technology horizontal premise cabling and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

## 1.4 RELATED DOCUMENTS

A. Division 27 Sections apply to this Section

1	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communications Copper Backbone Cabling
7.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
8.	Section 27 15 43	Communications Faceplates and Modules
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access PointSystem
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

# 1.5 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturer of cable, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1 Hubbell Premise Wiring
- 3. Product substitutions from other manufacturers shall require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

#### A. Shop Drawings:

- Shop drawings will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1 Major items not included in the ProductSection.
  - 2 Submit for approval in accordance with specified submittal procedures:
    - a) Cable
    - b) Modular Jacks
    - c) Patch panels.
    - d) Faceplates

## 1.7 OUALITY ASSURANCE

- A. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed UTP and fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations.
- D. Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E. Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D AND ANSI/TIA/EIA-568-3.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of the installation.
- G. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according to ISO9001.
- H. Installed products will be manufactured by an ISO 9001 certified facility.
- Installed products will be free from defects in material or workmanship from the manufacturer and will be
  of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Installed products will be lot-traceable by date code.

## 1.8 DEFINITION

- A. CMP: Communications Plenum Cable
- B. CMR: Communications RiserCable

#### 1.9 WARRANTIES

A. Refer to Section 27 00 00 for general details.

## 1.10 MATERIALS

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

## 1.11 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of Category 5e, Category 6 or Category 6a cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

# 1.12 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, The School District of Osceola County and SDOC Technology Services Department Representative immediately before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2 Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.

- Will coordinate that raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
- 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- 6. Will coordinate sleeve selection specified in Division 26.
- Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- 8 Will coordinate the gauge cables to be used in the telecommunication grounding system.
- D. Low Voltage Contractor shall furnish and install the following:
  - 1 Patch Panels
  - 2. Cable, Copper
  - 3. Modular Jacks
  - Face Plates
- E. Electrical Contractor shall furnish and install the following:
  - 1 Conduit
  - 2. Outlet Boxes
  - 3. Penetrations
  - 4. Mechanical Firestop devices
  - 5. Sleeving (rated / non-rated barriers)
- F. Unless noted otherwise, the following items will be the responsibility of the School District of Osceola County:
  - 1 All electronics and active data networking equipment, etc.
  - Telephones, etc.
  - 3. PC's, printers, video display terminals (desktop), flat panel displays (desktop), etc.

## PART 2 PRODUCTS

## 2.1 CABLES

- A. Category 5e UTP
  - 1. 4-pair, category 5e, unshielded twisted pairs (UTP), 22 AWG, bare copper, polyethylene insulated conductors, with overall GreenJacket
    - a) Conductor: 22 awg solid bare copper
    - b) 1GB Application
    - c) Maximum bandwidth 190 MHz
    - d) PoE, PoE+ and 4PPoE
    - e) Approved manufacturer part numbers:
      - 1) Hubbell Premise Wiring
        - Plenum Green C5EPPGN
        - Riser Green C5ELPRGN
- B. Category 6 UTP:
  - 1. 4-pair, category 6, unshielded twisted pairs (UTP), 23 AWG, bare copper, polyethylene insulated conductors, with overall YellowJacket:

- a) Rate to 550 MHz
- b) TIA PARAMETER HEADROOM
- c) NEXT loss +3 dB
- d) PSNEXT loss +3 dB
- e) ACRF +3 dB
- f) PSACRF +3 dB
- g) PoE, PoE+
- h) Component Compliant
- i) Cables shall be terminated on modular jacks in equipment frames.
- j) Approved manufacturer part numbers:
  - 1) Hubbell Premise Wiring
    - Plenum Yellow C6RPY
    - Riser Yellow C6RY
- C. Category 6 OSP:
  - 1. Suitable for direct burial, lashed aerial, duct and underground conduit
    - a) UV resistant jacket
    - b) Approved manufacturer:
      - 1) Hubbell Premise Wiring
        - Underground Burial C6SOPBK
- D. Category 6A UTP
  - 4-pair, category 6A, unshielded twisted pairs (UTP), 24-gauge, bare copper, polyethylene insulated conductors, with overall YellowJacket
    - a) Conductor: 23 awg solid barecopper
    - b) 10GbE Application Assurance
    - c) Maximum bandwidth beyond 750 MHz
    - d) Component Compliant ANEXTPerformance
    - e) PoE, PoE+ and 4PPoE 100 Watt
    - f) Approved manufacturer part numbers:
      - 1) Hubbell Premise Wiring
        - Plenum Yellow C6ASPY
        - Riser Yellow C6ASRY
- 2.2 PATCH PANEL
  - A. UTP Patch Panels, Category 6A (Premise Distribution System)
    - 1. Approved Manufacturer:
      - a) Hubbell Premise Wiring
        - 1) HPJ24 (24 Port)
        - 2) HPJ48 (48 Port)

- 2. Panel shall be constructed of 16-gauge steel, rolled edge construction with black powder coat finish.
- 3. Panel shall be standard 19-inch rackmount
- 4. Compatible with Hubbell XCELERATOR jacks: Category 6A, 6, and 5e
- 5. Panels comply with EIA-310-D rack mount standards
- B. UTP Patch Panels, Category 6 (Intercom / BAS Systems)
  - 1. Acceptable Manufacturer:
    - a) Hubbell Premise Wiring
      - 1) HPJ24 (24 Port)
      - 2) HPJ48 (48 Port)
  - 2. Panel shall be constructed of 16-gauge steel, rolled edge construction with black powder coat finish.
  - 3. Panel shall be standard 19-inch rack mount.
  - 4. Compatible with Hubbell XCELERATOR jacks: CATEGORY 6A, 6, and 5e
  - Panels comply with EIA-310-D rack mount standards

#### 2.3 MODULAR JACK

## A. Category 5e

- 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC Compliant
- Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
- 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
- 4. Jacks shall have a temperature rating of -10°c (14°f) to 70°c (158°f).
- 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- 6. Housings shall be ultrasonically welded for tamper resistance.
- 7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
- Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCCstandard RJ-45 plug.
- 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.
- 10. Jack contacts shall be constructed of beryllium copper for maximum spring force and durability.
  Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.
- 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solid conductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.

- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated perANSI/TIA-568.2-D.
- 31. Colors to specified by enduser.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HXJ5EGN

## B. Category 6

- 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
- Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
- 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
- 4. Jacks shall have a temperature rating of -10 °c (14°f) to 70°c (158°f).
- 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- 6. Housings shall be ultrasonically welded for tamper resistance.
- 7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
- Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCCstandard RJ-45 plug.
- Jack contacts shall be formed flat for increased surface contact with mated plugs.
- 10. Jack contacts shall be constructed of beryllium copper for maximum spring force and durability. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.

- 11 Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solid conductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated per ANSI/TIA-568.2-D.
- 31. Colors to specified by enduser.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HXJ6xx

## C. Category 6A

- 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
- 2. Each jack shall be single unit construction, with snap fit to industry standard keystone opening  $(.760^{\circ} \times .580^{\circ})$ .
- 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
- 4. Jacks shall have a temperature rating of -10  $^{\circ}$ C (14 $^{\circ}$ f) to 70 $^{\circ}$ C (158 $^{\circ}$ f).
- 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- 6. Housings shall be ultrasonically welded for tamper resistance.
- 7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.

- 8. Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
- 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.
- 10. Jack contacts shall be constructed of beryllium copper for maximum spring force and durability. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.
- 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solidconductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated per ANSI/TIA-568.2-D.
- 31. Colors specified by enduser.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HJ6Axx
    - 2) HJU6Axx

## 2.4 FACE PLATES

- A. Rear loading w/designation window
  - 1. Faceplates shall be constructed of high impact, UL94 v-0 rated thermoplastic
  - 2. Faceplates shall be compatible with standard NEMA openings and boxes.

- 3. Faceplates shall be 2.75" w x 4.5" h (69.8 mm x 114.3 mm) for single gang and 4.5" x 4.5" (114.3 x 114.3 mm) for double gang.
- Port size in each faceplate shall fit the category 6 modular jack or snap-fit fiber optic, audio, and video modules for multimedia applications.
- Faceplates shall be provided with clear plastic and color-matched label field covers. Faceplates shall provide for ANSI/TIA-606-B compliant workstation outlet labeling.
- #6-32 pan head Philips / slotted mounting screws shall be included with each faceplate.
- Faceplates shall be UL listed and CSA certified.
- Colors specified by enduser.
- Work area faceplates, as specified in the contract documents, shall be:
  - Hubbell (IFP series)
    - 1) End user specified 1 PORT IFP11xx
    - End user specified 2 PORT IFP12xx 2)
    - End user specified 3 PORT IFP13xx
    - End user specified 4 PORT IFP14xx
    - 5) End user specified 6 PORT IFP16xx

#### PART 3 EXECUTION

#### 3.1 Installation

#### Cable Support:

- This Contractor shall install all supports for cables specified in this section. Traditional ladder rack will be used in each telecommunication rooms, basket tray (main pathway, over 25 cables), and j-hooks will be used in the horizontal.
- Cable supports shall be spaced randomly, but no further than 5'-0"apart.
- Provide all additional cable management products, sleeves or conduit raceways as required to protect exposed cabling and complete the installation of cables in a neat manner.
- A horizontal conduit system consists of conduits radiating from the telecommunication room to the workstation outlets in the floor, walls, ceilings, and columns of a building. When using a conduit distribution system utilize the most direct route following the building lines.
- Conduit is only required if building codes or environmental conditions necessitate it. Rigid or EMT metal conduits are deemed suitable for building installation. Adequate planning should allow for a minimum of one 1-1/4-inch conduits to each workstation location if code requires conduit for voice and data cables.
- Conduit fill ratios shall not exceed 40%; contact your cable manufacturer to get recommendation on fill rates.
- No conduit run should be designed with more than two (2) 90-degree bends between pull points or pull boxes. If a run requires more than two (2) 90-degree bends, installa pull box.
  - a) Exceptions:
    - 1) The total run is no longer than 33 ft inlength.
    - The conduit size is increased to the next trade size.
    - One of the bends is located within 12 in of the cable feed end. (This exception only applies to operations where cable is pushed around the first bend).

- 8. All conduits will be equipped with a contiguous length of plastic or nylon pull string with a minimum rating of 200 lbs. (90 kg).
- 9. A conduit run should not be designed with continuous closed sections longer than 100 feet without pull points or pull boxesinstalled.
- 10. All conduits should terminate above or in the installed ladder racks and allow for proper cable racking. Cable waterfalls should be considered in areas that have excessive distance between the conduit and ladder rack.
- 11. Trays and conduits located within the ceiling shall protrude into the room 1 to 2 in without a bend and above 8 feet high. Clear, unobstructed access to the ladder rack and conduits shall be provided within telecommunication rooms.
- 12. Conduits entering through the floor shall terminate at least six (6) inches above the finished floor.
- 13. Locate slot/sleeve systems in places where pulling and termination will be easy.
- 14. If possible, locate sleeves, slots, and/or conduits on the left side of the room; this placement enhances the use of wall space from left toright.
- 15. When possible, entrance conduit and distribution conduit/cable tray should enter and exit on the same wall, if this is not possible, ladder rack inside the room should be provided for distribution from wall to wall.
- 16. All floor penetrations shall be core drilled with a maximum 1/4-inch size greater than the exterior dimension of the riser conduit.
- Conduits entering through a wall shall be reamed and bushed and terminated as close as practicable to the terminating rack orwall.
- 18. Terminations above a suspended ceiling not less than 3 inches above finished ceiling and finished with bushing opening.
- 19. All conduit will be labeled for easy identification.
- 20. All floor penetrations shall be at columns, exterior walls or in equipment rooms.
- 21. Cables shall be supported at height of bottom flange of structural beams using a rigid support method (i.e. threaded rod, beam clamps, etc.).
- Do not support cables from ductwork, sprinkler piping, water piping, waste piping, conduit, ceiling wire, or other system supports.
- 23. The conduits or sleeve will be installed per TIA/EIA-569-C and seal all penetration with approved fire stop product.
- 24. Provide independent support system for each low voltage cabling system.

#### B. Cable:

- 1. Category 6 or Category 6a cable (yellow in color) will be run for data. Category 6 or Category 6a gelled filled cable will be run in areas where the cable run is in or below the floor that is in contact with dirt or gravel. Certain environments may require the use of different cables and/or cable jackets.
- PE 89 (outside plant telephone cable) six (6) pair will be run for backbone cabling between building unless overwise noted (U.O.N.)
- All terminations will utilize T568a wiring in School District of Osceola County Facilities. Any Contractor
  not complying with this wiring requirement will fix the problem at no cost to School District of Osceola
  County.

- 4. Maximum cable lengths to be 295 feet (90m) including service loops. Provide all necessary installation materials, tools, and equipment to perform insulation displacement type terminations at all communications outlets, patchpanels.
- All communications cabling that has become abandoned as part of new renovation projects, previous renovation projects, or temporary communication cables used during the construction process shall be completely removed.
- 6. Refer to detailed manufacturer's guidelines for deployment of category 6 or category 6a cable. Certain restrictions apply, and specific techniques are recommended.
- 7. All cabling shall be installed in accordance with manufacturers' written bend radius and pulling tensions. General industry guidelines recommend the following bend radius and pulling tensions:
  - a) Tensile loading on a single 4-pair copper UTP cable shall not exceed 25 lbs.
  - b) Bend radius of a single 4-pair copper UTP cable shall not exceed 4 times the diameter of the cable.
  - Bend radius of multi-pair copper UTP and optical fiber cable shall not exceed 10 times the diameter of the cable.
- 8. All conduits and conduit sleeves shall have bushings or grommets and shall be installed prior to the installation of communication cables to avoid damage and abrasions to cable sheathing and insulation. If the electrical Contractor does not install bushings, the communication cabling contractor shall furnish and install bushings prior to pulling communications cabling.
- 9. Horizontal cable length for 4-pair copper UTP cables shall not exceed 295 feet (90m). Prior to bidding and installation, the contactor shall review the drawings and verify no cable run exceeds 295 feet (90m) and notify the Technology Project Manager and SDOC Technology Services Department Representative of cable runs that may exceed 295 feet (90m).
- 10. Splices are not permitted in any voice or data cable.
- 11. Avoid placing copper cables near sources of extreme heat (i.e. boilers, radiators, heat coils).
- 12. Maintain cable twists for all UTP cables. For terminations cable sheathing shall be stripping back no more than ½" back from termination point for all Category 6 cables.
- 13. All cables shall be supported by cable tray, cable runway, or j-hooks. When large quantities of cables leave trays or runways, cables shall be supported by drop-outs or cable support hardware manufactured specifically for the purpose of supporting cables. J-hooks shall be installed a minimum of every 5 feet and cabling shall maintain minimal deflection and strain (less than 12" deflection). Cables shall not be supported from ceiling grid wires. Cables shall not run above iron joists.
- 14. All cables shall be separated and bundled into like groups (disciplines).
- 15. Service loops shall be provided at both ends of installed horizontal and backbone cabling. A three (3) foot service loop shall be installed in the ceiling space near workstation outlets (excessive cable shall not be coiled in outlet boxes). A ten (10) foot service loop shall be provided in communication rooms and shall be installed to allow for future equipment rack/cabinet relocations without the need to reterminate patch panels; the ten (10) foot service loop shall be neatly bundled and secured in cable trays. Additional Cable slack and service coils shall be stored properly above the ceiling or under the access floor (where applicable).
- 16. Any cabling installing in equipment rooms shall be neatly placed in cabling trays, cabling runways, or horizontal and vertical rack/cabinet cable managers.
- 17. Velcro straps shall be utilized in the TR and inside TC enclosures for all cable bundling. Tie wraps are prohibited in the telecommunicationrooms.

## C. Separation:

1. Maintain the following distances between cables, other system cables and other building systems.

- a) Two (2) feet from fluorescent lights.
- b) Two (2) feet from power cable in parallel.
- c) Two (2) feet from electrical conduits, other systems cables or other electrical equipment.
- d) Four (4) feet from motors and transformers.
- e) Three (3) feet from hot water piping or other mechanical equipment.
- f) Ten (10) feet from bus conductors or high-current branch circuits.
- 2. All low voltage cables shall run parallel or at right angles to building structural framework. Do not run cables diagonally across ceiling space without written authorization by the Technology Project Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative.
- 3. Communication cabling that must cross power cables or conduit shall cross at a 90-degree angle and shall not make physical contact.
- 4. Fire seal around all cables running through rated floors and walls. Firestop all cables and pathways that penetrate fire-rated barriers using approved methods and according to local codes.
- 5. Leave spare pull string with every outlet installed.
- Do not install cable in wet areas, or in proximity to hot water pipes or boilers.
- 7. Cable ends for termination shall be clean and free from crush marks, cuts, or kinks left from pulling operations. Installed cable jackets shall have no abrasions with exposed conductor insulation or bare copper "shiners". The installer is responsible to replace damaged cables.
- Backbone cables shall be installed and bundled separately from horizontal distribution cables. Backbone and horizontal cable bundles shall be loose and random.
- Backbone cables spanning more than three floors shall be supported at the top of the cable run with a wire mesh grip and on alternating floors, unless otherwise specified by local codes or manufacturer's guidelines.
- Vertical runs of backbone cables entering each TR shall be securely fastened along a properly prepared wall in the TR on each floor. Use of cable ladder is recommended.

## D. Communication infrastructure:

- 1 Maximum cable lengths to be 295 feet (90m) including service loop. Provide all necessary installation materials, tools, and equipment.
- Support and secure cables at patch panels using rear cable management bracket, spools, or management devise.
- Install category 3, multi-pair voice backbone cables utilizing an independent open cabling. This may require gelled filled cable for under slab installations.
- For each voice cross-connect; provide the appropriate color icon at each patch panel port at the TC and/or TR locations.
- Complete all cross-connects for analog central office facilities and alarm lines to 66-termination block.
- 6. Cross-connects shall be completed as per construction schedule.

## E. Category 6 jacks:

- Refer to specific manufacturer's guidelines for termination of jacks and dressing category 6 cables inside wall outlets and surface housings. Due to the larger size of category 6 cable, service coils in outlet boxes and surface housings are notrecommended.
- Terminate jacks according to manufacturer's instructions.

- 3. All jacks shall be wired utilizing T568a wiring scheme.
- 4. To assure 10GBase-T performance, maintain wiring pair twists as close as possible to the point of termination. Also, minimize the length of exposed pairs from the jacket to the IDC termination point during installation.
- 5. The length of wiring pair un-twist in each termination shall be less than 0.5 inches (13 mm).
- Jacks shall be properly mounted in plates, frames, or housings with dust caps fully installed over IDC contacts.
- 7. Horizontal cables extending from mounted jacks shall maintain a minimum bend radius of at least 4 times the cable diameter unless space is restricted.
  - a) Note: refer to specific manufacturer's recommendations for restricted cable bend radius.
- Cable terminations shall minimize tensile or bending strain on IDC contacts after assembly of faceplate or housing to the wall outlet.

## F. Category 6 patch panels:

- Properly mount patch panels into the designated rack, cabinet, or bracket locations with the #12-24 screws provided.
- 2. Terminate cables behind the patch panel according to manufacturer's instructions.
- 3. To assure performance, maintain wiring pair twists as close as possible to the point of termination. Also, minimize the length of exposed pairs from the jacket to the ICD termination point during installation.
- 4. The length of wiring pair un-twist in each termination shall be less than 0.5 inches (13 mm) and shall be kept to a minimum.
- 5. Each terminated and dressed cable shall be maintained perpendicular to the rear cover using the recommended cable managementhardware.
- 6. Horizontal or backbone cables extending from the rear panel terminations shall maintain a minimum bend radius of at least 4 times the cable diameter.
- 7. Cable terminations shall have minimal tensile or bending strain on panel IDC contacts in each installed location.
- Panels shall be properly labeled on the front and back with the cable number and port connections for each port.
- Patch panel jacks shall match color of patch cords (exceptions general telecom outlets (D2-D6) shall be black in color).

## G. Fire stop:

- Before beginning installation, verify that substrate conditions previously installed under other sections
  are acceptable for installation of firestopping in accordance with manufacturer's installation
  instructions and technical information.
- Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.
- Provide masking and temporary covering to protect adjacent surfaces.
- 4. Do not proceed until unsatisfactory conditions have been corrected.
- 5. Install through-penetration firestop systems in accordance with performance criteria and in accordance with the conditions of testing and classification as specified in the published design.
- 6. Comply with manufacturer's instructions for installation of firestopping products.

- 7. Keep areas of work accessible until inspection by authorities having jurisdiction. Where deficiencies are found, repair firestopping products so they comply with requirements.
- 8. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.
- Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

#### 3.2 LABELING

#### A. General:

- All labels shall be permanent, machine generated labels produced by a labeling machine. Labels shall
  be a permanent polyester material clear in color with label lettering black in color. No handwritten
  labels will be accepted.
- 2. Labeling information will be reviewed at pre-installation meeting, and the School District of Osceola County Representative shall approve the labeling scheme prior to the installation of any cabling.
- 3. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment, faceplates, patch panels termination blocks, etc.
- 4. All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, and schematic designs.

#### B. Cabling:

- All structured cables (horizontal and backbone) shall be labeled at both ends within 6" of cable termination point. Where voice backbone cables extend behind termination blocks, cable labels shall be placed at a location on the cable where the labels are visible from the front of the termination blocks.
- Labels shall have an adhesive backing and shall wrap completely around the circumference of the cable jacket. Label and lettering sizes shall be of appropriate size in regard to cable diameter.
- C. Equipment racks, termination hardware, and faceplates:
  - All communications equipment racks, cabinets, fiber enclosures, and termination hardware shall be clearly labeled at the top, left-hand corner of the equipment.
  - 2. Equipment racks and cabinets shall have 3/4" to 1" high lettering and shall be labeled with the telecommunication room number followed by an alphanumeric character in sequence for each rack/cabinet. (i.e. Tr2-a represents the first rack/cabinet in telecommunication room #2).
  - 3. Modular patch panels shall have 3/8" to ½" high lettering and shall be labeled with the telecommunication room number followed by an alphanumeric character of the rack/cabinet and the patch panel number (i.e. Tr3-c-2) represents the second patch panel, third rack/cabinet in telecommunication room #3). Patch panels shall be labeled with sequential numbering starting with "01" for topmost patch panel and moving downward towards the bottom of the rack. Additionally, each jack position on the patch panel shall be identified with the jack position number (i.e. A 48-port patch panel shall have number 1 through 48 silk screen printed on the patch panel or shall have labeling strips with numbers 1 through 48 machine printed above/below corresponding jack position).
  - 4. Voice and data outlets shall have 3/16" high lettering with the labeling method as indicated. Voice and data outlets shall be identified with the telecommunication room where cables are terminated, the rack/cabinet number, the patch panel number, and the jack position number (i.e. TR3-C2-28 represents the outlet is located on the second patch panel in the third rack/cabinet in telecommunication room #3 and is jack position #28). The Contractor shall terminate all cabling in a sequential method.

#### 4.1 CATEGORY CABLE TESTING

- A. Permanent link testing shall be completed on all horizontal (station) cables:
  - Category rated cabling systems shall be tested as an installed horizontal permanent link configuration.
    Jacks and faceplates shall be assembled complete and properly mounted into outlet boxes. Panels shall be terminated completely and fully dressed with proper cable management.
  - 2. All wiring shall be certified to meet or exceed the specifications as set forth in ANSI/Tia-568.0-D.
    - a) Field testing shall include the following parameters for each pair of each cable installed:
      - 1) Name of the person performing the test.
      - 2) Test equipment manufacturer and model number.
      - 3) Cable identification of the test sheets will be in numerical order by cable identification.
      - 4) Date of test.
      - 5) Wire map (pin to pin connectivity and polarity check).
      - 6) Length (in feet).
      - 7) Insertion loss.
      - 8) Near end crosstalk (next).
      - 9) Power sum near end crosstalk(psnext).
      - 10) Equal-level far end crosstalk (elfext).
      - 11) Power sum equal-level far end crosstalk (pselfext).
      - 12) Return loss.
      - 13) Delay skew.
      - 14) Attenuation to crosstalk ratio (acr).
  - 3. A "pass" indication shall be obtained for each link, using at minimum a level iii tester that complies with ANSI/TIA-568.0-D field test requirements.
  - 4. Record test results for each cable and turn over to the general Contractor upon completion of the job. Correct malfunctions when detected, and re-test to demonstrate compliance.
    - a) Note: Test equipment shall be a type IV cable tester.
  - 5. Performance testing (100%) of all horizontal copper cabling shall be conducted by Project Technology Designer (Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and Premise Contractor prior to Substantial Completion acceptance and said test results forwarded to Project Technology Designer, and SDOC Technology Services Department Representative, in writing, containing original test results for project manager / owner Representative approval.
  - 6. Performance testing (100%) of all Fiber Optic cabling, both single mode and multi-mode cabling, shall be conducted by Project Technology Designer (Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and Premise Contractor prior to Substantial Completion acceptance and said test results forwarded to Project Technology Designer, and SDOC Technology Services Department Representative, in writing, containing original test results for project manager / owner Representative approval.

END OF SECTION 27 15 13

#### **SECTION 27 15 43**

#### COMMUNICATIONS FACEPLATES AND MODULES

#### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

## 1.3 INTRODUCTION

#### A. Faceplates and Modules:

- The work covered by this section of the Specifications includes all labor necessary to perform and
  complete such construction, all materials and equipment incorporated or to be incorporated in such
  construction and all services, facilities, tools, and equipment necessary or used to perform and
  complete such construction. The work of this section shall include, but is not limited to, the following:
  - Telecommunication faceplates, jacks, outlet modules cabling and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

#### 1.4 RELATED DOCUMENTS:

B. Division 27 Sections apply to this Section

1.	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communication Copper Backbone Cabling
7.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
8.	Section 27 15 13	Communications Copper Horizontal Cabling
9.	Section 27 16 19	Communications Patch Cords and Station Cords
10.	Section 27 21 33	Wireless Access PointSystem
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 24 51 50	Educational Intercom / Public Address / Bell Signaling Systems

#### 1.5 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturer of the faceplates and modules, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1. Hubbell Premise Wiring
- B. Product substitutions from other manufacturers shall require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

#### A. Shop Drawings:

- Shop drawings will indicate the location and quantity of faceplate and modules (including number of data jacks) and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1. Major items not included in the ProductSection.
  - 2. Submit for approval in accordance with specified submittal procedures:
    - a) Faceplates
    - b) Modules
    - c) Jacks

#### 1.7 QUALITY ASSURANCE

- A. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed UTP and fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations.
- D. Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E. Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D AND ANSI/TIA/EIA-568-3.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of the installation.
- G. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according toISO9001.
- H. Installed products will be manufactured by an ISO9001 certified facility.
- Installed products will be free from defects in material or workmanship from the manufacturer and will be of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Installed products will be lot-traceable by date code.

#### 1.8 DEFINITION

#### A. Jack:

1. Termination point for telecommunications cabling that transitions from permanently installed station cable to a user end station cord. Also referred to as an "Information Outlet"

#### B. Faceplate:

1. Any type of plastic or metal plate designed to fit over a device or computer component to enhance the device's functionality or its looks. Also referred to as "Outlet Cover."

#### C. Module:

A Standardized snap-in package for mounting a variety of low-voltage electrical jacks or optical
connectors also referred to as keystone wall plates, face plates, surface-mount boxes, or a
patch panel. Keystone modules have a rectangular face and are held in place with flexible tabs.

#### 1.9 WARRANTIES

A. Refer to Section 27 00 00 for general details.

## 1.10 MATERIALS

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment is not permitted. Provide equipment to site in original packaging whenever practical.

#### 1.11 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of Category 5e, Category 6 or Category 6a cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50<sup>0</sup>f and 80<sup>0</sup>f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

## 1.12 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.

- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.
  - 4. Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
  - 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
  - 6. Will coordinate sleeve selection specified in Division 26.
  - Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
  - 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.

#### PART 2 PRODUCTS

#### 2.1 WALL FACEPLATE - REAR LOADING

- A. Faceplates for single gang outlets shall have from 1 to 6 ports.
- B. Provides a rear loading, snap in, flush mounting of keystone connectors.
- C. Single gang.
- D. All parts are to be same color to match electrical unless otherwise noted (U.O.N).
- E. All IFP plates are supplied with paper labels, clear screw covers, and color-matched screw covers.
- F. UL listed and cUL certified.
- G. ANSI/TIA-606-B station labeling capability.
- H. UL 94V-0 rated flame-retardant material.
- I. Mounts to standard NEMA openings andboxes.
- J. Approved manufacturer:
  - 1. Hubbell Premise Wiring
    - a) 1-port IFP11xx
    - b) 2-port IFP12xx
    - c) 3-port IFP13xx
    - d) 4-port IFP14xx
    - e) 6-port IFP16xx

## K. Blank Inserts

- 1. Hubbell Premise Wiring
  - a) SFB10

#### 2.2 WALL FACEPLATE - FRONT LOADING

- A. The IMF modular plates provide the flexibility to tailor each workstation solution to your specific requirements. The front-loading plates accept modules in 3 Unit combinations for single gang.
- B. Aesthetic, rounded profile single gang face plate.
- C. All parts are to be the same color match electrical unless otherwise noted (U.O.N.).
- D. All IFP plates are supplied with paper labels, clear screw covers, and color-matched screw covers.
- E. UL listed and cUL certified.
- F. Field configurable, front loading, easy snap in keystone mounting modules.
- G. Supports copper, fiber, and AV applications.
- H. ANSI/TIA-606-B station labeling capability.
- I. UL 94V-0 rated flame-retardant material.
- J. Mounts to standard NEMA openings and boxes.
- K. Approved manufacturer:
  - 1. Hubbell Premise Wiring
    - a) Single-gang IMF1xx
    - b) Double-gang IMF2xx
- L. Modules
  - 1. Approved manufacture:
    - a) Hubbell Premise Wiring
      - 1) Single Port Flat IM1K1xx
      - 2) Dual Port Flat -IM2K1xx
      - 3) Single Port Angled IM1KA15xx
      - 4) Dual Port Angled IM1KA15xx
- M. Blank Face Plate Inserts
  - 1. Approved manufacturer:
    - a) Hubbell Premise Wiring
      - 1) 0.5 Insert IMB05xx
      - 2) 1.0 Insert IMB1xx
      - 3) 1.5 Insert IMB15xx
- 2.3 WALL PHONE FACEPLATE W/ JACK
  - A. Faceplates shall be stainless steel with two studs for hanging a wall phone.
  - B. Studs mounted in standard positions to accommodate any standard wall phone
  - C. Mounts to any single gang wall box, universally accepted
  - D. Accepts 2 phone styles: flush or semi-extended jack mount
  - E. Keystone opening accepts HPW HD series jacks
  - F. Fast and easy to install cost effective

- G. Category 6 Modular Jack
- H. Approved manufacturer:
  - 1. Hubbell Premise Wiring
    - a) SP6R

#### 2.4 SURFACE MOUNT BOXES

- A. Uses HPW Keystone adapters and jacks. (AV, Fiber, and Copper)
- B. UL and cUL Listed 1863
- C. ANSI/TIA/EIA-606-B compliant
- D. ADA compliant
- E. RoHS Compliant
- F. Material High-impact thermoplastic (UL 94V-0)
- G. Plenum and workstation rated
- H. Box must have an option for attachment with screws
- I. All parts are to be white in color unless otherwise noted.
- J. Approved manufacturer:
  - 1. Hubbell Premise Wiring
    - a) 1-Port Standard ISB1xx
    - b) 1-Port Plenum ISB1xxP
    - c) 2-Port Standard ISB2xx
    - d) 2-Port Plenum ISB2xxP
    - e) 4-Port Standard ISB4xx
    - f) 6-Port Standard ISB6xx
    - g) 12-Port Standard ISB12xx

## 2.5 MODULAR JACKS

- A. Category 6 jack
  - 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
  - Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
  - 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
  - 4. Jacks shall have a temperature rating of -10  $\Box$ c (14 $\Box$ f) to 70 $\Box$ c (158 $\Box$ f).
  - 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
  - 6. Housings shall be ultrasonically welded for tamperresistance.
  - 7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
  - 8. Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
  - 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.

- Jack contacts shall be constructed of beryllium copper for maximum spring force and durability.
   Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.
- 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solid conductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated per ANSI/TIA-568.2-D.
- 31. Colors to specified by end user.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring
    - 1) HXJ6xx

## B. Category 6a jack

- 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
- 2. Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
- 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
- 4. Jacks shall have a temperature rating of -10  $\Box$ c (14 $\Box$ f) to 70 $\Box$ c (158 $\Box$ f).
- 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- 6. Housings shall be ultrasonically welded for tamper resistance.

- 7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
- 8. Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
- 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.
- Jack contacts shall be constructed of beryllium copper for maximum spring force and durability.
   Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.
- 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solid conductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated per ANSI/TIA-568.2-D.
- 31. Colors to specified by end user.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HJ6axx

#### PART 3 EXECUTION

#### 3.1 GENERAL

- A. Quantities of system elements shown on the drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of materials to construct a system that meets the intent of these Specifications and the relevant codes.
- B. Follow all manufacturers' instructions.
- C. Faceplates and modular jack installation shall be in conformance to ANSI/TIA-568.0-D & ANSI/TIA-568.1-D standards, BICSI methods, industry standards and manufacturer's guidelines.
- D. Coordinate with all other trades prior to pre-construction submittals and installation.

## 3.2 LABELING

- A. All labels shall be permanent, machine generated labels produced by a labeling machine. Labels shall be a permanent polyester material clear in color with label lettering black in color. No handwritten labels will be accepted.
- B. Labeling information will be reviewed at pre-installation meeting, and the Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and SDOC Technology Services Department Representative shall approve the labeling scheme prior to the installation of any cabling.
- C. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment, faceplates, patch panels termination blocks, etc.
- D. All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, and schematicdesigns.

#### 3.3 FACEPLATE

- A. Faceplates shall be installed straight and plumb in all directions.
- B. Wall faceplates shall be installed at the same height as accompanying electrical outlets unless specific heights are noted.
- C. Faceplates shall be installed at appropriate ADA height.
- D. Faceplates shall be installed with screws.
- E. Should the faceplate not cover the entirety of the outlet box hole in the wall due to overcutting or rough workmanship, the wall shall be appropriately patched and painted for a neat and clean finished appearance.
- F. All telecommunications outlets, with the exception of surface mount boxes, are only to be installed over enclosed back boxes.
- G. All faceplates shall be fastened to back box with threaded machine screws of appropriate length. Fill all module unused openings with blank modules.

## 3.4 WALL PHONE FACEPLATE

A. Refer to the ADA for requirements concerning wall mount telecommunications devices.

#### 3.5 SURFACE MOUNT BOXES

- A. Surface mount boxes are only to be used in new construction for outlets above the ceiling or in mechanical/electrical spaces.
- B. Surface mount boxes are not to be used in communication CD (MDF) / FD (IDF) locations, user spaces, or any other new construction areas.
- C. Surface mount boxes must be permanently attached to the building's structure with screws.

- D. Surface mount boxes must not be installed inside panels used for other services unless those panels are accessible by a certified Contractor.
- 3.6 MODULAR JACK (INCLUDINGSURFACE-MOUNT)
  - A. Follow all Manufacturerinstructions.
  - B. All category modular jacks shall be terminated using the T568a termination scheme specified in ANSI/TIA-568.0-D.
  - C. Modular jacks terminated in areas prior to final cleaning (e.g., painting, carpet installation, dusty areas) shall be placed in a protective envelope to ensure dust, debris, moisture, and other foreign materials do not settle onto modular jack contacts. Once final cleaning is complete, modular jacks shall be inserted into faceplates and screwed into place.
  - D. Pair-twist shall be maintained up to the point oftermination.
  - E. Cable sheath shall be maintained up to within 0.5 inches of the modular jack termination.

END OF SECTION 27 15 43

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#### Section 27 16 19

#### COMMUNICATIONS PATCH CORDS AND CABLING

#### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

#### 1.3 INTRODUCTION

#### A. COMMUNICATION PATCHING CABLING:

- 1 The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:
  - a) Technology patch cords, station cords, fiber optic patch cords and cross-connect cabling and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

## 1.4 RELATED DOCUMENTS

A. Division 27 Sections apply to this Section.

1	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communications Copper Backbone Cabling
7.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
8.	Section 27 15 13	Communications Copper Horizontal Cabling
9.	Section 27 15 43	Communications Faceplates and Modules
10.	Section 27 21 33	Wireless Access PointSystem
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 24 51 50	Educational Intercom / Public Address / Bell Signaling Systems

#### 1.5 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturer of patch cords, stations cords, fiber optic patch cords, and cross-connect cabling, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1 Hubbell Premise Wiring
- Product substitutions from other manufacturers shall require the approval of the Project Technology
  Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and
  SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

#### A. Shop Drawings:

- Shop drawings will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1 Major items not included in the ProductSection.
  - 2 Submit for approval in accordance with specified submittal procedures:
    - a) Patch Cords
    - b) Station Cords
    - c) Fiber Optic Patch Cords
    - d) Cross-connect cabling

#### 1.7 OUALITY ASSURANCE

- A. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed UTP and fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations
- D. Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E. Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D AND ANSI/TIA/EIA-568-3.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of the installation.
- G. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according toISO9001.
- H. Installed products will be manufactured by an ISO9001 certified facility.
- Installed products will be free from defects in material or workmanship from the manufacturer and will be
  of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Installed products will be lot-traceable by date code.

#### 1.8 WARRANTIES

A. Refer to Section 27 00 00 for general details

#### 1.9 MATERIALS

- All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

#### 1.10 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of Category 6 or Category 6a cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

## 1.11 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2 Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.
  - 4. Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.

- 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- 6. Will coordinate sleeve selection specified in Division 26.
- Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.

#### PART 2 PRODUCTS

#### 2.1 STANDARD COPPER CABLE COLORS

- A. Patch Cords (Telecom Room) Server Purple
- B. Patch Cords (Telecom Room) Data Yellow
- C. Patch Cords Intercom / Clocks / AV Green
- D. Patch Cords Wireless Access Point Pink
- E. Patch Cords Telephone Black
- F. Patch Cords Printers Brown
- G. Patch Cords HVAC / Environmental White
- H. Patch Cords Security / Camera Orange
- I. Station Cords (User End) Yellow
- J. Fire Alarm Red
- K. UPS Blue
- L. Cross-connect Red (where applicable)

## 2.2 STANDARD COPPER PATCH CABLES

- A. Category 6 Patch Cords (Station patch cords):
  - 1. Provide 8-position/8-conductor modular RJ45 type plugs compatible with industry standard modular jacks.
  - 2. Extended strain relief for added protection in high density applications.
  - 3. The cord shall be of stranded construction and shall be available in one (1) and four (4) pair configurations.
  - 4. Snag-less Design Easy to route and cable manage without the latch getting caught.
  - 5. Flexible cable for easy cablemanagement.
  - 6. Backwards compatible to Cat 5e, 5 & 3.
  - 7. Cable Construction:
    - a) Conductor: 24AWG UTP
    - b) OD: 0.224
    - c) Jacket: Flame-Retardant PVC CMRated
  - 8. Plug Material:
    - a) Plug body: Polycarbonate UL 94V-0
    - b) Plug boot: Polycarbonate UL94V-0

- 9. Contact:
  - a) High strength copperalloy
- 10. Plating: 50 micro-inch Gold with 100 micro-inch underplating
- 11. Mechanical:
  - a) Cable to plug tensile strength: 20+lbs.
  - b) Mating cycles: 2000+
- 12. TIA-568.2-D Category 6 component
- 13. Channel: Third-Party tested for TIA568.2-D
- 14. Category 6 and ISO 11801 Class E
- 15. IEEE 802.3af, IEEE 802.3at & IEEE 802.3btcompliant
- 16. UL Listed 1863
- 17. Approved Manufacturer:
  - a) Hubbell Premise Wiring
    - 1) 3' HC6xx03
    - 2) 5' HC6xx05
    - 3) 7' HC6xx07
    - 4) 10' HC6xx10
    - 5) 15' HC6xx15
    - 6) Color xx = color

      - BK (Black)GN (Green)
      - OR (Orange)
      - P (Purple)
      - R (Red)
      - BL (Blue)
      - Y (Yellow)
      - W (White)
- B. Category 6A Patch Cords (Station patchcords):
  - 1. Provide 8-position/8-conductor modular RJ45 type plugs compatible with industry standard modular jacks.
  - 2. Extended strain relief for added protection in high density applications.
  - 3. The cord shall be of stranded construction and shall be available in one (1) and four (4) pair configurations.
  - 4. Snag-less Design Easy to route and cable manage without the latch getting caught.
  - 5. Soft flexible cable for easy cable management.
  - 6. Backwards compatible to Cat 6, 5e, 5 & 3.

- 7. Cable Construction:
  - a) Conductor: 26AWG UTP
  - b) Jacket: Dual Layer Flame-Retardant PVC CM Rated
- 8. Plug Material:
  - a) Plug body: Polycarbonate UL 94V-0
  - b) Plug boot: Polycarbonate UL94V-0
- 9. Contact: High strength copperalloy.
- 10. Plating: 50 micro-inch Gold with 100 micro-inch underplating.
- 11. Mechanical:
  - a) Cable to plug tensile strength: 20+lbs.
  - b) Mating cycles: 2000+
- 12. ANSI/TIA-568.2-D Category 6Acomponent.
- 13. ISO 11801/60603-7-41 Category 6A component.
- 14. Mechanical: Verified to TIA-568.2-D.
- 15. UL Listed 1863.
- 16. TIA-568-C.2 Category 6A component.
- 17. Channel: Third-Party tested for TIA 568-C.2.
- 18. Category 6A and ISO 11801 Class EA.
- 19. Application: Third-Party qualified for 10 Gigabit Ethernet Transmission IEEE 802.3an.
- 20. Current Capacity: Exceeds current levels for PoE and PoE+ IEEE802.3at.
- 21. Tested to 150% of IEEE 802.3bt.
- 22. Approved Manufacturer:
  - a) Hubbell Premise Wiring
    - 1) 3' HC6Axx03
    - 2) 5' HC6Axx05
    - 3) 7' HC6Axx07
    - 4) 10' HC6Axx10
    - 5) 15' HC6Axx15
    - 6) Color xx = color
      - BK (Black)
      - GN (Green)
      - OR (Orange)
      - P (Purple)
      - R (Red)
      - BL (Blue)
      - Y (Yellow)
      - W (White)
      - PK (Pink)

#### 2.3 LOW DIAMETER COPPER PATCH CABLES

- A. Category 6 ((Equipment) patch cords ONLY):
  - 1. O.D. = 0.155"
  - 2. 28 AWG stranded conductors.
  - 3. Approved Manufacturer:
    - a) Hubbell Premise Wiring
      - 1) 3' HCL6xx03
      - 2) 5' HCL6xx05
      - 3) 7' HCL6xx07
      - 4) 10' HCL6xx10
      - 5) 15' HCL6xx15
      - 6) Color xx= color
        - BK (Black)
        - GN (Green)
        - OR (Orange)
        - P (Purple)
        - R (Red)
        - BL (Blue)
        - Y (Yellow)
        - W (White)
        - PK (Pink)
- B. Category 6A ((Equipment) patch cords ONLY):
  - 1. O.D. = 0.186"
  - 2. 28 AWG stranded conductors.
  - 3. Approved Manufacturer:
    - a) Hubbell Premise Wiring
      - 1) 3' HCL6Axx03
      - 2) 5' HCL6Axx05
      - 3) 7' HCL6Axx07
      - 4) 10' HCL6Axx10
      - 5) 15' HCL6Axx15
      - 6) Color xx=color
        - BK (Black)
        - GN (Green)
        - OR (Orange)
        - P (Purple)
        - R (Red)
        - BL (Blue)
        - Y (Yellow)
        - W (White)
        - PK (Pink)

## 2.4 FIBER OPTIC PATCH CORDS

- A. Multimode:
  - 1. 50/125um Laser Optimized, OM3.
  - 2. Duplex LC to LC.
  - 3. High quality zirconia ferrules for high performance and superior durability.
  - 4. Low mated pair insertion loss minimum impact on signal budget:
    - a) < 0.35 dB
  - 5. Diameter over Jacket shall be 3mmmax.
  - 6. Wide temperature operating range for environmental stability.
  - 7. Multi-Mode Fiber Optic Patch Cables (Aqua Jacket)
  - 8. Approved Manufacturer:
    - a) Hubbell Premise Wiring
      - 1) DFPCLCLCEXMM
        - X=Length (1,2,3,5,7 meters)
- B. Single Mode:
  - 1. 8.3/125um, OS2.
  - Duplex LC to LC.
  - 3. High quality zirconia ferrules for high performance and superior durability.
  - 4. Low mated pair insertion loss minimum impact on signal budget:
    - a) <0.35 dB
  - 5. Diameter over Jacket shall be 3mmmax.
  - 6. Wide temperature operating range for environmental stability.
  - 7. Single Mode Fiber Optic Patch Cables (Yellow Jacket):
    - a) Hubbell Premise Wiring
      - 1) DFPCLCLCCXSM
        - X=Length (1,2,3,5,7 meters)

## 2.5 HDMI CABLE

- A. Standard HDMI:
  - 1. Cable Construction:
    - a) Conductor: 24 AWG
    - b) OD: 0.375
    - c) Jacket: Flame-Retardant PVC
  - 2. Contact:
    - a) Braided Copper
  - 3. Shield:
    - a) Aluminum Foil

- 4. Insulation:
  - a) 30% Glass Filled LCP
- 5. Approved Manufacturer:
  - a) Hubbell Premise Wiring
    - 1) 10' HDC10BK
- B. High Speed 4K HDMI cable:
  - 1. Supports 4K@60Hz
  - 2. Supports 18 Gbps bandwidth

## PART 3 EXECUTION

- 3.1 GENERAL
  - A. All Manufacturer's care and installation instructions will be followed.
  - B. Copper station or patch cords, no single cord shall exceed 15 feet in length.
  - C. All copper cables will be fit with less than 10% slack on the equipment rack.

END OF SECTION 27 16 19

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# Section 27 21 33 WIRELESS ACCESS POINT SYSTEMS

## PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

A. Refer to other Sections in Division 27 00 00 - Communications

#### 1.2 SUMMARY

A. These following communications Specifications are requirements for all School District of Osceola County (SDOC) projects. Request for deviations from these guides and requirements must be made in writing to the School District of Osceola County.

#### 1.3 INTRODUCTION

#### A. Wireless Access Point:

- 1 The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:
  - a) Technology wireless access point installations, cabling and accessories in accordance with the strictest manufacturer written recommendation per code or the best industry practice.

#### 1.4 RELATED DOCUMENTS:

A. Division 27 Sections apply to this Section

1	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communications Copper Backbone Cabling
7.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
8.	Section 27 15 13	Communications Copper Horizontal Cabling
9.	Section 27 15 43	Communications Faceplates and Modules
10.	Section 27 16 19	Communications Patch Cords and Station Cords
11.	Section 27 41 16	Classroom Amplification Systems
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling Systems

## 1.5 APPROVED PRODUCT MANUFACTURERS

- A. The manufacturer of cable, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1 Hubbell Premise Wiring
- Product substitutions from other manufacturers shall require the approval of the Project Technology
  Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and
  SDOC Technology Services Department Representative 10 business days prior to bid opening.

#### 1.6 SUBMITTALS

#### A. Shop Drawings:

- Shop drawings will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1 Major items not included in the ProductSection.
  - 2 Submit for approval in accordance with specified submittal procedures:
    - a) Cable
    - b) Modular Jacks
    - c) Patch panels.

## 1.7 QUALITY ASSURANCE

- A. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- B. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- C. Installed UTP and fiber cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards and regulations.
- D. Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- E. Installed optical fiber cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D AND ANSI/TIA/EIA-568-3.D.
- F. Where applicable, all equipment, components, accessories and hardware will be UL listed for the intended purpose of the installation.
- G. All critical internal manufacturing operations for installed products will have documented in-process inspection and testing according toISO9001.
- H. Installed products will be manufactured by an ISO9001 certified facility.
- I. Installed products will be free from defects in material or workmanship from the manufacturer and will be of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Installed products will be lot-traceable by date code.

#### 1.8 DEFINITION

- A. CMP: Communications Plenum Cable
- B. CMR: Communications RiserCable

#### 1.9 WARRANTIES

A. Refer to Section 27 00 00 for general details.

#### 1.10 MATERIALS

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

#### 1.11 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of Category 6 or Category 6a cable shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

#### 1.12 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with the work.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - 1 Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2 Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.

- 4. Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
- 5. Will coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- 6. Will coordinate sleeve selection specified in Division 26.
- Will coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- 8. Will coordinate the gauge cables to be used in the telecommunications grounding system.
- D. Low Voltage Contractor shall furnish and install the following:
  - 1 Patch Panels
  - 2. Cable, Copper
  - 3. Modular Jacks
  - Face Plates
- E. Electrical Contractor shall furnish and install the following:
  - 1 Conduit
  - 2. Outlet Boxes
  - 3. Penetrations
  - 4. Mechanical Firestop devices
  - 5. Sleeving (rated / non-rated barriers)
- F. Unless noted otherwise, the following items will be the responsibility of the School District of Osceola County Staff:
  - 1 All electronics and active data networking equipment, etc.
  - 2. Telephones, etc.
  - 3. PC's, printers, video display terminals (desktop), flat panel displays (desktop), etc.

## PART 2 Products

## 2.1 CABLES

- A. Category 6A
  - 1. Conductor: 23 awg solid bare copper
  - 2. 10GbE Application Assurance
  - 3. Maximum bandwidth beyond 750 MHz
  - 4. Component Compliant ANEXTPerformance
  - 5. PoE, PoE+ and 4PPoE 100 Watt
  - 6. Approved manufacturer part numbers:
    - a. Hubbell Premise Wiring
      - i. Plenum Yellow C6ASPY
      - ii. Riser Yellow C6ASRY

## 2.2 PATCH PANEL

- B. UTP Patch Panels, Category 6A
  - 1. Approved Manufacturer:
    - a) Hubbell Premise Wiring

- i. HPJ24 (24 Port)
- ii. HPJ48 (48 Port)
- 2. Panel shall be constructed of 16-gauge steel, rolled edge construction with black powder coat finish.
- 3. Panel shall be standard 19-inch rack mount
- 4. Compatible with Hubbell XCELERATOR jacks: Category 6A, 6, and 5e
- 5. Panels comply with EIA-310-D rack mount standards

## 2.3 MODULAR JACK

## A. Category 6A

- 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
- Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
- 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
- 4. Jacks shall have a temperature rating of -10 °c (14°f) to 70°c (158°f).
- 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- 6. Housings shall be ultrasonically welded for tamper resistance.
- 7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
- 8. Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
- 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.
- 10. Jack contacts shall be constructed of beryllium copper for maximum spring force and durability. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.
- 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solidconductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dustcovers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.

- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated per ANSI/TIA-568.2-D.
- 31. Colors to specified by end user.
- 32. Category 6 modular jacks, specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HJ6Axx

## 2.4 SURFACE MOUNT BOXES

- A. Uses HPW Keystone adapters and jacks. (AV, Fiber, and Copper).
- B. UL and cUL Listed 1863.
- C. ANSI/TIA/EIA-606-B compliant.
- D. ADA compliant.
- E. RoHS Compliant.
- F. Material High-impact thermoplastic (UL94V-0).
- G. Plenum and workstation rated.
- H. Box must have an option for attachment with screws.
- I. All parts are to be off white in color unless otherwise noted.
- J. Approved manufacturer:
  - 1. Hubbell Premise Wiring
    - a. 1-Port Standard ISB1xx
    - b. 1-Port Plenum ISB1xxP
    - c. 2-Port Standard ISB2xx
    - d. 2-Port Plenum ISB2xxP

# PART 3 EXECUTION

## 3.1 GENERAL

- A. Quantities of system elements shown on the drawings are illustrative only and are meant to indicate the general configuration of the work. The Contractor is responsible for providing the correct quantities of materials to construct a system that meets the intent of these Specifications and the relevant codes.
- B. Follow all manufacturers' instructions.
- C. Faceplates and modular jack installation shall be in conformance to ANSI/TIA-568.0-D & ANSI/TIA-568.1-D standards, BICSI methods, industry standards and manufacturer's guidelines.
- D. Coordinate with all other trades prior to pre-construction submittals and installation.

## 3.2 LABELING

- A. All labels shall be permanent, machine generated labels produced by a labeling machine. Labels shall be a permanent polyester material clear in color with label lettering black in color. No handwritten labels will be accepted.
- B. Labeling information will be reviewed at pre-installation meeting, and the Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and SDOC Technology Services Department Representative shall approve the labeling scheme prior to the installation of any cabling.
- C. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment, faceplates, patch panels termination blocks, etc.
- D. All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, and schematicdesigns.

### 3.3 SURFACE MOUNT BOXES

- A. Surface mount boxes are only to be used in new construction for outlets above the ceiling or in mechanical/electrical spaces.
- B. Surface mount boxes are not to be used in communication CD (MDF) / FD (IDF) locations, user spaces, or any other new construction areas.
- C. Surface mount boxes must be permanently attached to the building's structure with screws.
- Surface mount boxes must not be installed inside panels used for other services unless those panels are accessible by a certified Contractor.

## 3.4 MODULAR JACK (INCLUDINGSURFACE-MOUNT)

- A. Follow all Manufacturerinstructions.
- B. All category modular jacks shall be terminated using the T568a termination scheme specified in ANSI/TIA-568.0-D.
- C. Modular jacks terminated in areas prior to final cleaning (e.g., painting, carpet installation, dusty areas) shall be placed in a protective envelope to ensure dust, debris, moisture and other foreign materials do not settle onto modular jack contacts. Once final cleaning is complete, modular jacks shall be inserted into faceplates and screwed into place.
- D. Pair-twist shall be maintained up to the point of termination.
- E. Cable sheath shall be maintained up to within 0.5 inches of the modular jack termination.

# 3.5 INSTALLATION

- A. All Manufacturer's care and installation instructions will be followed.
- B. Copper station or patch cords, no single cord shall exceed 15 feet in length.
- C. All copper cables will be fit with less than 10% slack on the equipment rack.

END OF SECTION 27 21 33

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# **SECTION 27 41 16**

## CLASSROOM AMPLIFICATION SYSTEMS

## PART 1 GENERAL

# 1.1 INTRODUCTION:

- A. Classroom Amplification Systems:
  - 1 The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:
    - Audio Enhancement Systems, including speakers, microphones, amplifiers, modules, associated hardware, and devices in accordance with the strictest manufacturer

## 1.2 RELATED DOCUMENTS

A. Division 27 Sections apply to this Section.

1	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communications Copper Backbone Cabling
7.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
8.	Section 27 15 13	Communications Copper Horizontal Cabling
9.	Section 27 15 43	Communications Faceplates and Modules
10.	Section 27 16 19	Communications Patch Cords and Station Cords
11.	Section 27 21 33	Wireless Access PointSystem
12.	Section 27 51 50	Educational Intercom / Public Address / Bell Signaling System

# 1.3 STANDARDS AND CODES:

- A. Refer to other sections in Division 27 00 00 Communications
- B. Refer to Division 01 Reference Standards and General Conditions of the Contract
- C. Complies with both ANSI/TIA-607-C and NEC Article 250. The most stringent rules apply.

# 1.4 APPROVED PRODUCT MANAUFACTURERS

- A. The manufacturer of components, devices, and hardware, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1 Audio Enhancement
- B. These product have been approved by the School District of Osceola County School Board as a sole source solution for Classroom Amplification System on August 20, 2013. Product substitutions from

other manufacturers <u>are not</u> permitted without the express written permission and approval by the School District of Osceola County School Board.

### 1.5 SUBMITTALS

# A. Shop Drawings:

- Shop drawings will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1 Major items not included in the ProductSection.
  - 2 Submit for approval in accordance with specified submittal procedures:
    - a) Audio Enhancement System
      - i. Speakers
      - ii. Microphone (handheld / tear drop)
      - iii. Amplifiers
      - iv. Input / Output interface devices
      - v. Antenna
      - vi. Brackets
      - vii. Supports
    - viii. Hardware
    - ix. Transmitters

## 1.6 QUALITY ASSURANCE

## A. Manufacturer:

- 1 Firm has regularly engaged in manufacture of the materials, called out for in this section, whose products have been satisfactory use in similar service for not less than 3 years.
- B. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- C. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- D. Installed UTP cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations
- E. Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the

- intended purpose of the installation.
- G. All critical internal manufacturing operations for installed products will have documented inprocess inspection and testing according to ISO9001.
- H. Installed products will be manufactured by an ISO9001 certified facility.
- I. Installed products will be free from defects in material or workmanship from the manufacturer and will be of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Installed products will be lot-traceable by date code.

### 1.7 DEFINITION:

- A. Classroom Amplification System
  - An Amplification system to provide adequate volume of all audio requirements within a classroom setting. This system provides hardware, devices, and components conducive for the amplification of instructional audio, instructional presentations, and other supportive audio related instructional presentations within a classroom setting.

# 1.8 WARRANTIES:

A. Refer to Section 27 00 00 for general details

### 1.9 MATERIALS:

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

### 1.10 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of Cable, speakers, modules, components, devices, gateways, and amplifier shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 50°f and 80°f is recommended. Cabling should only be installed in facilities that are not exposed to the elements.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris

from the facility.

## 1.11 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with thework.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2 Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - Will allow right of way for piping and conduit installed at required slope.
  - 4. Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
  - 5. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
  - 6. Coordinate sleeve selection specified in Division 07 and Division 26.
  - Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
  - 8. Coordinate the gauge cables to be used in the telecommunications grounding system.
- D. Audio Enhancement shall furnish and install the following:
  - 1 Speakers
  - 2 Transmitters
  - 3. Components / Modules
  - 4. Devices / Interfaces
  - 5. Cable / copper
  - 6. Amplifier
  - 7. Brackets

- 8. Pathways
- 9. Support / Trays / Hardware
- E. Electrical Contractor shall furnish and install the following:
  - 1 Conduit
  - 2. Outlet boxes
  - Penetrations
  - 4. Mechanical firestop devices
  - 5. Sleeving (rated / non-rated barriers)

## PART 2 PRODUCTS

# 2.1 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS

- A. All equipment shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on the contract drawings shall be the best suited for the intended use and shall be provided by a single manufacturer. The existing Intercom Equipment Cabinet shall be removed and turned over to the customer for spare parts.
- B. The control equipment submitted for this project shall be as included as a standard product by the manufacturer for at least a year at time of bid. If requested, a letter from the Manufacturer's representative shall be provided verifying the length of time that a product has been in distribution. "Beta" or other un-commissioned products will not be accepted.
- C. Provide all components, equipment, parts, accessories, and associated quantities required for a complete installation and to perform all functions and/or features included in this section of the specifications even though not specifically noted or specified herein. All components may not be specified herein
- D. All devices/components/products shall be suitable for use intended and meet all stated performance requirements for Intercom and Master Clock System specified in this section.

## 2.2 RACEWAYS

- A. General:
  - 1. All raceways (conduit, wireways, pull boxes, outlet boxes, etc.) shall comply with applicable requirements of sections within Division 26 of these specifications.
  - 2. All raceways (conduit, wireways, pull boxes, outlet boxes, etc.) shall comply with all requirements of the manufacturer of the intercom system.
- B. Conduit: Comply with Section Conduit except as noted below:
  - 1. Pull Cords: Install pull cords in all raceway runs that are installed without cable.
  - 2. Size: Minimum size shall be 2" conduit.
- C. J-Hooks:
  - 1. Provide size as required for cables, with a maximum fill of 50% cross-area.
  - 2. Provide mounting/fastener type as required for installation.
- 2.3 ACCEPTABLE MANUFACTURERS
  - A. Basis of Design: Audio Enhancement
- 2.4 Acceptable Substitutions:
  - A. None

### PART 3 PRODUCTS

### 3.1 GENERAL

A. The contractor is advised that circuit routing for this system is not necessarily shown on the project drawings. The contractor shall provide and install all raceways, wiring and cabling required for a complete and fully functional system as intended by these specifications. All backbone cabling shall be in conduit, unless noted otherwise. Contractor shall provide and install a properly sized, flush mounted outlet box for every device. Contractor shall provide and install, within the wall, a properly sized conduit extended above ceiling and turned into room it serves for each device. Contractor shall size and route raceways to accommodate the proper installation of the system cabling. T-Tapped cabling shall not be acceptable. In locations where raceway and/or conduit is not accessible after completion of the project, conduit shall be routed from device to device or fire rated access panels shall be installed to provide access to junction and pull boxes. Routing of raceway from device to device shall only be acceptable where the wiring scheme of the system, as recommended by the manufacturer, requires cable to pass from device to device. Contractor shall properly terminate each device according to the manufacturer's recommendations. Station/device cabling for this system shall be installed in J-Hooks. Provide and install sleeves where penetrations are made through rated walls and floors.

## 3.2 INSTALLATION

- A. General Contractor shall provide and install all Audio Enhancement (AE) stub outs, power receptacles and faceplates as specified in the detail pages of SDOC Standards and Specification
- B. Sound enhancement contractors shall provide, install, terminate, test and label all SDOC approved interior flush mount ceiling mounted speakers for hard ceiling or ceiling grid applications. Each interior flush mount speaker installation shall be installed with a ceiling grid tile bridge bracket and above ceiling a recessed enclosure.
- C. Support for each sound enhancement system cable run shall be contractor provided and installed to SDOC satisfaction of the SDOC Technology Standards and Specifications.
- D. Contractor shall provide and install a complete and separate cable pathway for the sound enhancement cable run at all locations. Supports shall be placed every five (5) feet with the cable(s) secured to the supports with Velcro at these locations. For cable runs with multiple cables these cable runs shall be contractor provided and installed with Velcro on the cable bundle every two (2) feet throughout the pathway run.
- E. SDOC approved support devices are "J" hooks "ONLY". Velcro straps installed by themselves and tied to building structures is not SDOC authorized or approved. Cable ties and or pipe straps are not SDOC approved or authorized support devices or means to secure cabling. <u>Contact SDOC Technology Construction Supervisors to approve devices if in question.</u> Contractor shall be responsible for removal of unauthorized supports and to provide and install SDOC approved support systems.

# 3.3 LABELING

- A. All labels shall be permanent, machine generated labels produced by a labeling machine. Labels shall be a permanent polyester material clear in color with label lettering black in color. No handwritten labels will be accepted.
- B. Labeling information will be reviewed at pre-installation meeting, and the Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and Owner IT Department Representative shall approve the labeling scheme prior to the installation of any cabling.
- C. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment.
- D. All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, and schematic designs.

### 3.4 PATHWAY

### A. General

1. Provide and install raceway for all surface mount speaker installations to non-exposed location, penetrations of fire rating assemblies/walls/etc., where exposed to damage, exterior locations,

- underground locations, interconnection of CC's, CP's, and CER's, or any combination thereof, for all backbone cables, and all areas required by applicable codes and standards or as otherwise noted/required in these specifications.
- Where acceptable to authority having jurisdiction and all applicable codes/standards, cables above accessible ceilings may be run without raceways provided complete installation complies with all applicable codes/standards. Proper cable type, sleeves and support hardware must be utilized.
- 3. Raceway shall not be shared by power or any other electrical wiring that is not part of the low voltage Audio Enhancement Systems.

### B. Horizontal Cable Pathway

## 1. Cable Support

- a) Install J-Hooks located 48 inches to 60 inches on center above accessible ceiling areas for cable support.
- b) Where large quantity of cables are congested in an area such as near CC or CER, provide/install special supports designed to carry weight.
- c) Size shall be as required to provide for cables installed plus 50% spare and still not exceed rating of support device.
- d) Velcro all cables to J-Hooks at all bends with Velcro approved for use.

## 3.3 CABLE/WIRE

- A. Install appropriate cable to match application, i.e., plenum, riser, etc. All cables shall bear CMP and/or appropriate marking for the application in which they are installed.
- B. Special Requirements for Cable Routing and Installation:
  - The majority of speaker wiring within buildings will be installed above ceilings. All cabling used throughout this project shall comply with the requirements as outlined in the National Electrical Code (NEC) Article 800. All cabling shall bear CMP and/or appropriate markings for the environment in which they are installed.
  - The system contractor shall be responsible for any damage to any surfaces or work disrupted as a result of his work. Repair of surfaces, including painting, shall be included as necessary.
  - 3. Maintain proper separation between system cables and all power and/or unshielded cables, as required to prevent noise, crosstalk, etc.

# 3.4 SPEAKERS

- A. Mount ceiling speakers in or on ceiling system at locations shown on drawings as directed by ceiling system contractor, manufacturer, and installer. Provide all required mounting hardware and/or accessories. In general, all speakers shall be recessed mounted in the ceiling system. Wireway speaker cannot be recessed; install surface speaker assembly.
- B. Audio Enhancement speakers shall be tapped for individual room requirements. Speakers shall be tapped, main system amplifier sized, and overall system balanced to allow minor system adjustments after installation has been substantially completed. In no instance shall any speaker be tapped to its minimum setting prior to final adjustments. Minimum tap setting shall be reserved for volume adjustment in undersized rooms. In no instance shall any speaker control assembly in the equipment rack be loaded in excess of eighty percent (80%) of the manufacturers stated full load rating.
- C. Connect speakers together so that no speaker circuit exceeds either five speakers or 40 watt load.

## D. Conductors.

- Conductors shall meet requirements of Section Building Wire and Cable. Minimum size to be #12 THWN.
- 2. Bends in excess of 90 degrees in any grounding conductor shall not be permitted. A radius of 6 inches or greater shall be maintained on all bends.
- 3. Do not bundle unprotected conductors with protected conductors.

- 4. Conductors shall be kept as short as possible.
- 5. Conductors shall be secured at 12" intervals with an approved copper clamp.
- Grounding conductors shall be properly connected to the building service ground by approved clamps.

# E. Grounding Connectors

- Connectors, splicers, and other fittings used to interconnect grounding conductors, bond to equipment or grounding bars, shall be approved by NEC or U.L. for the purpose.
- 2. All connectors and fittings shall be of the non-reversible Nico press crimp or compression type.
- Special treatment to fittings, lugs, or other connectors of dissimilar material shall be applied to prevent electro-galvanic action.

# 3.5 DEMONSTRATION

- A. Demonstrate system to designated Owner personnel as required by applicable sections of these specifications.
- B. Conduct walking tour of project. Briefly describe function, operation, and maintenance of each component.
- C. Provide detailed operation and maintenance instruction and training.
- D. Use submitted operation and maintenance manual as reference during demonstration and training.

## **END OF SECTION**

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# **SECTION 27 51 50**

# EDUCATIONAL INTERCOM / PUBLIC ADDRESS / BELL SIGNALING SYSTEMS

## PART 1 GENERAL

# 1.1 INTRODUCTION:

- A. Education Intercom / Public Address / Bell Signaling:
  - 1 The work covered by this section of the Specifications includes all labor necessary to perform and complete such construction, all materials and equipment incorporated or to be incorporated in such construction and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The work of this section shall include, but is not limited to, the following:
    - Education Intercom / Public Address / Bell Signaling system, including speakers, microphones, amplifiers, modules, associated hardware, and devices in accordance with the strictest manufacturer

## 1.2 RELATED DOCUMENTS

A. Division 27 Sections apply to this Section.

1	Section 27 00 00	Communications
2.	Section 27 05 26	Grounding & Bonding for Communications Systems
3.	Section 27 05 28	Pathways for Communications Systems
4.	Section 27 05 36	Cable Trays for Communications Systems
5.	Section 27 11 10	Telecommunications Spaces, Equipment and Fittings
6.	Section 27 13 13	Communications Copper Backbone Cabling
7.	Section 27 13 23	Communications Optical Fiber Backbone Cabling
8.	Section 27 15 13	Communications Copper Horizontal Cabling
9.	Section 27 15 43	Communications Faceplates and Modules
10.	Section 27 16 19	Communication Patch Cords and Station Cords
11.	Section 27 21 33	Wireless Access PointSystem
12.	Section 27 41 16	Audio Enhancement System

## 1.3 STANDARDS AND CODES:

- A. Refer to other sections in Division 27 00 00 Communications
- B. Refer to Division 01 Reference Standards and General Conditions of the Contract
- C. Complies with both ANSI/TIA-607-C and NEC Article 250. The most stringent rules apply.

# 1.4 APPROVED PRODUCT MANAUFACTURERS

- A. The manufacturer of components, devices, and hardware, that School District of Osceola County is using as basis of design in this document, as required for construction of the cabling infrastructure per contract documents shall be:
  - 1 Rauland Borg (Ametek)
  - 2. Hubbell Premise Wiring

B. These product have been approved by the School District of Osceola County School Board as a sole source solution for Education Intercom / Public Address / Bell Signaling System on April 2, 1990. Product substitutions from other manufacturers are not permitted without the express written permission and approval by the School District of Osceola County School Board

# 1.5 SUBMITTALS

- A. Shop Drawings:
  - Shop drawings will indicate the location of cable routes, bundle sizes, and penetrations (including cable trays, mechanical firestops, and interior / exterior sleeving), and will require the approval of the Project Technology Designer (Project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative prior to implementation.
- B. Submit Manufacturer's Cut Sheets for the following: Refer to Section 27 00 00 Communications Submittal.
  - 1 Major items not included in the ProductSection.
  - 2 Submit for approval in accordance with specified submittal procedures:
    - a) Telecenter U School Communication System
      - i. Status Light
      - ii. Message board
      - iii. IP module with speaker
      - iv. Speakers (internal / external)
      - v. Call button
      - vi. Volume control
      - vii. Amplifiers
    - viii. Input / Output interface devices
    - ix. Brackets
    - x. Supports
    - xi. Transition blocks
    - xii. Hardware
    - xiii. Transmitters
    - xiv. Gateways
    - xv. Patch Panels (green inserts)
    - xvi. Patch Cords (green in color)
    - xvii. Premise cable (green in color)

# 1.6 QUALITY ASSURANCE

A. Manufacturer:

- 1 Firm has regularly engaged in manufacture of the materials, called out for in this section, whose products have been satisfactory use in similar service for not less than 3 years.
- B. The Contractor will install work in accordance with the latest School District of Osceola County Requirements, the latest BICSI Information Technology Systems Installation Methods Manual, Telecommunications Distribution Methods Manual, TIA/EIA Standard Commercial Building Telecommunications Cabling Standard, systems planning and design manual.
- C. The Contractor who is installing the materials and installing the system will be trained by the referenced manufacturer in the proper installation practices. The Contractor will have the proper tools and test equipment to insure a good and proper installation.
- D. Installed UTP cabling systems, pathways and distribution facilities will adhere to manufacturer's instructions, contract drawings and specifications, and applicable codes, standards, and regulations
- E. Installed UTP cabling systems and field test results will strictly adhere to requirements of ANSI/TIA-568-0.D, ANSI/TIA-568-1.D and ANSI/TIA/EIA-568-2.D.
- F. Where applicable, all equipment, components, accessories, and hardware will be UL listed for the intended purpose of the installation.
- G. All critical internal manufacturing operations for installed products will have documented inprocess inspection and testing according to ISO 9001.
- H. Installed products will be manufactured by an ISO9001 certified facility.
- Installed products will be free from defects in material or workmanship from the manufacturer and will be of the quality indicated.
- J. All methods of construction that are not specified in the contract documents will be subject to control and approval by the Project Technology Designer and SDOC Technology Services Department Representative.
- K. Installed products will be lot-traceable by date code.

# 1.7 DEFINITION:

- A. Educational Intercom / Public Address System
  - A communication system that allows for general announcements, two-way speech between educational environment and Administration, critical notifications, and visual components for immediate verification of classroom safety.
- B. Program Clock and Bell signaling System
  - A time keeping and signaling system for campus-wide synchronized clock interface with uniformed time updates from a central source and the ability to signal specific time notifications on a regular / scheduled basis.

## 1.8 WARRANTIES:

A. Refer to Section 27 00 00 for general details

## 1.9 MATERIALS:

- A. All materials shall be UL or ETL listed and verified and shall be marked as such.
- B. Products shall be regularly catalogued items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications with any optional items required for proper installation unless otherwise noted.
- C. All materials used on this project shall be new. Used and refurbished equipment are not permitted. Provided equipment on site in original packaging whenever practical.

### 1.10 DELIVERY, STORAGE AND HANDLING LOGISTICS

- A. Material shall be delivered to the site in the original packing.
- B. Materials delivered to the construction site shall be stored in a dry, secure area, preferably indoors. Storage temperature of materials shall adhere to manufacturer's recommendations. Movement of packaged materials shall be in a manner to avoid damage of contents. On-site storage, either indoors or trailer, shall have permission by the School District of Osceola County Staff, and shall not interfere with other construction activity.
- C. Installation of Cable, speakers, modules, components, devices, gateways, and amplifier shall be within the recommended temperature range specified by the manufacturer. Cable installation temperature range between 500f and 800f is recommended. Cabling should only be installed in facilities that are not exposed to the elements.
- D. The Contractor is responsible for scheduling all deliveries and providing proper receipt, handling, and storage of all materials. Protect all equipment from physical damages (dents, scratches, dust, water, paint, chemicals, and temperature extremes) and vandalism, or theft. The Contractor shall replace any damaged or stolen equipment. The Contractor is responsible for all equipment until final project acceptance by the School District of Osceola County.
- E. The Contractor is responsible for cleaning the worksite every business day and removing debris from the facility.

## 1.11 COORDINATION WITH OTHER TRADES

- A. Coordinate layout of work with other trades. Make minor adjustments in locations required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs. Structural systems, heating work, and plumbing lines shall not interfere with or otherwise impede the routing of communication cabling with cable tray, raceways, or other pathways dedicated to communications. All potential issues shall be brought to the attention of the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative immediately, before proceeding with installation.
- B. Other than minor adjustments, all concerns / deviations shall be submitted to the General Contractor, Construction Manager, Architect, Engineer, Project Technology Designer, and SDOC Technology Services Department Representative for approval before proceeding with thework.
- C. Coordinate locations, arrangement, mounting, and support of all communications provisions with Division 26 Representative, Project Technology Designer, and SDOC Technology Services Department Representative that:
  - Will allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2 Will provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. Will allow right of way for piping and conduit installed at required slope.
  - Will coordinate that connecting raceways, cables, and cable trays will be clear of obstructions and of the working and access space of other equipment.
  - Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
  - 6. Coordinate sleeve selection specified in Division 07 and Division 26.

- 7. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- 8. Coordinate the gauge cables to be used in the telecommunications grounding system.
- D. Rauland-Borg Contractor shall furnish and install the following:
  - 1 Speakers
  - 2. Clocks
  - Transmitter (with FCC Licensing)
  - 4. Components / Modules
  - 5. Devices / Interfaces
  - 6. Cable / copper
  - 7. Amplifier
  - 8. Brackets
  - 9. Pathways
  - 10. Patch Cables
  - 11. Support / Trays / Hardware
- E. Electrical Contractor shall furnish and install the following:
  - 1 Conduit
  - 2. Outlet boxes
  - 3. Penetrations
  - 4. Mechanical firestop devices
  - 5. Sleeving (rated / non-rated barriers)
- F. Unless otherwise noted, the following items will be the responsibility of the School District of Osceola County:
  - 1 All electronics and active data networking equipment, etc.
  - 2 All port assignments for Intercom interface
  - 3. All port assignments for Synchronized Clock interface.

# PART 2 PRODUCTS

- 2.1 CABLE:
  - A. Category 5e UTP
    - 1. 4-pair, category 5e, unshielded twisted pairs (UTP), 22 AWG, bare copper, polyethylene insulated conductors, with overall Green Jacket
      - a) Conductor: 22 awg solid barecopper
      - b) 1GB Application

- c) Maximum bandwidth 190 MHz
- d) PoE, PoE+ and 4PPoE
- e) Approved manufacturer part numbers:
  - 1) Hubbell Premise Wiring
    - Plenum Green C5EPPGN
    - Riser Green C5ELPRGN

# B. Category 6 UTP:

- 1. 4-pair, category 6, unshielded twisted pairs (UTP), 23 AWG, bare copper, polyethylene insulated conductors, with overall YellowJacket:
  - a) Rate to 550 MHz
  - b) TIA PARAMETER HEADROOM
  - c) NEXT loss +3 dB
  - d) PSNEXT loss +3 dB
  - e) ACRF +3 dB
  - f) PSACRF +3 dB
  - g) PoE, PoE+
  - h) Component Compliant
  - i) Cables shall be terminated on modular jacks in equipment frames.
  - j) Approved manufacturer part numbers:
    - 1) Hubbell Premise Wiring
      - Plenum Yellow C6RPY
      - Riser Yellow C6RY

# C. Category 6A UTP

- 4-pair, category 6A, unshielded twisted pairs (UTP), 24-gauge, bare copper, polyethylene insulated conductors, with overall YellowJacket
  - a) Conductor: 23 awg solid barecopper
  - b) 10GbE Application Assurance
  - c) Maximum bandwidth beyond 750 MHz
  - d) Component Compliant ANEXTPerformance
  - e) PoE, PoE+ and 4PPoE 100 Watt
  - f) Approved manufacturer part numbers:
    - 1) Hubbell Premise Wiring
      - Plenum Yellow C6ASPY
      - Riser Yellow C6ASRY

### 2.2 PATCH PANEL

- A. UTP Patch Panels, Category 6A (Premise Distribution System)
  - 1. Approved Manufacturer:
    - a) Hubbell Premise Wiring
      - 1) HPJ24 (24 Port)
      - 2) HPJ48 (48 Port)
  - 2. Panel shall be constructed of 16-gauge steel, rolled edge construction with black powder coat finish.
  - 3. Panel shall be standard 19-inch rackmount
  - 4. Compatible with Hubbell XCELERATOR jacks: Category 6A, 6, and 5e
  - 5. Panels comply with EIA-310-D rack mount standards
- B. UTP Patch Panels, Category 6 (Intercom / BAS Systems)
  - 1. Acceptable Manufacturer:
    - a) Hubbell Premise Wiring
      - 1) HPJ24 (24 Port)
      - 2) HPJ48 (48 Port)
  - 2. Panel shall be constructed of 16-gauge steel, rolled edge construction with black powder coat finish.
  - 3. Panel shall be standard 19-inch rack mount.
  - 4. Compatible with Hubbell XCELERATOR jacks: CATEGORY 6A, 6, and 5e
  - 5. Panels comply with EIA-310-D rack mount standards

# 2.3 MODULAR JACK

- A. Category 5e
  - 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC Compliant
  - 2. Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
  - 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
  - 4. Jacks shall have a temperature rating of  $-10^{\circ}$  c (14 $^{\circ}$ f) to  $70^{\circ}$ c (158 $^{\circ}$ f).
  - 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
  - $6. \hspace{0.5cm} \hbox{Housings shall be ultrasonically welded for tamper resistance.} \\$
  - Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
  - Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC- standard RJ-45 plug.
  - 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.
  - 10. Jack contacts shall be constructed of beryllium copper for maximum spring force and durability. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inches of nickel.
  - 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.

- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solidconductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE power specification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated per ANSI/TIA-568.2-D.
- 31. Colors to specified by enduser.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HXJ5EGN

## B. Category 6

- 1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant
- 2. Each jack shall be single unit construction, with snap fit to industry standard keystone opening (.760" x .580").
- 3. Jack housings shall be high impact UL 94 v-0 rated thermoplastic.
- 4. Jacks shall have a temperature rating of -10  $\Box$ c (14 $\Box$ f) to 70 $\Box$ c (158 $\Box$ f).
- 5. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
- 6. Housings shall be ultrasonically welded for tamper resistance.
- Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
- 8. Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC- standard RJ-45 plug.

- 9. Jack contacts shall be formed flat for increased surface contact with mated plugs.
- 10. Jack contacts shall be constructed of beryllium copper for maximum spring force and durability. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro- inches of nickel.
- 11. Jack termination method shall follow the industry standard 110 IDC punch-down. Jacks shall be compatible with single conductor standard 110 impact termination tools.
- 12. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose
- 13. Jacks shall have their category rating designation, visible from the front when installed.
- 14. Bottom of jack shall have date code and an abbreviated catalog number.
- 15. Jacks shall terminate 26-22 awg solidconductors.
- 16. Jacks shall not require special cords, specialty tools or special installation requirements.
- 17. Stuffer cap shall have retention snaps to assure conductor strain relief.
- 18. Jacks shall accept optional hinged dust covers
- 19. Jacks shall be compatible with ANSI/TIA-606-B color code labeling.
- 20. Jacks shall accept snap-on icons for specific identification.
- 21. Jacks shall be available in various colors to meet specific customer applications.
- 22. Jacks shall have attached wiring instruction labels to permit T568a wiring configurations.
- 23. Category rated jacks shall be backward compatible for fit, form, and function.
- 24. Jacks shall be manufactured in the USA.
- 25. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
- 26. Jacks shall be UL listed 1863 and CSA certified.
- 27. Jacks shall exceed IEEE 802.3af DTE power specification to 4 times the rated current limits with no degradation of performance ormaterials.
- 28. Jacks shall exceed IEEE802.3bt DTE powerspecification.
- 29. Jacks shall be third party verified, to meet or exceed performance requirements.
- 30. Component rated perANSI/TIA-568.2-D.
- 31. Colors to specified by end user.
- 32. Category 6 modular jacks, as specified in the contract documents, shall be:
  - a) Hubbell Premise Wiring:
    - 1) HXJ6xx
- 2.4 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS
  - A. All equipment shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on the contract drawings shall be the best suited for the intended use and shall be provided by a single manufacturer. The existing Intercom Equipment Cabinet shall be removed and turned over to the customer for spare parts.
  - B. The control equipment submitted for this project shall be as included as a standard product by the

- manufacturer for at least a year at time of bid. If requested, a letter from the Manufacturer's representative shall be provided verifying the length of time that a product has been in distribution. "Beta" or other un-commissioned products will not be accepted.
- C. Provide all components, equipment, parts, accessories, and associated quantities required for a complete installation and to perform all functions and/or features included in this section of the specifications even though not specifically noted or specified herein. All components may not be specified herein
- D. All devices/components/products shall be suitable for use intended and meet all stated performance requirements for Intercom and Master Clock System specified in this section.

### 2.5 RACEWAYS

## A. General:

- 1. All raceways (conduit, wireways, pull boxes, outlet boxes, etc.) shall comply with applicable requirements of sections within Division 26 of these specifications.
- All raceways (conduit, wireways, pull boxes, outlet boxes, etc.) shall comply with all requirements of the manufacturer of the intercom system.
- B. Conduit: Comply with Section Conduit except as noted below:
  - 1. Pull Cords: Install pull cords in all raceway runs that are installed without cable.
  - Size: Minimum size shall be 2" conduit.

### C. J-Hooks:

- Provide size as required for cables, with a maximum fill of 50% cross-area.
- Provide mounting/fastener type as required for installation.

### 2.6 TERMINATION CABINETS

- A. Terminal cabinets are to comply with applicable sections of these specifications.
- 2.7 TERMINATION BACKBOARDS
  - A. Provided by Electrical Contractor.
- 2.8 "SYSTEMS" AND "LOCAL" GROUND BUS
  - A. Bus to comply with applicable sections of these specifications.
- 2.9 ACCEPTABLE MANUFACTURERS
  - A. Basis of Design: Rauland-Borg Telecenter U
- 2.10 Acceptable Substitutions:
  - A. None
- 2.11 SOFTWARE
  - A. Provide all required Server and Client Software for system configuration and control.

### 2.12 TELECENTER U OVERVIEW:

### A. General:

- 1. This web-based system shall provide state of the art technology for all intercom communications, emergency notification, life safety paging, and evacuation tones and alerts.
- This web-based system shall be easy to learn and operate. All standard system programming shall be user friendly to allow the system administrator the ability to easily program system features.
- All Equipment shall be provided with all required power supplies, cables, connectors, and interfaces as required for a complete and functional system.

4. See contract drawings for all product requirements not indicated in these specifications.

## 2.13 PERFORMANCE REQUIREMENTS:

- A. Intercom System shall provide for distribution and activation of a status light module located outside each educational location for visual confirmation that an event has occurred, response to an event has been acknowledged, and / or escalation of an event is necessary as indicated by Project Technology Designer (RCDD) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.
- B. Intercom System shall provide for distribution to remote speakers all class change signaling tones and class change tones (including any pre-recorded announcements, music, or notifications) to all speakers within the system, including educational locations, outside speakers, common areas, staff areas, student toilet areas, and administrative areas as indicated by Project Technology Designer (RCDD) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.
- C. Intercom System shall provide for distribution of alert tones, notification tones, evacuation tones, and assist with Fire Alarm signals to remote speakers in all locations throughout the campus as indicated by Project Technology Designer (RCDD) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.
- D. Intercom System speakers shall be tapped for individual room requirements. Speakers shall be tapped, main system amplifier sized, and overall system balanced to allow minor system adjustments after installation has been substantially completed. In no instance shall any speaker be tapped to its minimum or maximum setting prior to final adjustments. Minimum tap setting shall be reserved for volume adjustment in undersized rooms. In no instance shall any speaker control assembly be loaded in excess of eighty percent (80%) of the manufacturers stated full load capacity rating.
- E. Program Clock System shall include Synchronized Master Clock Transmitter with access to a Universal Time keeping source, independent clock receivers, devices, components, and associated hardware as indicated by Project Technology Designer (RCDD) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.
- F. Intercom Primary System controller and Master Clock Transmitter equipment shall be installed in the rack and on the backboard location in the CD (MDF) location as indicated by Project Technology Designer (project Electrical Engineer and Registered Communication Distribution Designer (RCDD)) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.
- G. Auxiliary Intercom System equipment shall be installed in the rack and on backboard locations in the FD (IDF) locations as indicated by Project Technology Designer (RCDD) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.
- H. Intercom System shall be accessible from any VoIP communication device location through-out the campus, School District of Osceola County Education Intercom and Program Clock Systems from any designated District Administration Personnel, and as indicated by Project Technology Designer (RCDD) and SDOC Technology Services Department Representative. Verify all requirements with conformed documents assigned to the project.

## 2.14 DESCRIPTION OF SYSTEM:

- A. The Contractor shall furnish and install a complete Intercom/Public Address/Bell Signaling System. The system shall include but not be limited to:
  - 1. Sound and communications center head end equipment cabinet with
    - a) Announcement Controller (System Controller)

- Internal Program clock and signaling equipment, Internal tone generator, power supplies, amplifiers,
- c) Multi-Media Player
- d) Microphone
- e) VoIP Phone Appliance and Interface (Owner Phone System)
- Power supplies
- 3. IP Gateway (Power amplifier)
- Classroom Displays
- 5. Classroom Speakers
- 6. Classroom Status Lights
- 7. Call-in switches, call/emergency switches, privacy switches, volume controls.
- 8. Administrative control station phones.
- 9. Handsets
- 10. LCD Display
- 11. Media Player
- 12. Remote AM/FM antenna
- 13. Speakers, backboxes, etc.
- 14. UPS System
- 15. Raceway/outlet system, wire, cable, etc., complete with all basic materials
- 16. Wire and cable labeling
- 17. Terminal blocks
- 18. Terminations
- 19. Grounding
- 20. Surge suppression
- 21. Firestopping
- 22. Programming
- 23. Exterior handset instrument and enclosure
- 24. Admin Phones / Consoles
- B. All associated raceway/outlet system, wire, cable, etc., complete with all basic materials for a completely installed and operating system that meets the intent and requirements of these specifications.
- C. The Intercom (IC) system shall be a hybrid Analog / IP architecture allowing the use of VoIP endpoint via local LAN / WAN and analog speakers to provide paging announcements, emergency announcements, textual and visual messages on IP devices, and bell signaling on all devices.
- D. The communication system shall provide a comprehensive communication network between administrative areas and staff locations throughout the facility. The communication network shall be interconnected via the Owners data network with cabinet location and network connected nodes as shown on the project drawings.
- E. Intercom System shall provide for distribution to remote speakers all class change signaling tones and class change tones (including any pre-recorded announcements, music, or notifications) to all speakers within the system, including educational locations, outside speakers, common areas, staff areas, student toilet areas, and administrative.

- F. Intercom System shall provide for distribution and activation of a status light module located outside each educational location for visual confirmation that an event has occurred, response to an event has been acknowledged, and / or escalation of an event is necessary
- G. Program Clock System shall include Synchronized Master Clock Transmitter with access to a Universal Time keeping source or independent clock receivers
- H. Common areas, including but not limited to, hallways, cafeterias, gymnasiums, exterior, and auditoriums shall be provided with IC coverage from the system for general and emergency announcements and bells.
- I. All common area loudspeakers shall operate on a 25 Volt distributed system. The loudspeakers shall be grouped in modular zones allowing maximum flexibility for paging area assignment.
- J. Common areas, including but not limited to, hallways, cafeterias, gymnasiums, and auditoriums IP display devices shall include integrated Master Clock providing accurate time keeping and simple visual messaging and shall be a PoE or PoE+ device attached to the school network.
- K. Dedicated Administration paging phone shall be provided where indicated on drawings and be programed for all message / paging / bell function required for a complete operational system.
- L. System shall include General Purpose Input and output (GPIO) trigger points for interfacing to other systems including Emergency and Security Systems, to provide event driven configuration scenarios for the system.
- M. Software and operating system shall be provided and connected to Owner LAN using system servers as directed in Contract documents.
- N. Shall have attached media player for background music. Source shall be routable based on zoning.
- O. Provide Rack Mounted UPS:
  - 1. Provide UL listed uninterruptible power supply (UPS) for complete system.

# P. Surge Suppression

- Provide and install all materials, labor and auxiliaries required to furnish and install complete surge suppression for the protection of building electronic equipment systems from the effects of induced transient voltage surge and lightning discharge as indicated on drawings or specified in this section.
- See Specification Section Surge Protective Devices for surge suppression equipment required for 120 VAC and above circuits.
- 3. Provide surge suppression equipment at the following locations:
  - a) On each conductor pair and cable sheath entering or leaving a building.
  - b) In other locations where equipment sensitivity to surges and transients requires additional protection beyond that inherent to the design of the equipment. Where equipment being protected has internal surge suppression equipment, the surge protection equipment herein specified is required to be installed in addition to internal equipment protection.

# Q. VoIP Phone System Integration

1. IC shall integrate with VoIP phone system to allow any phone to be configured for paging / messaging use. Coordinate with owners IT department for exact functionality and configuration requirements.

## R. Security Integration

Coordinate with owner prior to bid and provide all required equipment, software, and programing to interface
with the existing county wide Mass Notification software APP. Interface shall allow for activation of prerecorded IC messages and alerts form any authorized remote user device.

# 2.15 SYSTEM OPERATION:

- A. Provide at least two simultaneous speech paths between administrative control stations or (telephone instrument connected to Voice over Internet Protocol VOIP/DTMF telephone system) and classroom speakers.
- B. Provide simultaneous use of one (1) program channel and two (2) intercom channels.
- C. Provide 2-way voice communication directly between any Admin Phone and any remote speaker, another admin phone, or any remote classroom handset.

- D. System operation shall allow administrator to define user privileges, define loudspeaker zones, pre-recorded messages, bell schedules, bell designations, event logs, background music streams, system configuration and endpoint status.
- E. Manages dynamic requests for live, delayed, and prerecorded messages (simple and assembled), record and playback of ad hoc messages, text-to-speech, mute actions (by zone or zone group) and two-way full duplex intercom connections.
- F. Announcements and messages shall be initiated by contact closures, VoIP Phone Systems, and Wi-Fi Smartphones, tablets and computers using open standard IP based protocols.
- G. System shall interface with third party systems by connectivity of either eight (16) built-in logic inputs and eight (16) built-in relay outputs and two (2) balanced line level audio inputs for collaboration to third party systems
- H. Includes a built-in comprehensive message / bell scheduling system that allows the creation of schedule profiles that can be applied to specific days of the week or date ranges. Multiple profiles can be applied simultaneously.
- I. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation, and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).
- J. The system shall provide classroom occupants the ability to confirm that they have heard and executed the required instructions of any emergency announcement. Conformation shall be achieved by utilizing existing classroom call button or desktop client notification interface. The authorized administrator can view real-time classrooms state of either safely secured or non-secured via web-based user interface, both on-site and remotely. Authorized administrator shall be able to initiate two-way communication, without a pre- announcement tone, to the classroom.
- K. There shall be a System-Wide Facility Emergency All-Call feature. The Emergency All-Call shall be accessed from designated administrative phones or by the activation of an external contact closure which shall give the third audio program input emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages or Audio Distribution.
- L. The system shall provide supervision and logging for all associated end-point devices on the network with built-in E-mail / SMS notification & SNMP capabilities & Active Failover.
- M. Programming of above functions shall be using a WAN based programming tool enabling the owner to perform programming from a remote location (e.g. District Office).
- N. IP Endpoints shall use IEEE 802.3 standard PoE implementation so that they can be used with any IEEE 802.3af (PoE) or IEEE 802.3at (PoE+) 10/100Base-T switches
- O. IP Endpoints shall be Cisco IVT (Interoperability Verifications Test) Certified ensuring quality integration with Cisco products while not adversely affecting Cisco product operation.
- P. Master Clock:
  - A user programmable clock shall be incorporated into the system, which will provide multiple separate schedules. Clock shall activate tone generator for all class change signals. Class change signals shall sound as chimes over inside speakers and tones through outside speakers.
  - 2. Clock shall synchronize with District NTS-IP time server.
  - 3. Capable of operating and correcting both direct read digital and analog clocks.
- O. Admin Station:
  - Admin Station located at the main reception desk will receive all classroom calls and be able to extend, hold, or announce the call. Any location initiating a call will display the calling room number on a 16 character alpha/numeric LCD readout.
  - Room numbers shall all be programmable and may be assigned any alpha/number from 000001 to 899999 on the 16 character display. Any room number may be reassigned at any time and is not dependent on wiring or circuit numbers.

- Call origination shall require only the momentary depression of the call origination switch, which will sound a
  tone at the origination speaker / microphone module, at the Administration Console, and display the
  room number on the alpha-numerical LCD readout
- 4. There shall be a zone-page/all-page feature that is accessible by selected administrative VoIP phones and administrative phones. There shall be automatic muting of the loudspeaker in the area where a page is originating.
- 5. There shall be a pre-announce tone signal at any loudspeaker selected for voice paging.
- 6. The Admin Station display shall normally show the time of day and day of week, the current time signaling schedule, and the numbers of up to four stations calling in along with the call-in status of each station (normal, urgent, emergency). When dialing from the Administrative Display Phone, the display shall indicate the station number and type of station (loudspeaker or handset) being dialed.
  - a) The display shall also provide user-friendly menu selections to assist the operator when paging and distributing program material. Displays shall be in English with internationally recognized symbols for maximum ease of use. Systems, which require the operator to memorize long lists of operating symbols or control codes, shall not be acceptable.
  - b) Admin Station shall be programmable for one of 3 station types for system access, as follows:
    - Shall permit dialing any station in the system; turn program material on/off at their location; scroll, erase and auto-dial call-waiting queue; make conference calls and transfer calls; call forward to other administrative stations; make all-zone pages and emergency all-zone pages; have access to outside lines and be designated to receive outside line calls.
    - Select and distribute or cancel program material to any combination of stations, paging zones, or all zones; set/reset alarm/external functions and zone paging.
    - 3) Bump or join a conversation in progress, manually initiate time tones.
  - c) Program selection, and its distribution or cancellation shall be accomplished from a designated administrative display telephone, with the assistance of the menu display system. Distribution and cancellation shall be to anyone, or combination of speakers, or any zone(s), or all zones. It shall be possible to provide three program channels at the same time.
  - d) It shall be possible to manually initiate any of eight (8) tones or any of the emergency tones. The tones shall be separate and distinctly different from the emergency tones. The tone selected shall continue to sound until it is canceled, or until the administrative display phone is placed back onhook
  - e) Each station shall maintain a unique queue of all stations calling that particular phone.

### R. Speakers:

- Speakers shall be provided in each educational area, staff area, administrative area, hallways, student toilet areas, and common areas. Speakers are not required in single person toilets.
- Weatherproof Flush mounted speakers shall be provided around the outside of the building (as
  indicated by conformed documents) at a maximum distance between each speaker of twenty (20) linear
  feet and a maximum height of ten (10) feet above finished grade.

## S. Bus Loading:

- 1. Provide call-in, and two-way voice communication from bus loading to any administrative control station.
- Provide equipment, wiring, and conduit for this function complete including speakers and W.P. handset at bus loading area. Provide speakers as required for proper coverage.

## T. Provide Rack Mounted UPS:

The system shall provide operation of intercommunication functions during loss of AC power per SREF for
use as a Protective signaling system. Provide a U.P.S. system which shall be sized for the appropriate
electrical requirements for the complete system and SREF requirements including capacity for 24 hours of
monitoring after which the system shall be able to speak (operate) for at least 5 minutes.

- The system shall provide operation of intercommunication functions during loss of AC power. Provide
  an Uninterruptible Power Supply (UPS) system which shall be sized for the appropriate electrical
  requirements for the complete system including PDS if integral.
- The user programmable functions will be protected by a manufacturer supplied battery with a life expectancy of at least ten years.
- U. Eight separate paging/time-tone zones. Each location may be programmed in software to belong to any combination of software zones, initially zones shall be provided and programmed, as follows: (verify with owner prior to programming).
  - Classrooms
  - 2. Interior Corridors
  - 3. Exterior
  - 4. Administrative
  - 5. Multipurpose
  - 6. Media Center
  - 7. Aux Gym and Contiguous areas
  - 8. Spare

## 2.16 CENTRAL EQUIPMENT (HEAD END)

- A. Each Site shall be provided with an Announcement Control System appliance installed in designated equipment cabinet where indicated on drawings. This shall contain the compete program for the local system and shall/ be interfaced with owners VoIP phone system.
- B. Announcement Controller (Intercom and Bell Schedule) shall meet or exceed the below requirements:
  - The central switching exchange shall initially be supplied with (two) two-way voice amplified
    communication paths for intercommunications with locations equipped with staff speakers. The intercom
    module shall generate a warning tone to announce the incoming intercom call. This tone shall be
    repeated for every 15 seconds of administrative inactivity to prevent monitoring.
  - The two-way amplifier shall contain an automatic level control. Those systems offering the ability of only one amplified voice communication path within the system's design shall not be considered equal.
  - The central switching exchange shall utilize completely microprocessor controlled technology for memory, sensing and logic. The system shall lend itself to expansion by the simple addition of modules for a minimum total capacity of 500 stations.
    - a) The central switching exchange shall have a minimum of thirty two (32) simultaneous conversation paths available for use between dialing telephones and staff stations.
    - b) The system's digital readout shall be capable of displaying in the order received, calls from staff stations. These calls may be software prioritized for either routine or emergency type calls, or hardware assigned to user, selectable call-in devices. Calls re software routed to one of two separate call-in systems, or both, with each stacking their own respective calls and each capable of driving multiple displays. The use of a single button will answer the first call in the display window. It shall be possible to review in groups of four all calls in the display system. Each readout display shall show the user the last number dialed by the instrument. Systems not offering this digital readout flexibility will not be considered.
    - c) The system shall provide facilities for up to twelve (12) digital readout displays upon which incoming calls are identified by their designated numbers. The display shall show visually, in the order received, three (3) calls at a time. Emergency calls shall override normal calls and shall annunciate with the letters "EMER" and the calling station number.
    - d) The central switching exchange shall provide programming and diagnostics built into the WAN server browser accessible only to authorized Personnel. Diagnostics shall indicate passes and failures of system memory, system clock, all audio busses, tone generators and decoders and the integrity of the field wiring. A password separate from the password necessary for system programming shall be required to gain access to the previous functions described.

- 4. Field Programmable Software Options:
  - Every port in the system shall be universal and shall be capable of those allowed functions by software programming from the WAN based browser.
  - b) This programming should be capable of assigning the individual ports or lines to work with any of the following combinations of station equipment:
    - 1) Administrative (Dialing Instrument).
    - 2) Staff Telephone (Dialess with ringer).
    - 3) Staff Telephone with Speaker (Dialess no ringer).
    - 4) Administration Phone with Speaker.
    - 5) Speaker with call-in switch.
  - c) It shall be possible to make software-feature assignments from the WAN based browser:
    - Assignment of each speaker to any combination of eight page zones, or any or all of eight time-time zones.
    - 2) Assignment of executive override to authorized administrative instruments.
    - 3) Allow for software options of canceling call from call originating staff station.
    - Hotline ringing of a programmed telephone station automatically to a designated location that does not have digital readout capability.
    - 5) Allow/disallow paging, emergency tones, zone page.
    - Assignment of numbering system up to six (6) digits Time zone duration, programmable for each zone.
    - Attendant ring back, to automatically call back the attendant phone when transferred call is not answered with programmed duration.
    - 8) Interval between the BEEPS that announce an emergency call and the interval that announces a normal call. Normal call beep at attendance station may be reduced to a single non-repeating beep.
    - 9) Remote call pickup.
    - 10) Provide blank panels as necessary to fill unused panel space.
    - 11) Diagnostics
  - d) The system shall be capable of complete remote diagnostics, via the WAN based browser. Minimum diagnostics shall be as follows:
    - 1) Check active list of current activity within the system.
    - 2) DTMF test, to check the DTMF registers.
    - I/O diagnostics, enables the checking of each line, and each device connected in the circuit, e.g. can determine if a telephone is off hook, or if a speaker has been disconnected.
    - Capability of checking each link, and ability to remotely block a link from the system if found defective.
  - e) Design Criteria: Rauland #TCC2000
- Media Player
  - a) Provide rack mounting hardware
  - b) Audio output to be connected to local ACS input
  - c) Shall be capable of playing all standard digital media formats in addition to AM/FM radio, Bluetooth sources from Mobil devices, and removable media.
  - d) Basis of Design: DENON #DN-300Z
- 6. Program Line Input Module

- a) Locate where required to meet performance requirements of these specifications and as required for a complete and operational system. Module shall be provided with the following requirements:
- Encodes Analog Audio Signals to Digital for program input sources, IP-Based Data. Accepts Stereo or Mono Line Level Audio
- c) Equipped with 3.5 mm Socket and Connection Status Indicator LED
- d) Compliant with IEEE 802.3af Power Over Ethernet (PoE) Standard
- e) Shall be rack mounted with available rack mount kit
- f) Design Criteria: Rauland #TCC2055

## 7. Auxiliary I/O module

- a) Locate where required to meet performance requirements of these specifications and as required for a complete and operational system. Module shall be provided with the following requirements:
  - 1) Provides Dual Input and Dual Output Contact Closure Points to Control External Devices
  - 2) Compliant with IEEE 802.3af Power Over Ethernet (PoE) Standard
  - 3) Shall be rack mounted with available rack mount kit
- b) Design Criteria: Rauland #TCC2033

### 8. Power Supplies

- a) Provide all power supplies as required for complete system.
- b) Power supplies to include 12 volt DC power supply and 24 volt DC power supply.
- c) Provide all power supplies as required to activate Priority Volume Controls.

### 9. UPS System

- a) Provide UL listed uninterruptible power supply (UPS) for complete system.
- b) Size unit as required for this specific UPS load, plus 20% spare capacity.
- c) Mount unit in rack.
- d) Unit to provide for minimum of 20 minutes of operation at full power after 90 MINUTES loss of power.
- e) Basis of Design: APC Smart UPS.

## 2.17 ZONE PAGING INTERFACE

- A. Provide to interface with third party Sound Systems / AV Systems to allow for override and audio output for local amplification via third party system. And shall be provided with the below minimum requirements:
  - I. Shall decodes IP based Audio Signals to audio for local playback
  - 2. Shall provide Line Level audio output
  - 3. Two (2) Relays for control of external equipment
  - 4. POE Powered IEEE 802.3af
- B. Design Criteria: Rauland #TCC2022

## 2.18 ADMINISTRATIVE PHONE

- A. The administrative telephone shall be a single line instrument for desk use or wall mount use as indicated on the plans. It shall be a standard dual-tone 12 button touchpad dialing type, furnished, and installed in the types and quantities as indicated on the plans. All administrative phones shall be provided with a digital display.
- B. The standard "K" style handset shall be hearing aid compatible. A built-in soft tone ringer with volume control shall be included to permit calls to be transferred smoothly and efficiently; this shall eliminate the need to use the hook switch and shall provide an automatically timed hook flash condition to eliminate inadvertent cancellations. A "Last Number Redial" pushbutton shall be provided to permit a user to automatically redial the most recently dialed number.

- C. Three user-programmable speed dial keys shall be provided to permit single button dialing of access codes or frequently dialed numbers. The speed dial keys shall be programmable to include a "Pause" in the dial stream. The speed dial programming shall be retained even when the telephone is disconnected from the line.
- D. The instrument housing and handset shall be of high-impact plastic. The retractable handset cord shall be 5-feet (1.53m) long; the connecting line cord shall be 7-feet (2.14m) long.
- E. Cisco Compatible SIP/VoIP Handset
- F. Design Criteria: Rauland #TCC2044

## 2.19 HANDSET / CABINET (BUS LOOP)

- A. A weatherproof cabinet with communications station shall be provided where indicated on drawings and shall be configure for paging of local zones.
- B. Cabinet shall be NEMA 4X.
- C. Handset shall be VoIP (SIP) compatible and be capable of remote management and configuration via LAN. Model shall be provided with 12 button keypad
- D. Bus call handset shall be mounted in a lockable enclosure NEMA rated for application.
  - 1. Basis of Design: GAI-Tronics (Hubbell) #354-710

# 2.20 AMPLIFIER - 70v (Buss Loading Speakers)

- A. The product shall be a one channel 1RU half rack power amplifier and provide 100 Watts into a 70.7V load.
- B. The unit shall utilize rail tracking Class A/B topology and switch mode power supply technology.
- C. The front panel shall have a **Green** signal presence LED's a **Red** limit status LED, recessed screwdriver adjustable bass and treble tone controls along with master level controls. The front panel shall have mains power switch with and power Blue "ON" and Red "Standby" status LED indicator.
- D. The rear panel shall have balanced inputs with removable phoenix style connectors and an input impedance of 20KΩ. The unit shall have unbalanced RCA input connections with input impedance of 10KΩ. Output terminations are made via phoenix style connectors.
- E. The unit shall have an audio sense turn-on from standby mode, with threshold adjustment of 1mV to 20mV. The unit shall have accessory AC socket with AC sense to turn the unit on from stand by to active mode with threshold adjustment of 1ma to 350ma.
- F. The unit shall draw 16 Watts in standby mode. The unit shall incorporate dip switches to activate a 100Hz High-Pass filter and for pre / post VCA for Line Output. The unit shall have separate input level trim pots for the RCA inputs to allow mix summing with the balanced inputs. The unit shall have an input sensitivity of 320mv, frequency response of 30Hz 20KHz (±3dB) and an average THD of .02%.
- G. The unit shall include rack mount kit
- H. Basis of Design: Atlas Sound PA1001G.

### 2.21 AMPLIFIER - IP

- A. IP Amplifier to be location in IDF/MDF room rack to support local analog speaker circuits (corridors, exterior, assembly areas, etc.), provide count as required to support all local speakers and shall have the following minimum features:
  - The Zone Page Amplifier Module shall provide a full audio solution in a single enclosure with an integrated amplifier and IP-based audio signal.
  - 2. Euroblock connectors for audio output and external power supply connection.
  - 3. Provide external power by the optional power supply.
  - 4. Mounting brackets to allow installation in a standard 19" equipment rack.
- B. Basis of Design: Rauland #TCC3022
- 2.22 GATEWAY 24CH IP TO ANALOG

- A. Gateway shall be provided at all location serving local Intercom Stations / Speakers to the IP network with local analog devices.
  - 1. 24 Station Interface's for speaker and call in button connections
  - 2. Built In 25W audio amplifier
  - 3. Shall be rack mounted.
- B. Design Criteria: Rauland #TCC2024

## 2.23 GATEWAY - IP to Analog (Classrooms, office, conference rooms, etc.)

- A. The IP Classroom Module is an integral part of the system and provides a reliable communications link to the front office by utilizing the data network. Based on IP standards, the gateway controls two way audio signals for clear, noiseless full bandwidth intercom and paging. Equipped with a SPST relay, it can also trigger a visual indicator such as a strobe whenever high priority audio signals are present.
- B. Provide a single channel IP gateway at all locations indicating IP speaker. Device shall be installed adjacent to speaker being controlled and connect to local room volume / call in switches.
- C. Device shall be mounted on associated speaker per manufacture instructions.
- D. Capable of delivering a full 2W of audio power to an 8 0hm speaker, the audio power output is also software configurable for maximum installation flexibility. The 8 0hm speaker output of can be easily programmed to provide 2W, 1.5W, 1W, 0.5W, and 0.25W to meet the needs of any size classroom with the an 8 0hm speaker.
- E. Basis of Design: Rauland #TCC2011A

#### 2.24 CALL IN SWITCH

- A. The call-in switch shall consist of a single pushbutton mounted on a high-impact face plate for mounting to a standard, flush or surface mounted, single gang electrical box. The button shall be of the momentary contact type providing a single closure while depressed.
- B. The wall plate shall bear the designation PRESS TO CALL. Exterior call-in buttons shall be mounted in cast W.P. backbox.
- C. Design Criteria: Rauland #2305CS

# 2.25 VOLUME CONTROL

- A. Unit shall include plate and priority paging override relay.
- B. Attenuator shall be a ten (10) step type control with a positive off position. There shall be no stop between the maximum and off positions.
- C. Switch shall have silver plated contacts to eliminate noise and contact loss.
- D. Unit(s) shall be supplied with standard gang stainless steel wall plate which shall mount to a standard outlet box. Each wall plate shall have a dial scale to indicate attenuator position.
- E. Unit shall provide control of area speakers on 25-volt circuits, wattage to match speaker load.
- F. Unit shall include priority relay, premounted to volume control switch.
  - 1. When energized, relay is to override the switch to provide maximum level for emergency signals.
  - Unit is to be SPDT type and operate on 24 VDC at 5 mA.
  - 3. Assembly to include protective cover for long lasting trouble free performance and five color coded stripped and tinned leads for easy installation.
- G. Design Criteria: Atlas/Soundolier #AT Series with PA option.

## 2.26 MESSAGE BOARD - SMALL

- A. Classroom message boards / clocks shall be located inside al teaching areas above primary entry door and provide time and other school messages to be displayed.
- B. The Small Message Board provides visual notification to any area in a facility by providing a visually stimulating, multi-color LED display.

- C. Messages can be configured to be either static or scrolling. Each message can be scheduled to appear once or multiple times in various formats and colors. Messages can also be created on-the-fly and instantly distributed to one or all message boards.
- D. Power: Power Over Ethernet (POE) or POE+ to facilitate quick installation that requires a single data network drop. Accessories such as a Status Light can be connected to the AUX output port on the message board.
- E. Basis of Design: Rauland #TCC3011S

## 2.27 STATUS INDICATOR

- A. The Status Light provides visual notification of various intercom events. These include pages, call-ins, and emergencies. These shall include the following features:
  - Two (2), multi-color LED segments that can be configured with customizable blink patterns to visually indicate classroom, hallway and school status using multiple available blink patterns.
  - All status indicator lights require connection to the local IP Classroom Module or message board for power and control.
  - 3. Shall be ceiling mounted in standard outlet box.
  - 4. Provide Immediate Visual Status to First Responders in Emergency Situations
- Basis of design: Rauland #TCC2088

## 2.28 INTERIOR RECESSED CEILING SPEAKER

- A. The Ceiling Speaker Assembly consists of a USO188-type, 8" loudspeaker complete with a 25V line matching transformer, mounted on a 2 foot by 2 foot lay-in baffle, and an integrated backbox that runs the full length of the baffle
- B. The pre-assembled speaker can immediately "lay in" to a new or existing ceiling grid and be wired to finish the installation
- C. Where installed in hard ceilings, provide trim kit to all installation of 2x2 lay in speaker assembly.
- D. A tap selector switch on the backbox can quickly select an appropriate power level of either 1/4, 1/2, 1, 2 or 4 Watts.
- E. Speaker shall have integrated support wire connection points
- F. Basis of Design: Rauland #BAFKIT2X2L

### 2.29 INTERIOR WALL MOUNTED SPEAKER

- A. Wall Mounted Speaker for local intercom system
- B. Continuous power rating shall be (15, 8, 4, 2, 1, 1/2, 1/4 watts) at 25V.
- C. Frequency response shall be 600 to 5500 Hz (± 5dB).
- D. Sensitivity shall be 96.9dB (at 1 watt, 1 meter).
- E. Dispersion shall be greater than 190° (-6dB point, 1 and 2 kHz octave bands).
- F. Model shall be water/moisture sealed and constructed of die-cast zinc.
- G. Unit shall operate within the temperature range of 150°F (66°C) to -30°F (-35°C).
- H. Mounting: Speaker shall be semi recessed mounted with the Semi-flush adapter plate mounted behind VT Series to cover any recessed 4" SQ x 2-3/4" D outlet box. CRS wall plate is stamped and painted.
- I. Color shall be GREY.
- J. Basis of Design: Atlas Sound #VT-152UC

## 2.30 WALL MOUNTED SPEAKER - TYPE 01 (EXTERIOR)

- A. Shall consist of a weather resistant exterior rated semi recessed horn driver.
- B. Continuous power rating shall be (15, 8, 4, 2, 1, 1/2, 1/4 watts) at 25V.
- C. Frequency response shall be 600 to 5500 Hz (± 5dB).

- D. Sensitivity shall be 96.9dB (at 1 watt, 1 meter).
- E. Dispersion shall be greater than 190° (-6dB point, 1 and 2 kHz octave bands).
- Model shall be water/moisture sealed and constructed of die-cast zinc.
- G. Unit shall operate within the temperature range of 150°F (66°C) to -30°F (-35°C).
- H. Mounting: Speaker shall be semi recessed mounted with the Semi-flush adapter plate mounted behind VT Series to cover any recessed 4" SQ x 2-3/4" D outlet box. CRS wall plate is stamped and painted.
- I. Color shall be GREY.
- J. Basis of Design: Atlas Sound #VT-152UC

### 2.31 WALL MOUNTED SPEAKER - TYPE 02 (BUS LOADING AREA)

- A. Assemblies shall consist of 2-way, woofer, and tweeter, within environment-resistant housings. Enclosure shall be constructed of paintable UV-resistant, talc impregnated, polypropylene, injection molded plastic finished in black (SM52T-B) or white (SM52T-WH).
- B. Each unit shall include a stamped, powder coated, aluminum grille and removable C-shaped mounting bracket. All hardware inserts shall be brass and threaded 1/4"-20. The 100-Watt RMS system shall have a 5 1/4" (133mm) woofer, constructed of reinforced polypropylene, and a 1" (25mm) Ferrofluid cooled tweeter.
- C. The dividing network crossover frequency shall be 5kHz. The dividing network shall include protection circuits for the high-frequency component.
- D. Each unit shall include an internally mounted 30 Watt 70.7V / 100V line matching transformer for use in distributed sound applications wattage taps shall be screwdriver selectable via a sealed switch located near the input section. Wattage taps shall be 0.94, 1.9, 3.7, 7.5, 15, 30 @ 70.7V plus transformer bypass setting for direct coupled 8 $\Omega$  operation.
- E. The loudspeaker system shall meet the following performance criteria: Power handling: 100 Watts RMS; Frequency response: 85Hz 20kHz (±3dB); Pressure sensitivity, 90dB SPL at one watt, 100Hz 10kHz measured at a distance of one meter on axis.
- F. Input connectors shall include a two-pole barrier strip capable of accepting up to two #16AWG cables. A tongue-in-groove cover with rubber wire exit grommet shall be provided to protect the input connectors from corrosion.
- G. Unit shall be provided with AS Series Universal Surface Mounting system
- H. Basis of Design: Atlas Sound #AS-5T-B

### 2.32 WIRES/CABLES

# A. General

- Provide all wiring, cabling, etc. required for interconnection of equipment and connection from equipment to speakers as required for a complete and operational system.
- Refer to Specification Section 27 10 00 Premise Distribution System for all Category cable requirements for IP enabled devices.
- 3. All Termination shall be made using PDS color codes
- 4. All cable jackets shall be "GREEN"
- B. Horizontal Wire/Cable (and Cross-Connect/Patch)
  - . 2-Conductor Shielded 18AWG to be used for analog speakers and analog audio signals.
  - 4-Conductor 1-Pair Shielded / 1-Pair Un-Shielded to be used when connection to volume control with property page relay.
  - Unshielded cable may be used for GPIO controls.
  - 4. Cable shall be plenum rated, contractor may use non-plenum cable where allowed by code. Provide cable type as required per code and area of use:
  - 5. Non-plenum Rated
    - a) ASTM tinned solid copper shielded twisted pair cable, 18 AWG, with TC drain wire.

- b) PVC insulation.
- c) PVC jacket.
- d) UL listed type CM.
- e) Comply with UL 1581 vertical tray flame test.
- f) Comply with requirements of NEC.
- g) Construct in accordance with UL Standards 13 and 444.
- h) Manufacturer:
  - 1) 2-Conductor = West Penn #293.
  - 2) 4-Conductor = West Penn #360

## 6. Plenum Rated

- a) ASTM bare solid copper shielded twisted pair cable; 18 AWG with TC drain wire.
- b) Halan insulation.
- c) Plenum jacket.
- d) UL listed type CMP.
- e) Comply with UL 910 test.
- f) Comply with requirements of NEC.
- g) Construct in accordance with UL Standards 13 and 444.
- h) Manufacturers:
  - 1) 2-Conductor = West Penn #25293.
  - 2) 4-Conductor = West Penn #25360
- Provide additional pairs of wires where required for volume control priority relay override.

## 2.33 TERMINATION BLOCKS

- A. Contractor shall terminate all cable at DIN rail mounted terminal blocks and shall be individually labelled to indicate cable / conductor information.
- B. Terminal Blocks shall be located a designate section of TTB adjacent to amplifier equipment and Surge.
- C. Provide terminals sized for circuits required on project.

# 2.34 SURGE SUPPRESSION

- A. For 120V power to all equipment: Comply with Section Surge Protection Devices.
- B. Lightning protection assembly is comprised of Chassis and Modules and shall be provided for all cabling terminating outside the building envelope or otherwise susceptible to surge.
- C. Must be U.L. 497B listed and labeled.
- D. Surge shall open circuit when compromised
- E. Plug-in replaceable modular design or individually mounted units.
- F. Connection to ground via grounded DIN rail or the included grounding lug
- G. 35mm DIN Rail mounting configuration, install on designated section of TTB
- H. Suitable for use on both AC and DC circuits.
- I. Clamp voltage: 150% of circuit peak operating voltage with 100 amp 10 x 700µs waveform.
- J. Maximum continuous operating voltage: 125% of peak operating voltage, minimum.
- K. Horizontal CATx cable protection Units
  - 1. Refer to Div. 27 10 00 for surge requirements
- L. Analog Audio Mic/Line Protection Units

- 1. Shall be provided for <u>ALL</u> speaker cable devices, which are on the exterior of the building, covered walkway, or adjacent to building being fed with copper. i.e. Speakers, Microphones, etc.
- 2. Surge Protection Modules:
  - a) Modules shall be selected based on voltage protected and/or signal type.
  - b) Model Basis of Design: DITEK # DTK-DRF Series
- M. Speaker Circuit Protection Units
  - Shall be provided for <u>ALL</u> speaker cable devices, which are on the exterior of the building, covered walkway, or adjacent to building being fed with copper. i.e. Speakers, Microphones, etc.
  - Surge Protection Modules:
    - a) Modules shall be selected based on voltage protected and/or signal type
    - b) Model Basis of Design: DITEK # DTK-DRF Series

### 2.35 TERMINAL CABINETS

- A. Provide terminal cabinets for all terminations and surge suppression equipment including 120VAC power surge suppressor as required in Section Surge Protection Devices. Size terminal cabinets as required to facilitate installation of terminations and surge suppression in a neat and workmanlike manner.
- B. Terminal cabinet to meet specifications in Section Cabinets and Enclosures unless specifically manufactured for use.
- C. Manufacturers:
  - 1. Interior.
    - a) Square "D".
    - b) Atlantic Scientific DLM Series.
  - 2. Exterior.
    - a) Hoffman

## PART 3 PRODUCTS

## 3.1 GENERAL

A. The contractor is advised that circuit routing for this system is not necessarily shown on the project drawings. The contractor shall provide and install all raceways, wiring and cabling required for a complete and fully functional system as intended by these specifications. All backbone cabling shall be in conduit, unless noted otherwise. Contractor shall provide and install, a properly sized, flush mounted outlet box for every device. Contractor shall provide and install, within the wall, a properly sized conduit extended above ceiling and turned into room it serves for each device. Contractor shall size and route raceways to accommodate the proper installation of the system cabling. T-Tapped cabling shall not be acceptable. In locations where raceway and/or conduit is not accessible after completion of the project, conduit shall be routed from device to device or fire rated access panels shall be installed to provide access to junction and pull boxes. Routing of raceway from device to device shall only be acceptable where the wiring scheme of the system, as recommended by the manufacturer, requires cable to pass from device to device. Contractor shall properly terminate each device according to the manufacturer's recommendations. Station/device cabling for this system shall be installed in J-Hooks. Provide and install sleeves where penetrations are made through rated walls and floors.

# 3.2 INSTALLATION

- A. Locate, install, and test the Intercom and Master Clock System in accordance with the equipment manufacturer's written instructions, and the latest editions of the National Electrical Code, the National Electrical Contractor's Association publication "Standard of Installation" and all applicable codes and standards referenced in this specification.
- B. Provide all work required for a complete system including complete system testing and checkout. All components shall be properly mounted and wired. The installation of this system shall comply with the directions and recommendations of authorized factory representatives.

- C. Provide wiring, cabling, raceways, and electrical boxes in accordance with manufacturer's written instructions.
- D. Components shall be electrically "burned-in" by operating the component at full power for a period as recommended by the manufacturer.
- E. Installation shall be done in a neat workmanlike fashion by a firm regularly engaged in Educational Intercom and Master Clock System Installation and Service.
- F. Install all central equipment in equipment rack.
- G. Install equipment, cables, and speakers as required to comply with all applicable requirements of the references and/or regulatory requirements called for under PART 1 of this section of specifications, as a minimum installation requirement. Exceed this minimum requirement when called for herein.
- H. Install all electrical basic materials per applicable sections of these specifications. Install raceways to conform to applicable sections of these specifications.
- I. Connect reproducers to amplifiers with matching transformers.
- J. Install system cabinets/racks in locations shown; arrange to provide adequate ventilation and access.
- K. Properly ground system per applicable sections of these specifications.
- L. Support raceways, backboards, and cabinets under the provisions of Section Hangers and Supports, and/or as required by manufacturer's instructions.
- M. Install Intercom and Master Clock System wiring and/or raceways away from any surface that may become hot, including, and not limited to, hot water piping and heating ducts.
- N. Equipment Mounting:
  - 1. All equipment and associated wiring shall be installed in a neat manner and firmly secured in the console with appropriate hardware or to ceiling/wall.
  - 2. Provide terminal cabinets sized to house terminal strips and surge equipment.
  - 3. The Intercom and Master Clock System central equipment is to be installed in its own equipment cabinet(s) as shown on the project drawings.
  - 4. Remote Gateway / Amps may be located in bottom of PDS racks where indicated on drawings

### 3.3 LABELING

- A. All labels shall be permanent, machine generated labels produced by a labeling machine. Labels shall be a permanent polyester material clear in color with label lettering black in color. No handwritten labels will be accepted.
- B. Labeling information will be reviewed at pre-installation meeting, and the Project Technology Designer (Project Electrical Engineer and Registered Communications Distribution Designer (RCDD)) and Owner IT Department Representative shall approve the labeling scheme prior to the installation of any cabling.
- C. Surfaces shall be cleaned before attaching labels. All labels shall be attached firmly and vertically plumb on equipment.
- All labeling of cables, equipment, and components shall be included in as-built documentation, floor plan drawings, and schematic designs.
- E. Engraved laminate labels shall be installed on console equipment.

## 3.4 PATHWAY

## A. General

- Provide and install raceway for all surface mount speaker installations to non-exposed location, penetrations of fire rating assemblies/walls/etc., where exposed to damage, exterior locations, underground locations, interconnection of CC's, CP's, and CER's, or any combination thereof, for all backbone cables, and all areas required by applicable codes and standards or as otherwise noted/required in these specifications.
- Where acceptable to authority having jurisdiction and all applicable codes/standards, cables above accessible ceilings may be run without raceways provided complete installation complies with all

- applicable codes/standards. Proper cable type, sleeves and support hardware must be utilized.
- 3. All raceways shall terminate at point within 12 inches of termination point terminal block with appropriate grounding bushing.
- 4. Raceway shall not be shared by power or any other electrical wiring that is not part of the low voltage Intercom and Master Clock Systems. Intercom and Master Clock System wiring may be installed in underground pull boxes with other low-voltage systems provided:
  - a) Installation meets/complies with all applicable codes and standards.
  - b) Intercom and Master Clock System cables are separated by at least 12 inches from any non-shielded voice/telephone/PDS wire/cable.
- Bend raceway with minimum inside radius of 6 times the internal diameter. Increase bend radius to 10
  times for raceway larger than 2 inch size. Provide proper bend for all changes of direction. Pull and splice
  boxes shall not be used in lieu of a bend.
- 6. Install raceways so no more than two  $90^{0}$  bends are in any raceway section without pull box. Install additional pull boxes as required to maintain maximum of two  $90^{0}$  bends between pull boxes and/or termination points.
- Label all raceway at both ends to indicate destination and Intercom and Master Clock System source
  room. Also indicate length of raceway and this labeling/identification shall be fully documented
  in as-built (record) drawings.
- 8. Install polyethylene pulling string in each empty conduit over 10 feet in length or containing a bend.
- 9. Properly support cables/wire not installed in raceways.
- 10. Special Raceway Systems: Special raceway systems may be specified for some portions of the Intercom and Master Clock System. Refer to the drawings and other sections of these specifications to determine where or if such systems are used.
- Pathways/raceways at terminal board locations shall be neatly racked on a Kendorff type rack secured to wall above and below terminal boards.

### B. Horizontal Cable Pathway

## Sleeves

- a) Install rigid steel conduit sleeves with bushings on both ends at penetration of all walls above ceilings.
   Stub-out each side of wall a minimum of 12 inches.
- b) Size sleeves as required by the NEC for cable installed, but in no case shall sleeve be less than 2 inch diameter, nor smaller than that required by "c" below.
- c) Sleeve size shall not be smaller than that required by EIA/TIA-569, Table 4.1-1, "Conduit Sizing."

### Cable Support

- a) Install J-Hooks located 48 inches to 60 inches on center above accessible ceiling areas for cable support.
- b) Where large quantity of cables are congested in an area such as near CC or CER, provide/install special supports designed to carry weight.
- Size shall be as required to provide for cables installed plus 50% spare and still not exceed rating of support device.
- d) Velcro all cables to J-Hooks at all bends with Velcro approved for use.

### 3. CC/CER Termination Locations

- a) Install vertical wireway from within 12 inches of all termination blocks to ceiling space.
- b) Size wireway as required for cables and meet percent fill requirements of applicable codes/standards.
- c) Provide bushings on each end of wireway.

### 4. CP Termination Locations

 a) Install wireway from CP to ceiling space as called for CC/CER locations, but terminate wireway at CP.

### C. TERMINATION BACKBOARDS

- 1. Refer to division 27 10 00 for requirements.
- Install at designated section of terminal board.

## 3.3 CABLE/WIRE

- A. Install input circuits in separate cables and raceways/pathways from output circuits.
- B. Leave 12 inches excess cable at each.
- C. Leave 6 feet (2 M) excess cable at each termination at system equipment/rack.
- D. Provide protection for exposed cables where subject to damage.
- E. Support cables above accessible ceilings to keep them from resting on ceiling tiles. Use bridle rings to support cables. Provide quantity of bridle rings as required to provide 50% spare capacity at all bridle rings.
- F. Use suitable cable fittings and connectors.
- G. Install appropriate cable to match application, i.e., plenum, riser, etc. All cables shall bear CMP and/or appropriate marking for the application in which they are installed.
- H. Cables routed through rated walls, floors and assemblies shall be routed via appropriate fireproofing system as approved by UL.
- Label cable at both ends indicating the originating and terminating location of each end.
   This labeling/identification shall be fully documented in as-built (record) drawings.
- J. Special Requirements for Cable Routing and Installation:
  - The majority of speaker wiring within buildings will be installed above ceilings. All cabling used
    throughout this project shall comply with the requirements as outlined in the National Electrical Code (NEC)
    Article 800. All cabling shall bear CMP and/or appropriate markings for the
    environment in which they are installed.
  - 2. Sealing of openings between floors, through rated fire and smoke walls, existing or created by this contractor for cable pass through shall be the responsibility of the PABS system contractor. Sealing material and application of this material shall be accomplished in such a manner which is acceptable to the fire and building authorities having jurisdiction over this work. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the PABS system contractor's work. Any openings created by or for this contractor and left unused shall also be sealed as part of this work.
  - 3. The system contractor shall be responsible for any damage to any surfaces or work disrupted as a result of his work. Repair of surfaces, including painting, shall be included as necessary.
  - Common area and exterior speaker circuits shall be routed to local IDF/MDF room and terminated on TTB
    mounted DIN rail terminal strips. These circuits shall be fed with IP Gateway mounted adjacent in Rack.
  - Maintain proper separation between system cables and all power and/or unshielded cables, as required to prevent noise, crosstalk, etc.

## 3.4 SPEAKERS

- A. Mount ceiling speakers in or on ceiling system at locations shown on drawings as directed by ceiling system contractor, manufacturer, and installer. Provide all required mounting hardware and/or accessories. In general, all speakers shall be recessed mounted in the ceiling system. Wireway speaker cannot be recessed; install surface speaker assembly.
- B. System speakers shall be tapped for individual room requirements. Speakers shall be tapped, main system amplifier sized, and overall system balanced to allow minor system adjustments after installation has been substantially completed. In no instance shall any speaker be tapped to its minimum setting prior to final adjustments. Minimum tap setting shall be reserved for volume adjustment in undersized rooms. In no

- instance shall any speaker control assembly in the equipment rack be loaded in excess of eighty percent (80%) of the manufacturers stated full load rating.
- C. Connect speakers together so that no speaker circuit exceeds either five speakers or 40 watt load.
- Connect speaker circuits and program speaker circuits to form the zones indicated in Part 1 of these specifications.
- E. Each speaker circuit shall have a separate, splice-free cable homerun to the termination block in the local Terminal Cabinet.
- 3.5 IP DEVICES (CLOCKS / SPEAKERS / GATEWAYS)
  - A. Devices shall be connected to designated VLAN in IDF/MDF. All CAT6 cable serving these devices shall terminate in uppermost patch panel in rack and be designated with a color coded keystone jack at each end.
  - B. Each cable shall be labeled with 12" of termination and on each patch panel jack. Label shall include the following information:
    - 1. Device MAC Address in text and bar code format
    - 2. At device side MDF or IDF Room Number which feeds device
    - 3. At IDF/MDF side Room Number where located
- 3.6 CALL-IN SWITCH
  - A. Install call-in switch at locations shown on drawings.
  - B. Connect each call-in switch to control intercom call-in circuit in room speaker circuit shown.
  - C. Provide/install wiring from local equipment to call-in switch
- 3.7 ADMINISTRATIVE TELEPHONE
  - A. Install administrative telephone at locations shown on drawings.
  - B. Provide/install wiring from local LAN to administrative telephone.
- 3.8 HANDSETS
  - A. Install handset at locations shown on drawings.
  - B. Provide/install lockable enclosure NEMA rated for application.
  - C. Provide/install wiring from local LAN to telephone.
- 3.9 VOLUME CONTROLS
  - A. Install volume controls at locations shown on drawings.
  - B. Connect each volume control to control speakers in room and/or speakers per circuit shown. Size volume controls to match speaker load.
  - C. Each volume control to have priority override relay.
    - Provide/install relays in central equipment rack and wiring to each volume control unit as required to
      control volume control relay so that when priority/emergency signal is received by the central
      equipment, the volume control unit is overridden to provide maximum level for emergency signals (not
      paging signals.)
    - 2. Volume control override relays may be grouped together to match respective speaker circuiting.
    - Provide/install wiring from central equipment to volume control and relays.
- 3.10 WEATHERPROOF HANDSET ENCLOSURE
  - A. Install complete with telephone plate and jack.
  - B. Canopy column mount.
    - Mount securely to columns.

- 2. Provide and install all accessories as required to securely mount enclosures.
- C. Connect jack to nearest IDF with CAT6 UTP. Install surge suppression on lines.

### 3.11 GROUNDING

### A. Ground Bus Connections.

- Provide "local" ground bus in each terminal cabinet housing surge protection equipment (with lugs, etc. as required).
- 2. Bond "local" ground bus to terminal cabinet with minimum #6 copper wire.
- Connect terminal cabinet "local" ground bus to "systems" ground bus installed per Section
  Grounding and Bonding with minimum #6 copper insulated wire (unless otherwise noted) in
  conduit.

## B. Surge suppression equipment grounding.

- Connect each surge suppressor to local ground bus in terminal cabinet with wire sized as
  recommended by manufacturer. Where "M" block type terminations/surge suppressors are used, bond
  ground rail to local ground bar with wire as recommended by manufacturer.
- Coordinate with Section Surge Protection Devices Contractor to assure that 120VAC power source/supply surge suppressor is also grounded to same local ground bus as surge suppressors provided in this section.

### C. Conductors.

- Conductors shall meet requirements of Section Building Wire and Cable. Minimum size to be #12 THWN
- Bends in excess of 90 degrees in any grounding conductor shall not be permitted. A radius of 6 inches
  or greater shall be maintained on all bends.
- 3. Do not bundle unprotected conductors with protected conductors.
- 4. Conductors shall be kept as short as possible.
- 5. Conductors shall be secured at 12" intervals with an approved copper clamp.
- Grounding conductors shall be properly connected to the building service ground by approved clamps.

## D. Grounding Connectors

- Connectors, splicers, and other fittings used to interconnect grounding conductors, bond to equipment or grounding bars, shall be approved by NEC or U.L. for the purpose.
- 2. All connectors and fittings shall be of the non-reversible Nico press crimp or compression type.
- Special treatment to fittings, lugs, or other connectors of dissimilar material shall be applied to prevent electro-galvanic action.

## 3.12 SURGE SUPPRESSION

## A. General

- Provide and install surge suppression devices as specified for each Intercom and Master Clock System circuit conductor that exits the building associated with the control console.
- Provide and install surge suppression devices as specified in Section Surge Protection Devices for 120
  volt source to all equipment. Install online side of UPS at Central Equipment.
- 3. Extreme care shall be taken by contractor to assure a properly surge protected system.
- Surge protection equipment must be selected by contractor to match the equipment being protected including wire sizes, operating volts, amps, and circuit impedance.

5. Installation of surge protection equipment and its grounding must be per manufacturer's recommendations to assure short and proper ground paths.

## B. Equipment Installation

- Install surge suppression equipment per manufacturers recommendation at each wire terminal as noted under Part 1.
- Install in surge suppression equipment terminal cabinets, etc. as required to facilitate installation of surge protection equipment and terminal points. Increase size of terminal cabinets (from that shown on drawings) to size required to facilitate installation of surge suppression equipment and terminal blocks.
- Locate surge suppression equipment in terminal cabinet nearest the associated equipment cabinet (ICEC).
- Coordinate with Section Surge Protection Devices Contractor to assure that surge suppression for 120VAC power circuit and surge suppression required by this section are all installed in same terminal cabinet and bonded together.

## 3.13 FIELD QUALITY CONTROL

- A. Test per applicable sections of these specifications.
- B. Perform a complete, functional, component by component test of the entire Intercom and Master Clock System. Provide a detailed step by step testing procedure which is unique to this project, reflecting the type of system and the number and location of all components.
- C. Upon completion, the system shall be clean, properly adjusted, and in perfect operating condition.
- D. The system shall be free of any audible components of hum, noise or distortion.
- E. Demonstrate the proper operation of each component in the system.
- F. Measure and record sound power level at the following locations:
  - Multi-building Campus: Measure at least one speaker per floor in each building. Speaker is to be speaker that is furthest from central equipment.

## 3.14 ADJUSTING

- A. Adjust transformer taps for appropriate sound level
- B. Manufacturer's field service
  - 1. Provide manufacturer's field services.
  - 2. Include making or supervising final wiring connections, inspection and adjusting of completed installation and systems demonstration.
  - 3. Certify that installation is complete and performs according to specified requirements

## 3.15 DEMONSTRATION

- A. Demonstrate system to designated Owner personnel as required by applicable sections of these specifications.
- B. Conduct walking tour of project. Briefly describe function, operation, and maintenance of each component.
- C. Provide detailed operation and maintenance instruction and training.
- D. Use submitted operation and maintenance manual as reference during demonstration and training.

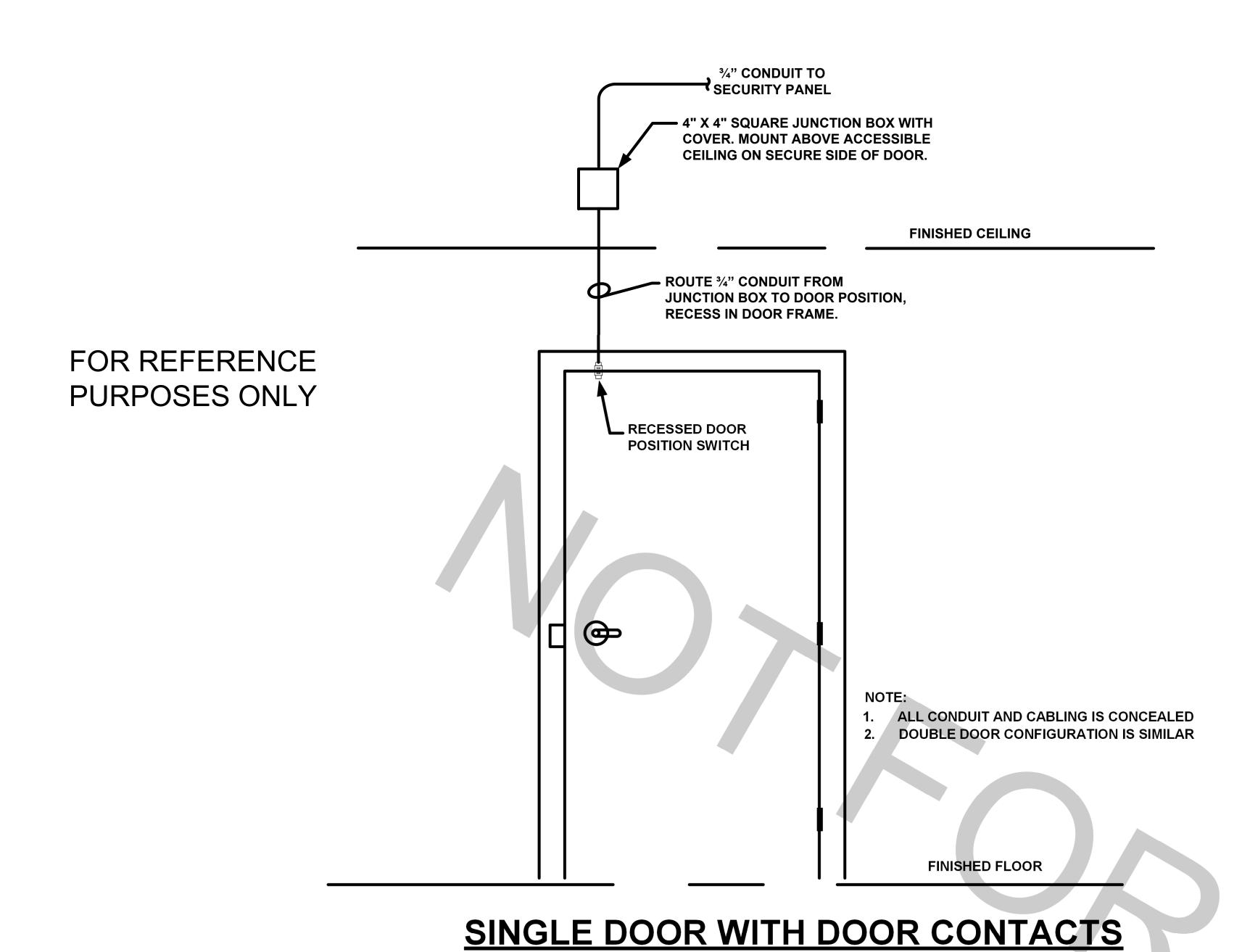
## 3.16 AUTHORITY HAVING JURISDICTION

A. The drawings and specifications herein comply to the best of the engineer's knowledge with all applicable codes

at time of design. However, it is this contractor's responsibility to coordinate/verify (prior to bid) the requirements of the authority having jurisdiction over this project and bring any discrepancies to the engineer's attention at least 7 days prior to bid. No changes in contract cost will be acceptable after the bid for work/equipment required to comply with the authority having jurisdiction

## **END OF SECTION**

## [REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]



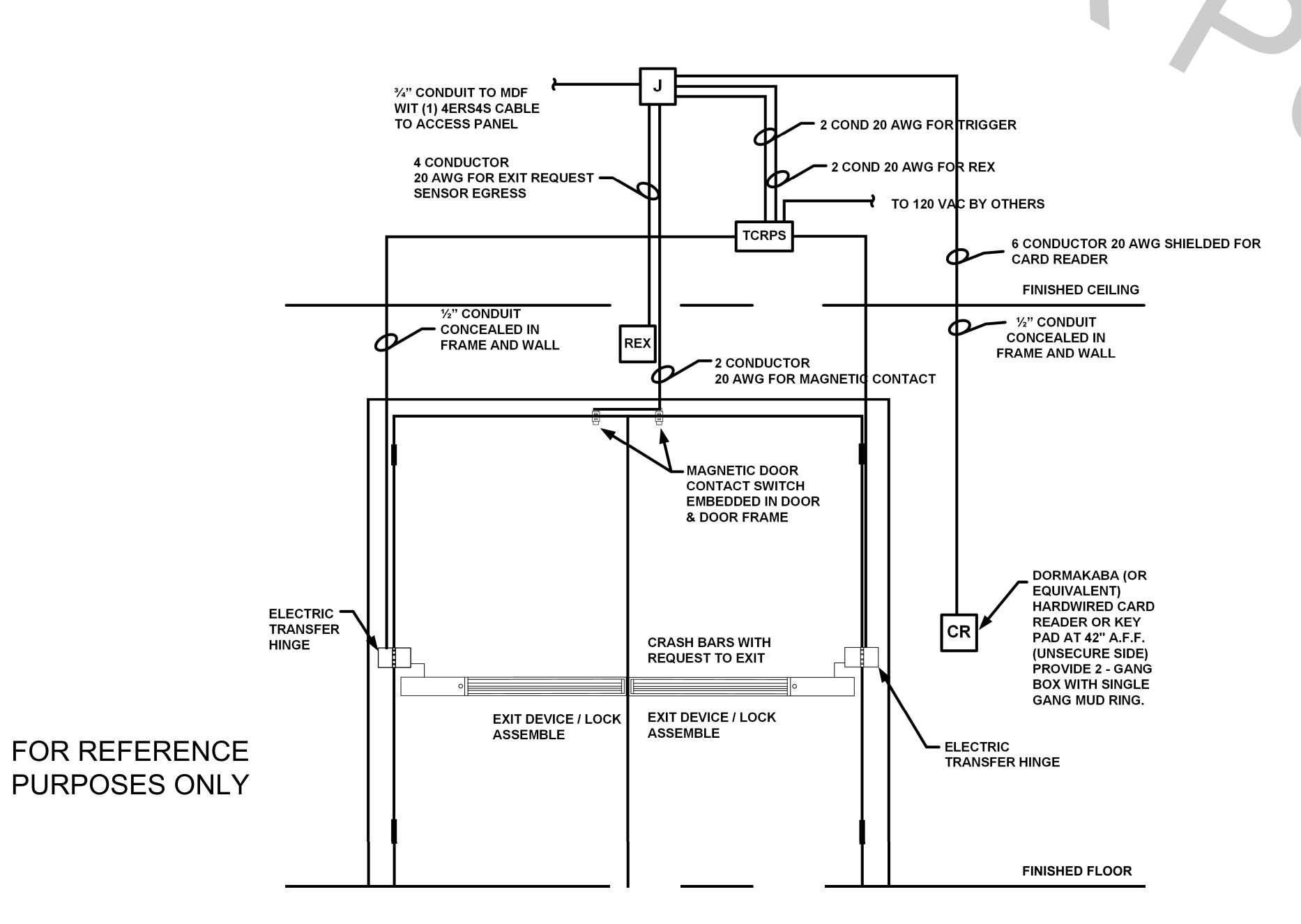
## → <sup>3</sup>/<sub>4</sub>" CONDUIT TO SECURITY PANEL **■** 4" X 4" SQUARE JUNCTION BOX WITH COVER. MOUNT ABOVE ACCESSIBLE CEILING ON SECURE SIDE OF DOOR **FINISHED CEILING** ½" CONDUIT 1/2" CONDUIT CONCEALED CONCEALED IN IN FRAME AND WALL FRAME AND WALL DORMAKABA (OR DOOR CORED FROM **EQUIVALENT)** HINGE TO MORTIS LOCK HARDWIRED CARD READER OR KEY PAD AT 42" A.F.F. (UNSECURE SIDE) PROVIDE 2 - GANG **BOX WITH SINGLE** GANG MUD RING. **ELECTRIC** TRANSFER HINGE WITH DOOR STATUS **SENSOR ELECTRIC MORTIS** LOCK WITH REQUEST TO EXIT SENSOR FINISHED FLOOR

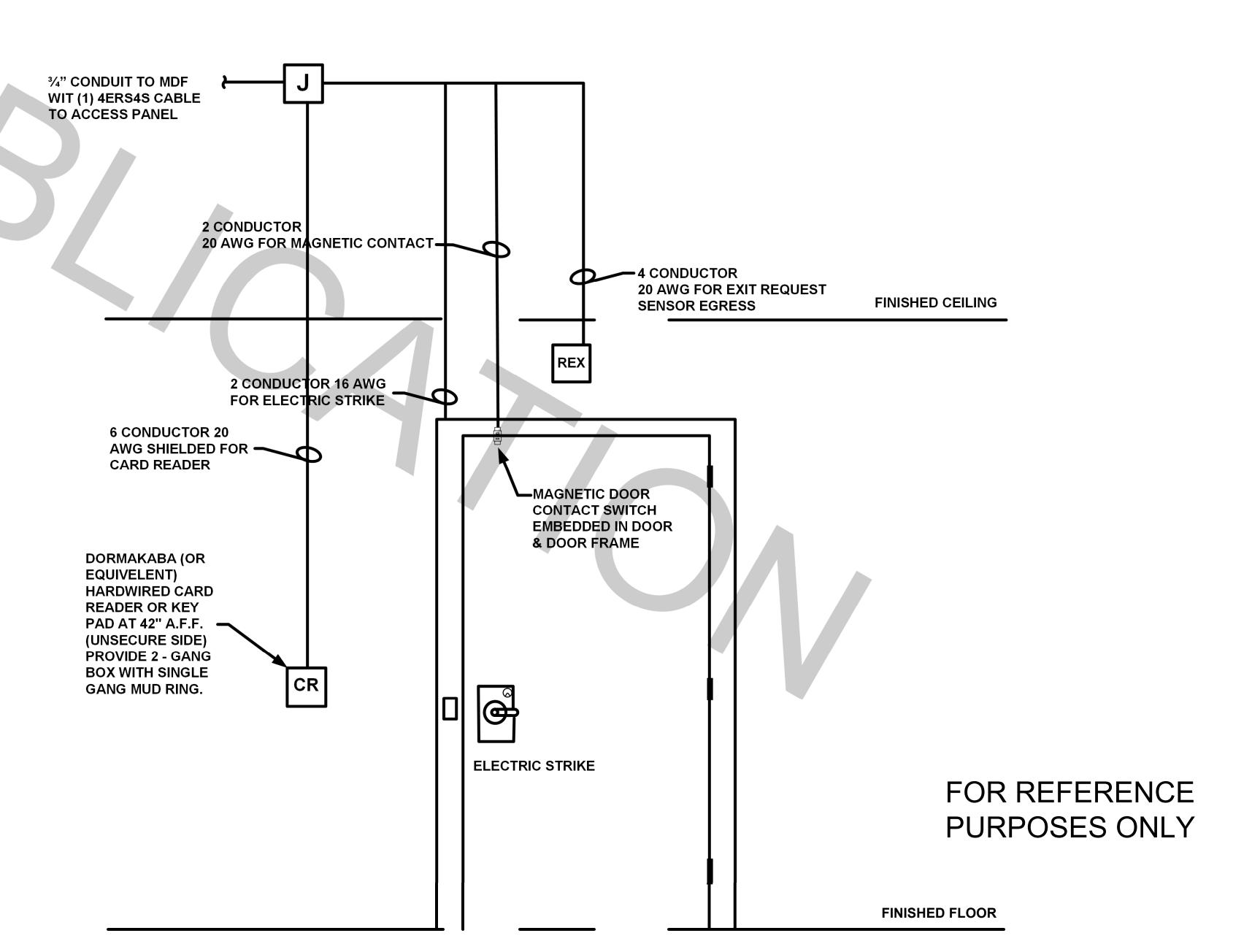
FOR REFERENCE

**PURPOSES ONLY** 

## SINGLE DOOR WITH CARD READER / KEYPAD

**→**120V BY OTHERS





DOUBLE DOOR WITH CARD READER / KEYPAD

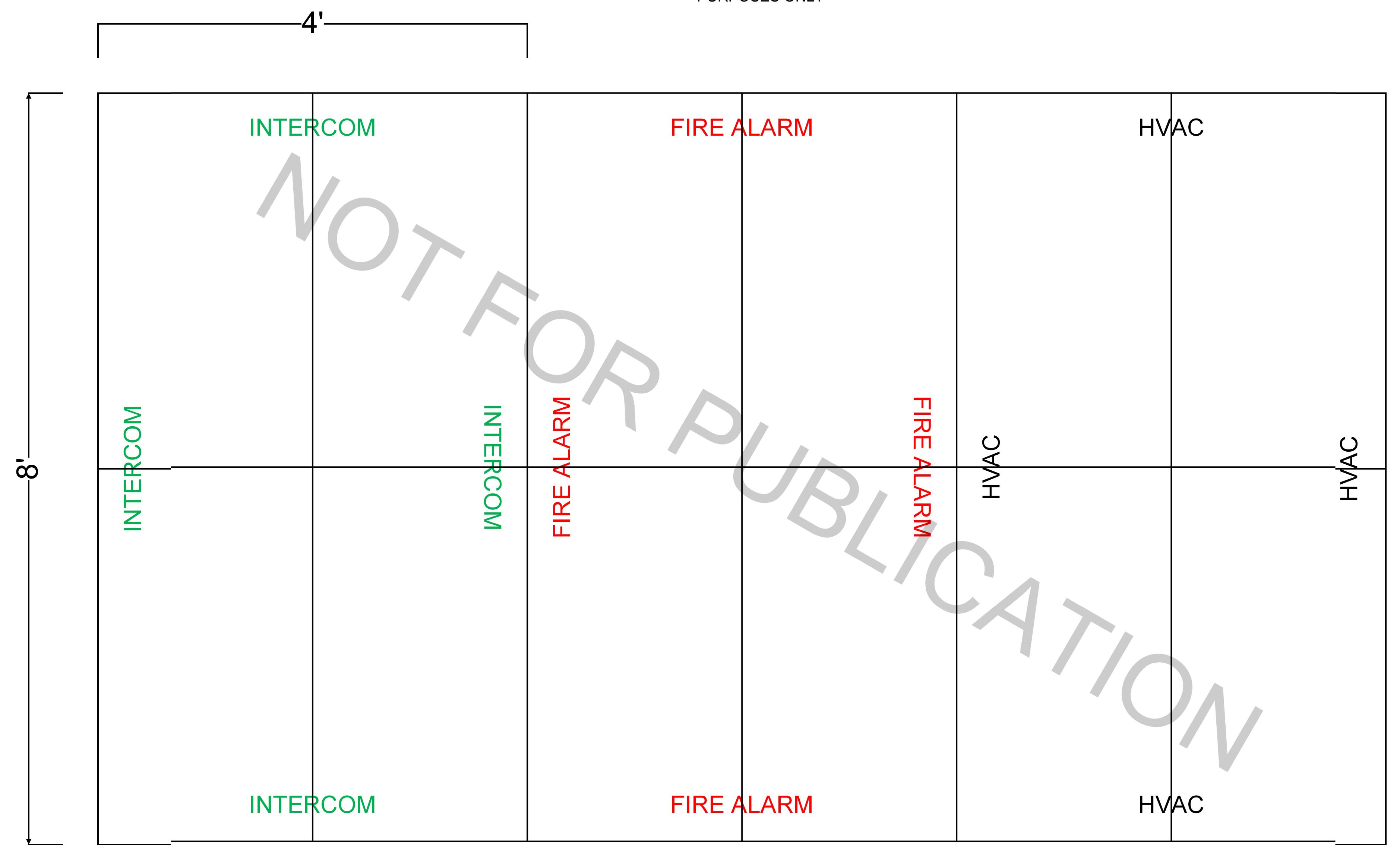
MAGNETIC RELEASE

SINGLE DOOR WITH CARD READER / KEYPAD

MAGNETIC RELEASE

**NOT TO SCALE** 

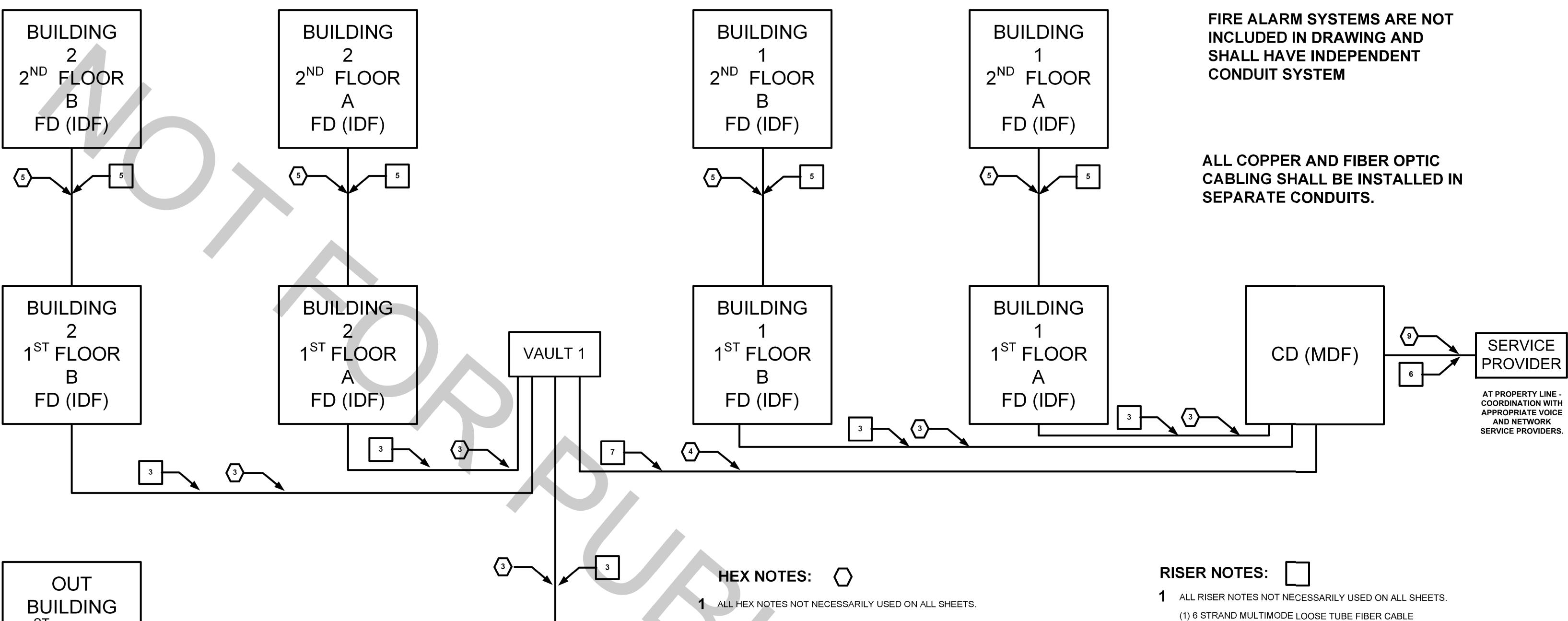
FOR REFERENCE FOR REFERENCE PURPOSES ONLY PURPOSES ONLY Exterior Protective Enclosure Dedicated 20 amp circuit Audio Enhancement Audio Enhancement Amplifier Unit Surface Mount Application POWER PANEL# CIRCUIT BREAKER# (SAMPLE LABEL) ΑE FOR REFERENCE **PURPOSES ONLY** 



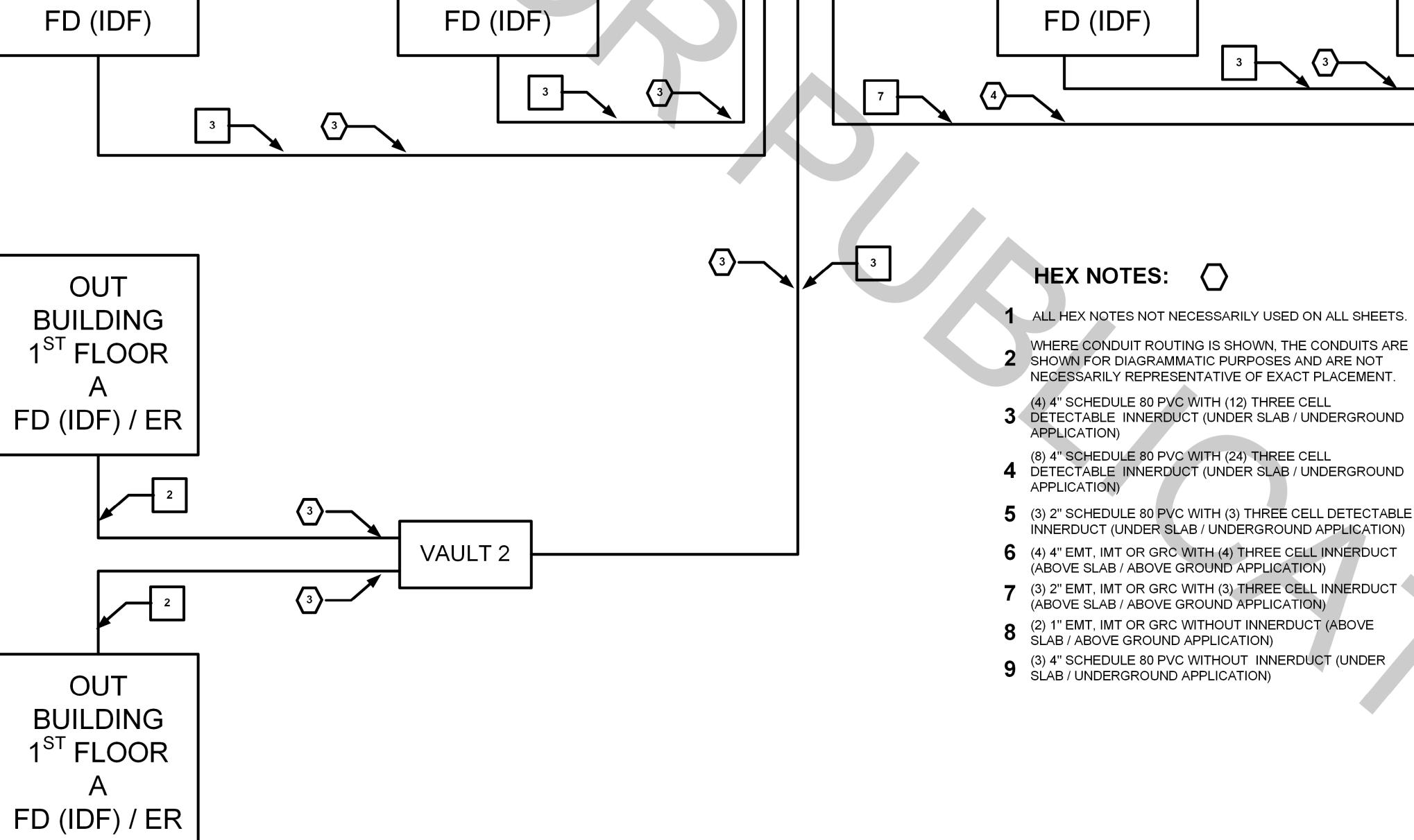
## SAMPLE BACKBOARD LAYOUT

Not to Scale

## FOR REFERENCE PURPOSES ONLY



FOR REFERENCE PURPOSES ONLY



2 (1) 24 STRAND SINGLE MODE LOOSE TUBE FIBER CABLE (1) 12 PAIR PE89 VOICE TIE CABLE

(2) 6 STRAND MULTIMODE LOOSE TUBE FIBER CABLE

(4) 6 STRAND MULTIMODE LOOSE TUBE FIBER CABLE

(4) 24 STRAND SINGLE MODE LOOSE TUBE FIBER CABLE (4) 12 PAIR PE89 VOICE TIE CABLE

(1) 6 STRAND MULTIMODE LOOSE TUBE FIBER CABLE

(6) 6 STRAND MULTIMODE LOOSE TUBE FIBER CABLE

ALL CABLING TYPE-WRITTEN LABELS DENOTING FAR-END

7 (6) 24 STRAND SINGLE MODE LOOSE TUBE FIBER CABLE (6) 12 PAIR PE89 VOICE TIE CABLE

8 TERMINATION POINT. SEE DETAILS AND SPECIFICATIONS FOR MORE INFORMATION.

(12) 18 / 4 WEST PENN AQ244 SECURITY CABLE

6 (1) SPECTRUM (NETWORK) FIBER OPTIC CABLE (SERVICE PROVIDER) (1) CENTURY LINK CABLE (FIBER OR COPPER) (SERVICE PROVIDER)

5 (1) 24 STRAND SINGLE MODE LOOSE TUBE FIBER CABLE (1) 12 PAIR 24 AWG VOICE RISER CABLE

3 (2) 12 STRAND SINGLE MODE LOOSE TUBE FIBER CABLE

(2) 18 / 4 WEST PENN AQ244 SECURITY CABLE

(4) 18 / 4 WEST PENN AQ244 SECURITY CABLE

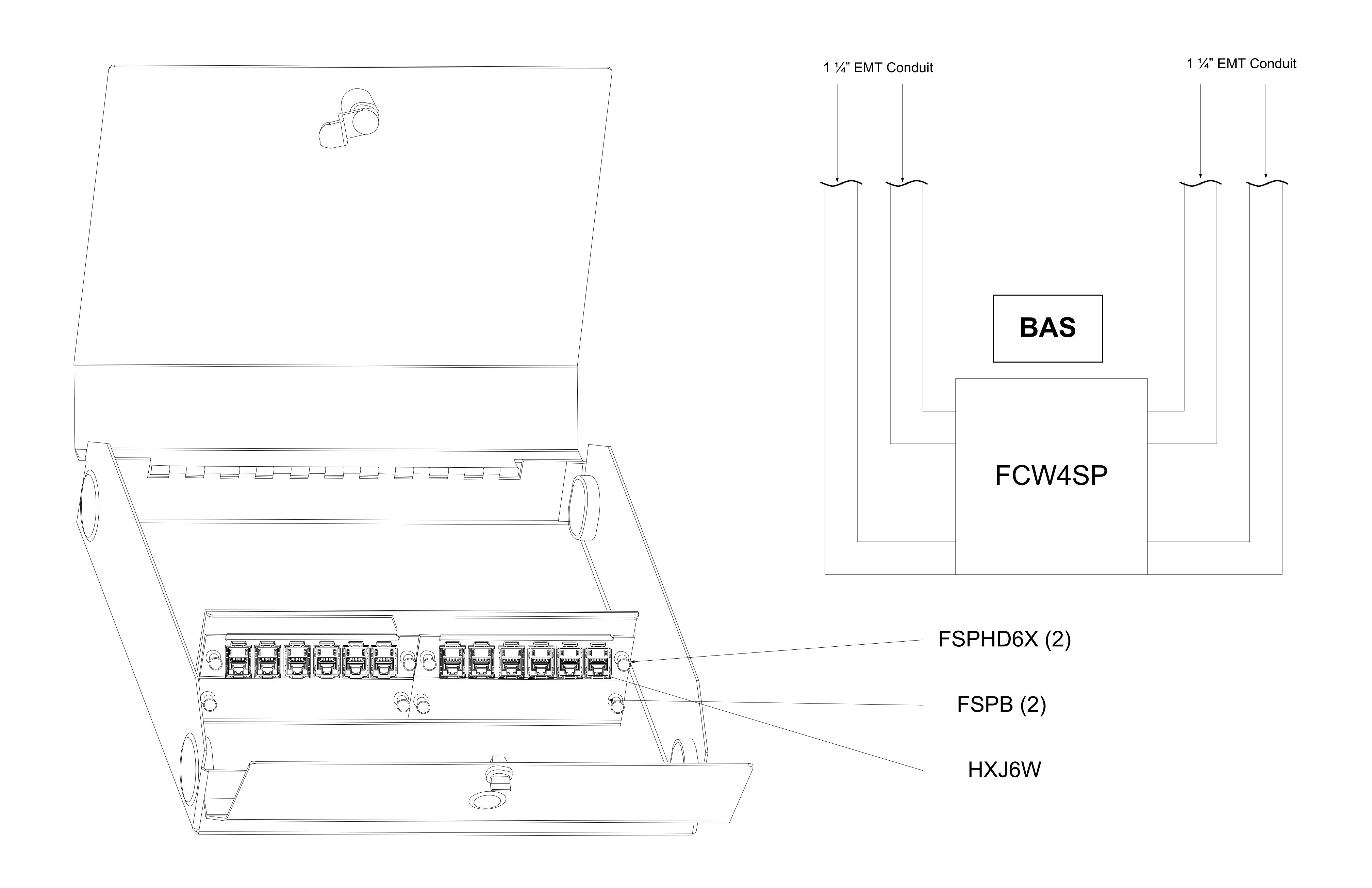
(8) 18 / 4 WEST PENN AQ244 SECURITY CABLE

(2) 18 / 4 INDOOR RATED SECURITY CABLE

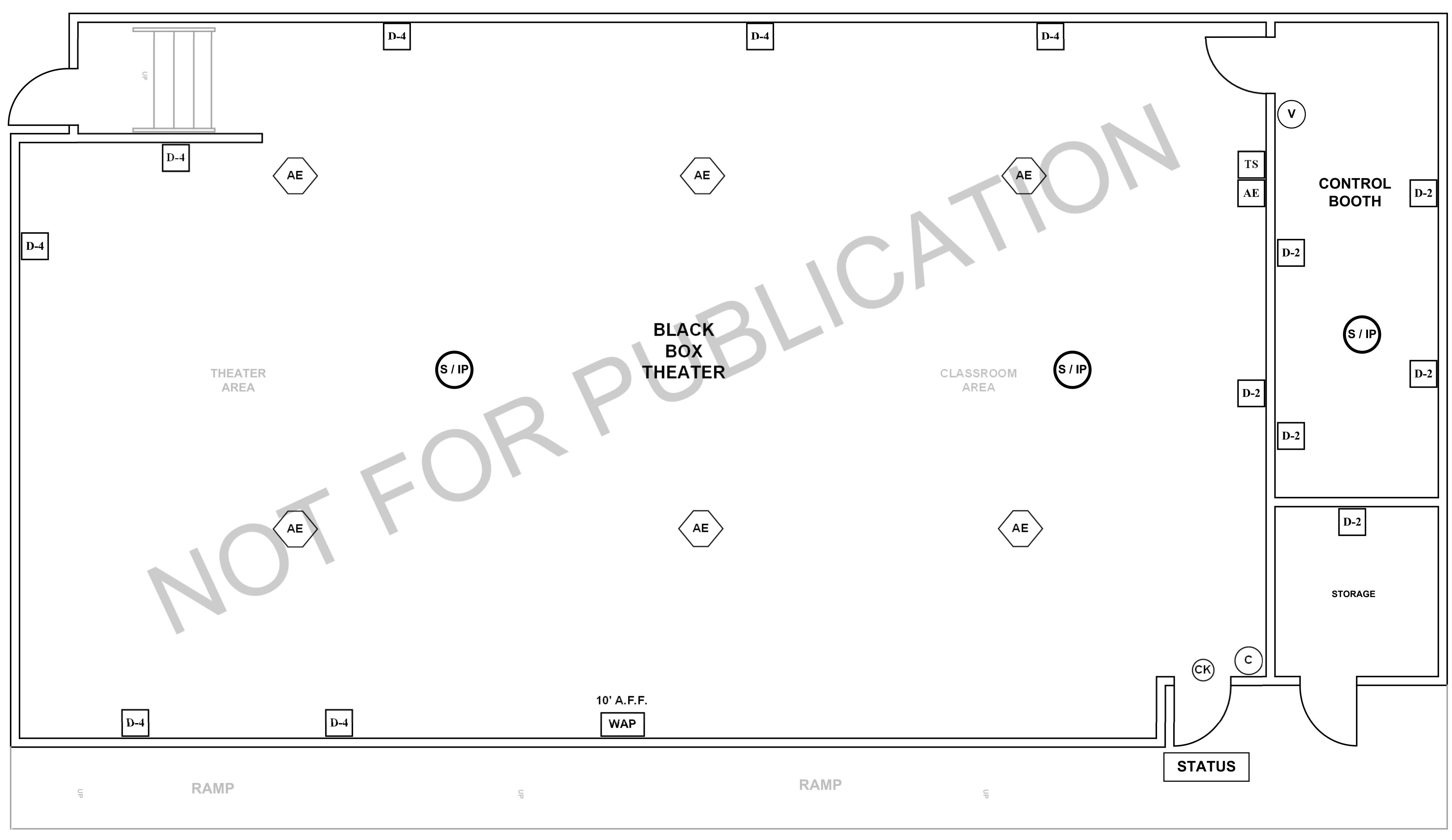
(2) 12 PAIR PE89 VOICE TIE CABLE

FOR REFERENCE PURPOSES ONLY

## TYPICAL BACKBONE CONDUIT / BACKBONE CABLING RISER DIAGRAM

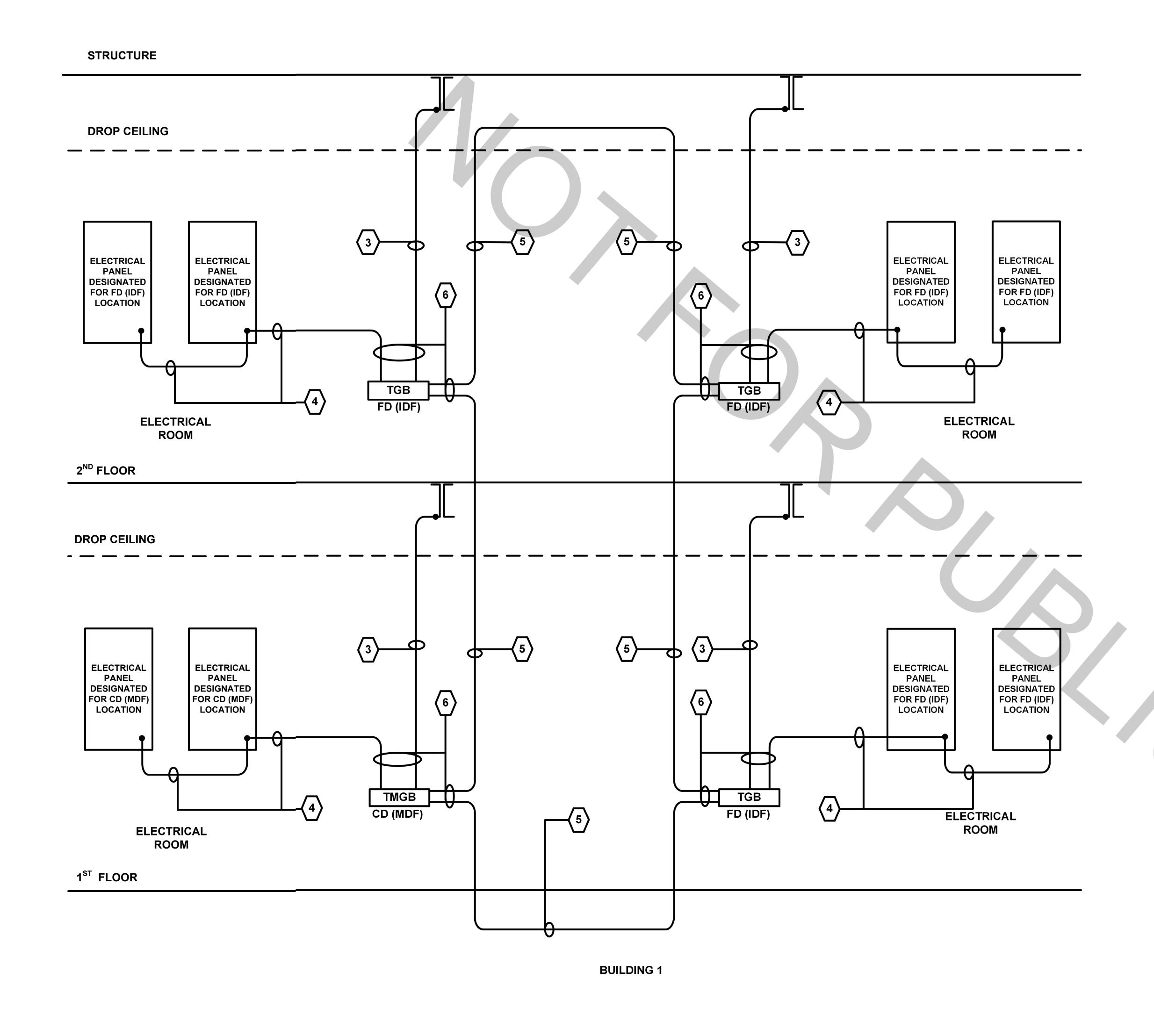


HVAC - BAS SUPPORT OUTLET



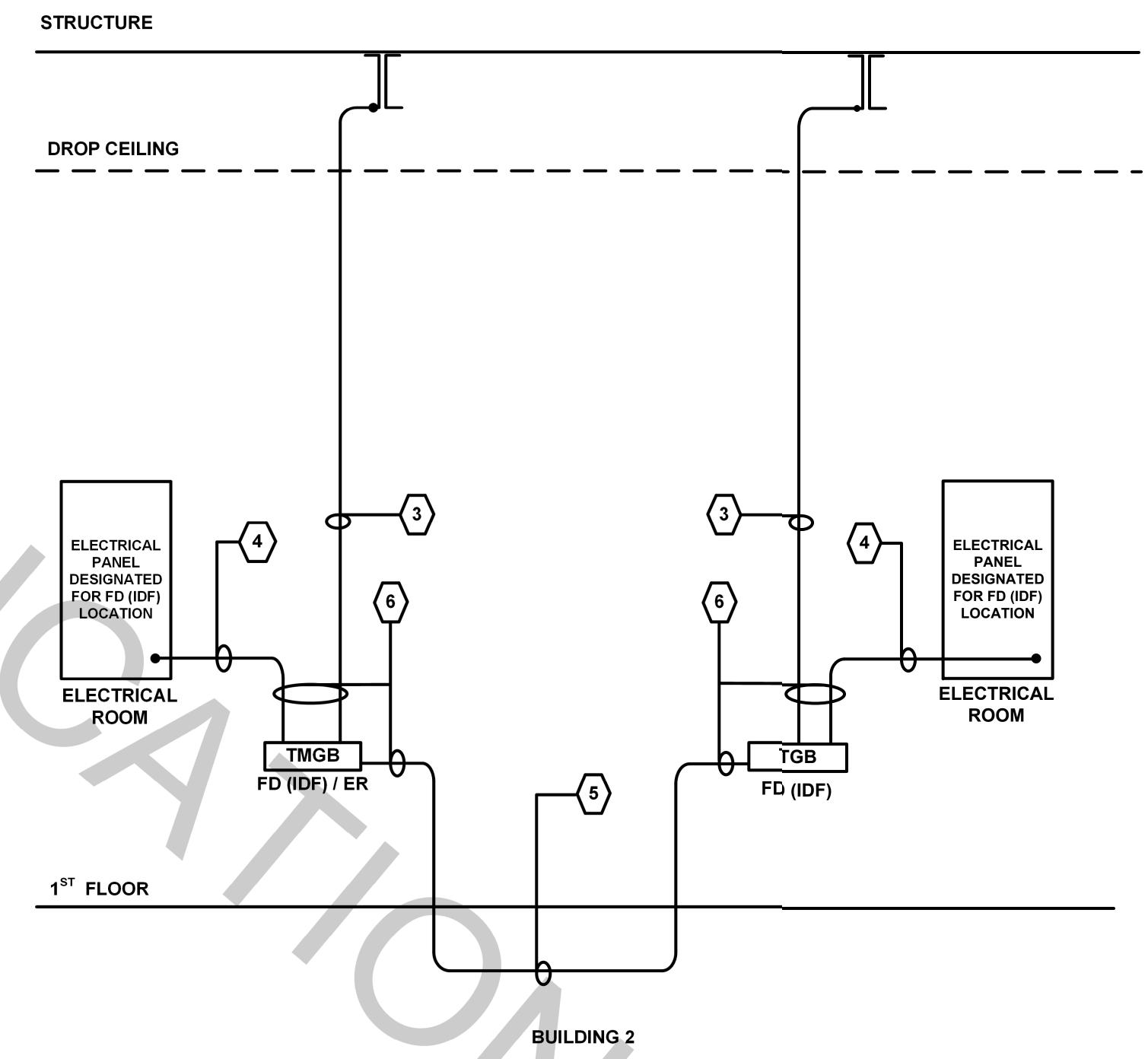
FOR REFERENCE PURPOSES ONLY TYPICAL
BLACK BOX
THEATER

FOR REFERENCE PURPOSES ONLY



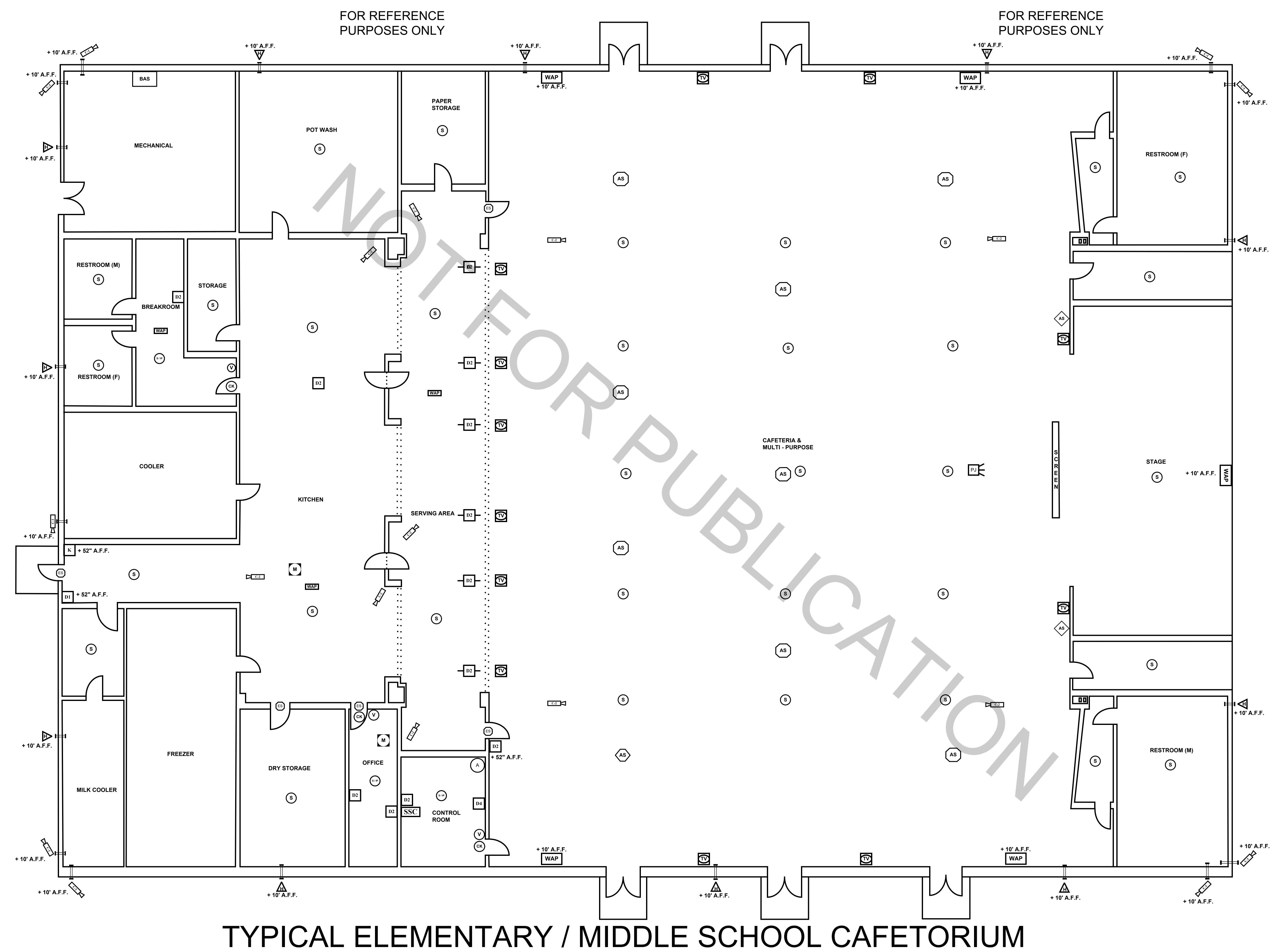
## DETAIL NOTES:

- ALL HEX NOTES NOT NECESSARILY USED ON ALL SHEETS.
- 1. COMPRESSION LUG DOUBLE BOLT FOR ALL GROUNDING APPLICATIONS TYPICAL
- #6 AWG (OR AS INDICATED BY PROJECT ENGINEER) GREEN INSULATED COPPER GROUND BETWEEN EQUIPMENT AND BUS BAR.
- #6 AWG (OR AS INDICATED BY PROJECT ENGINEER) GREEN INSULATED COPPER GROUND BETWEEN BUILDING STEEL AND BUS BAR.
- #4 AWG (OR AS INDICATED BY PROJECT ENGINEER) GREEN INSULATED COPPER GROUND BETWEEN POWER PANEL AND BUS BAR.
- #4 AWG (OR AS INDICATED BY PROJECT ENGINEER) GREEN INSULATED COPPER GROUND BETWEEN BUS BARS.
- 6. ALL CABLING TYPE WRITTEN LABELS DENOTING FAR END TERMINATION POINT.



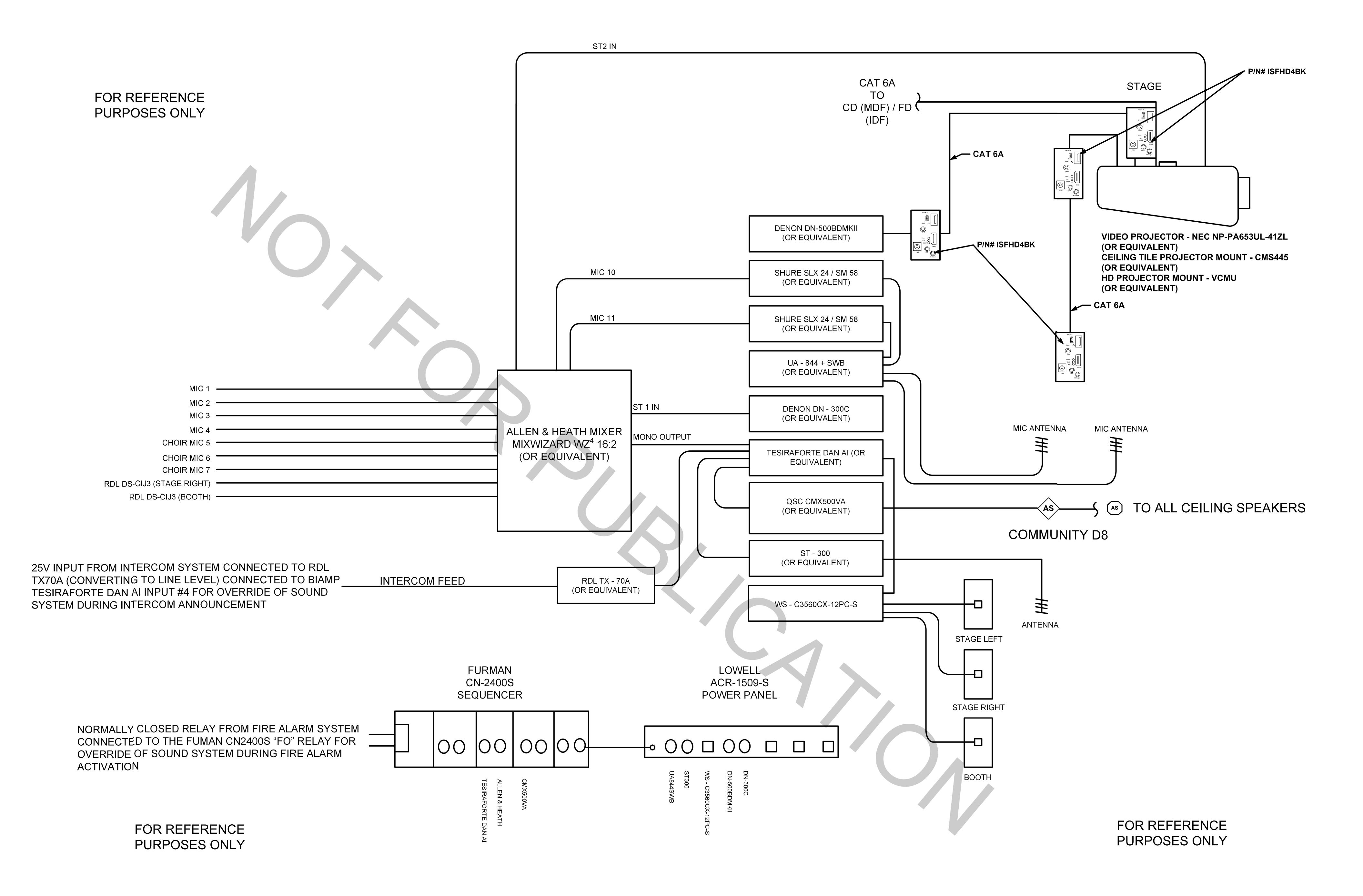
FOR REFERENCE PURPOSES ONLY

## BONDING BACKBONE RISER DIAGRAM

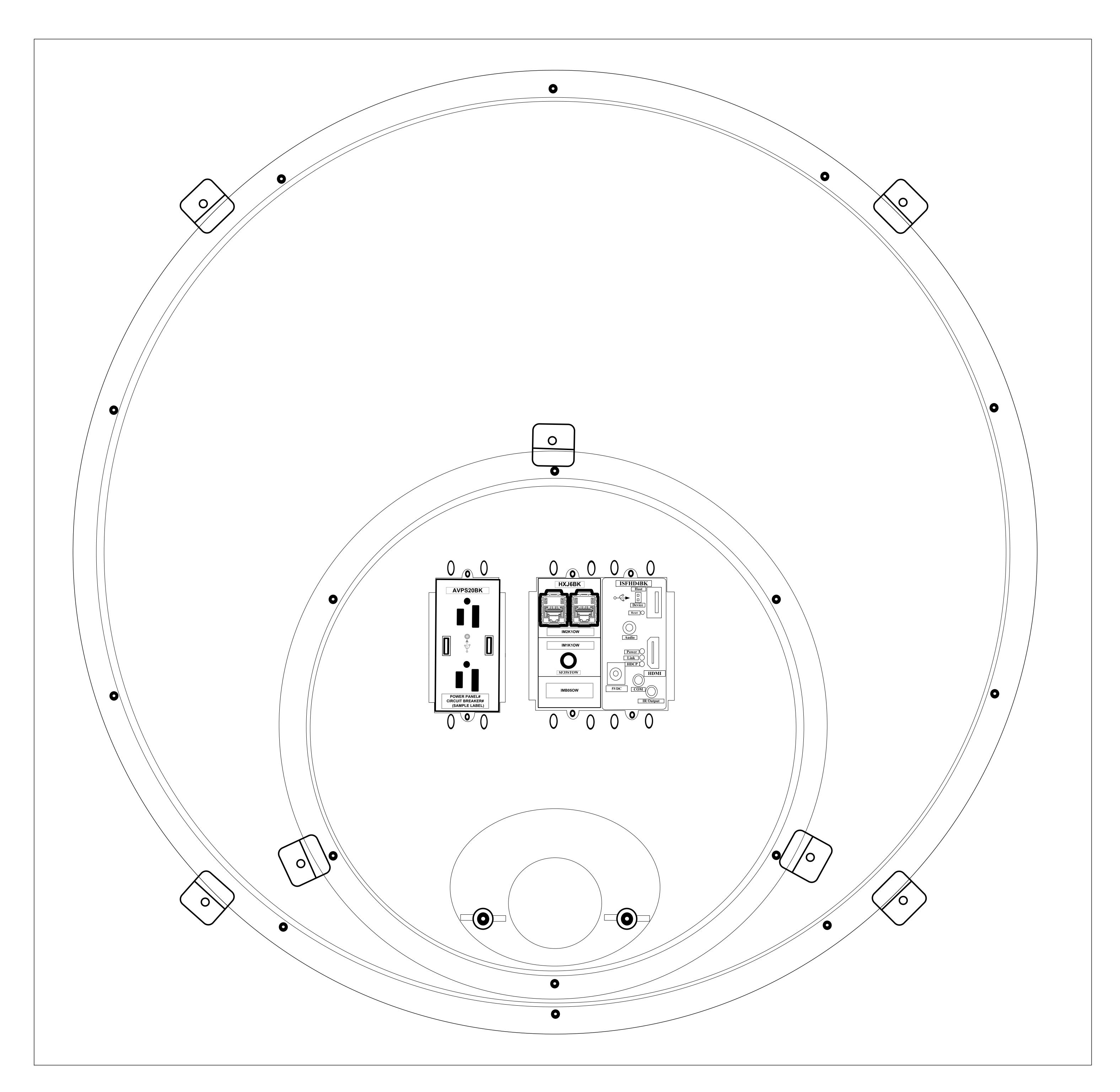


NOT TO SCALE

FOR REFERENCE PURPOSES ONLY



TYPICAL CAFETORIUM SOUND SYSTEM BLOCK DIAGRAM



## Note:

Typical 4K extender cabling homerun to control booth

Typical 3.5 mm audio cabling homerun to amplification system

Typical data cabling homerun to closest MDF / IDF location (CAT 6A)

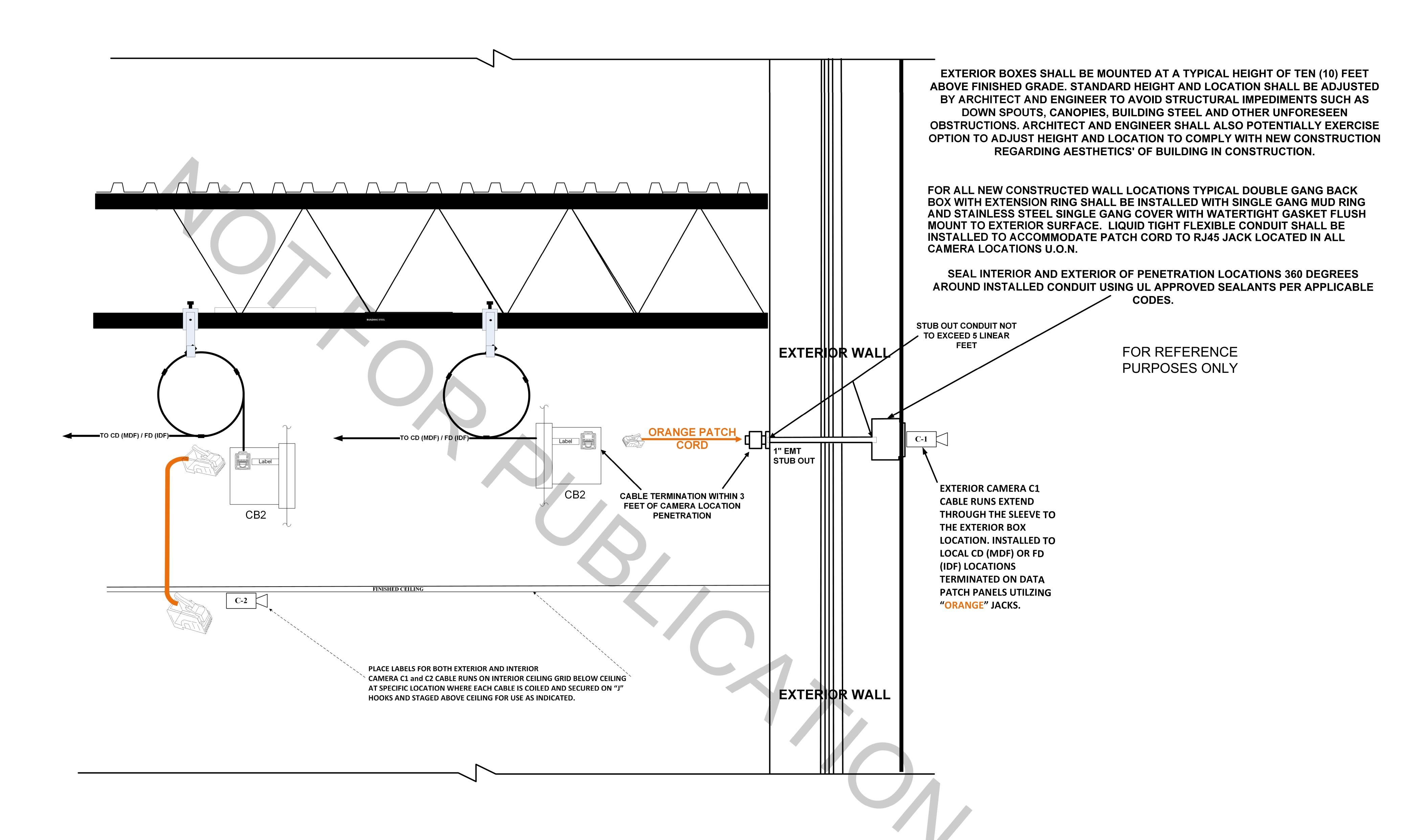
Typical projector
NEC NP-PA653UL-41ZL
or equivalent
Lens based on distance to screen

Typical Extension CMS0203 - 24"- 36" or equivalent

Typical Mount VCMU or equivalent

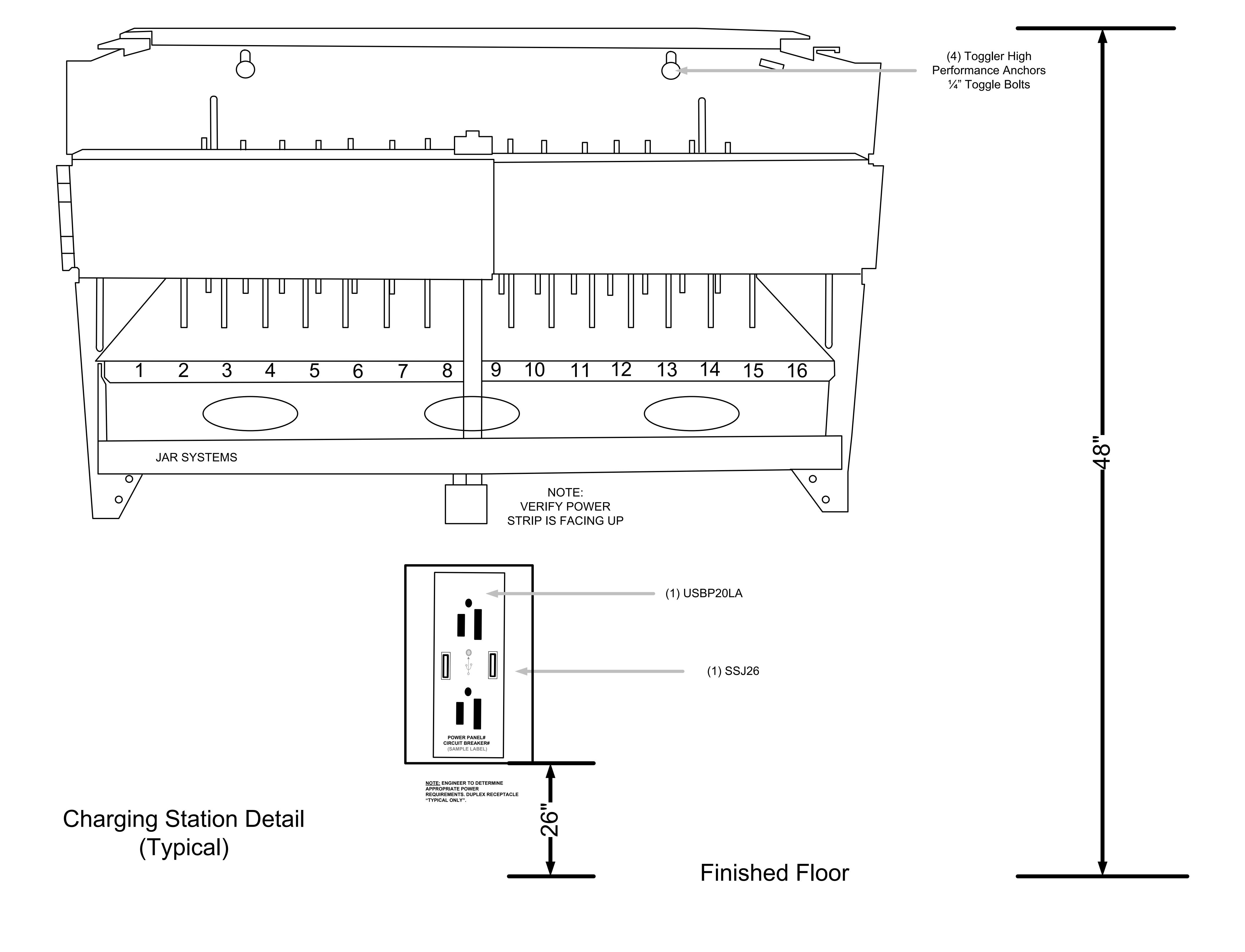
Typical Plate CMS445-T or equivalent

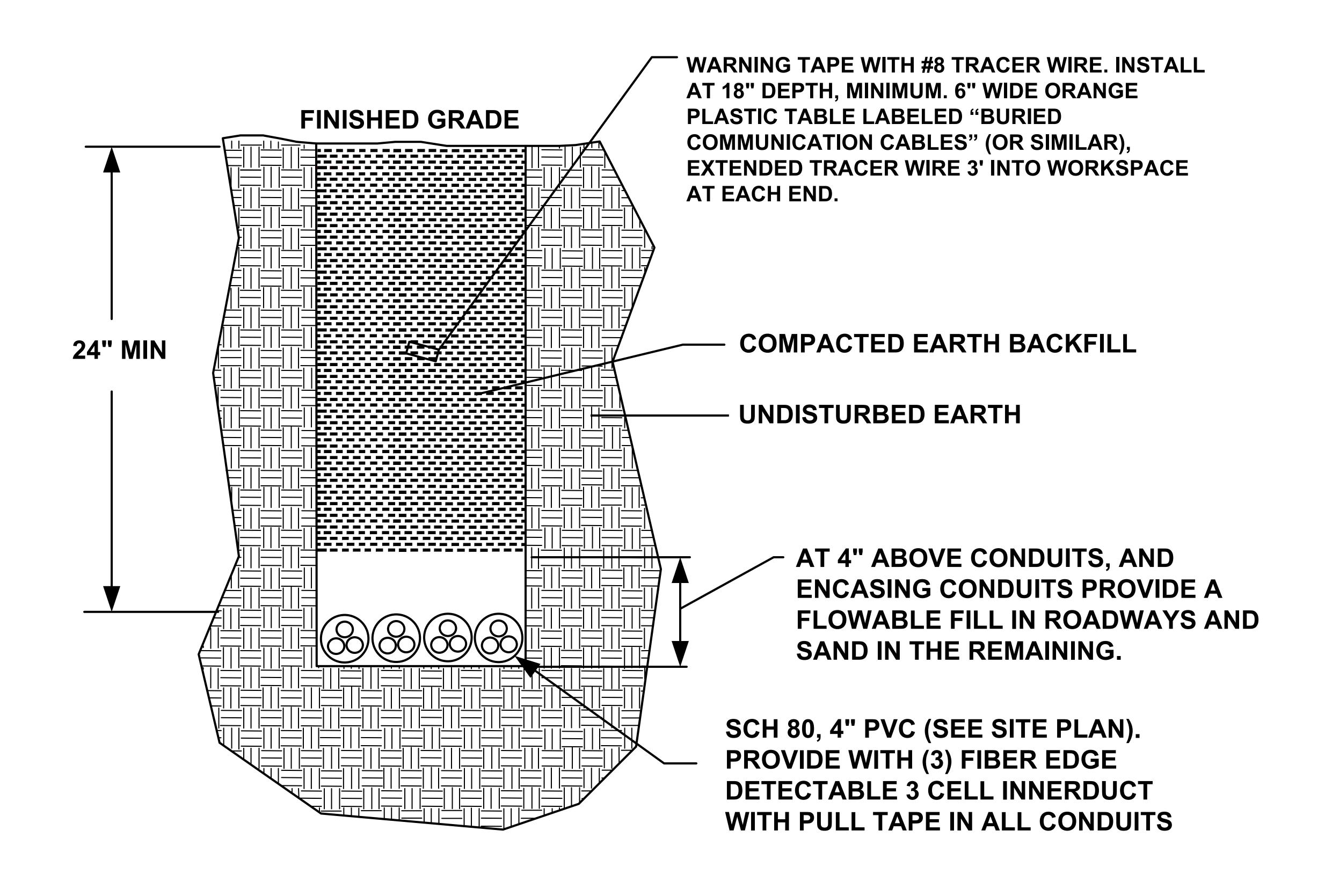
Typical
Cafetorium
Projector Plate
Assembly



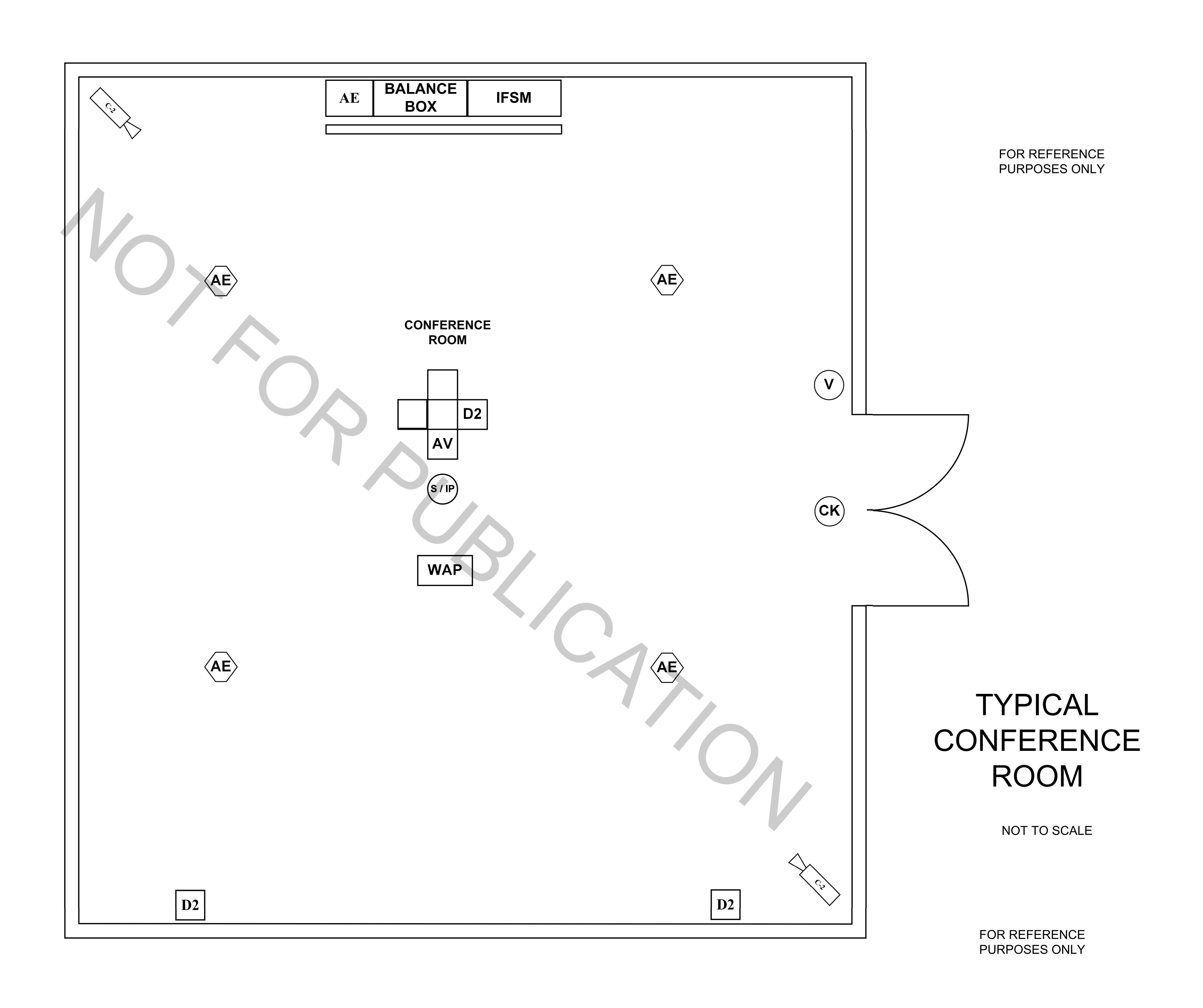
## C1 EXTERIOR AND C2 INTERIOR CAMERA CABLE INSTALLATION LOCATION DETAILS "TYPICAL"

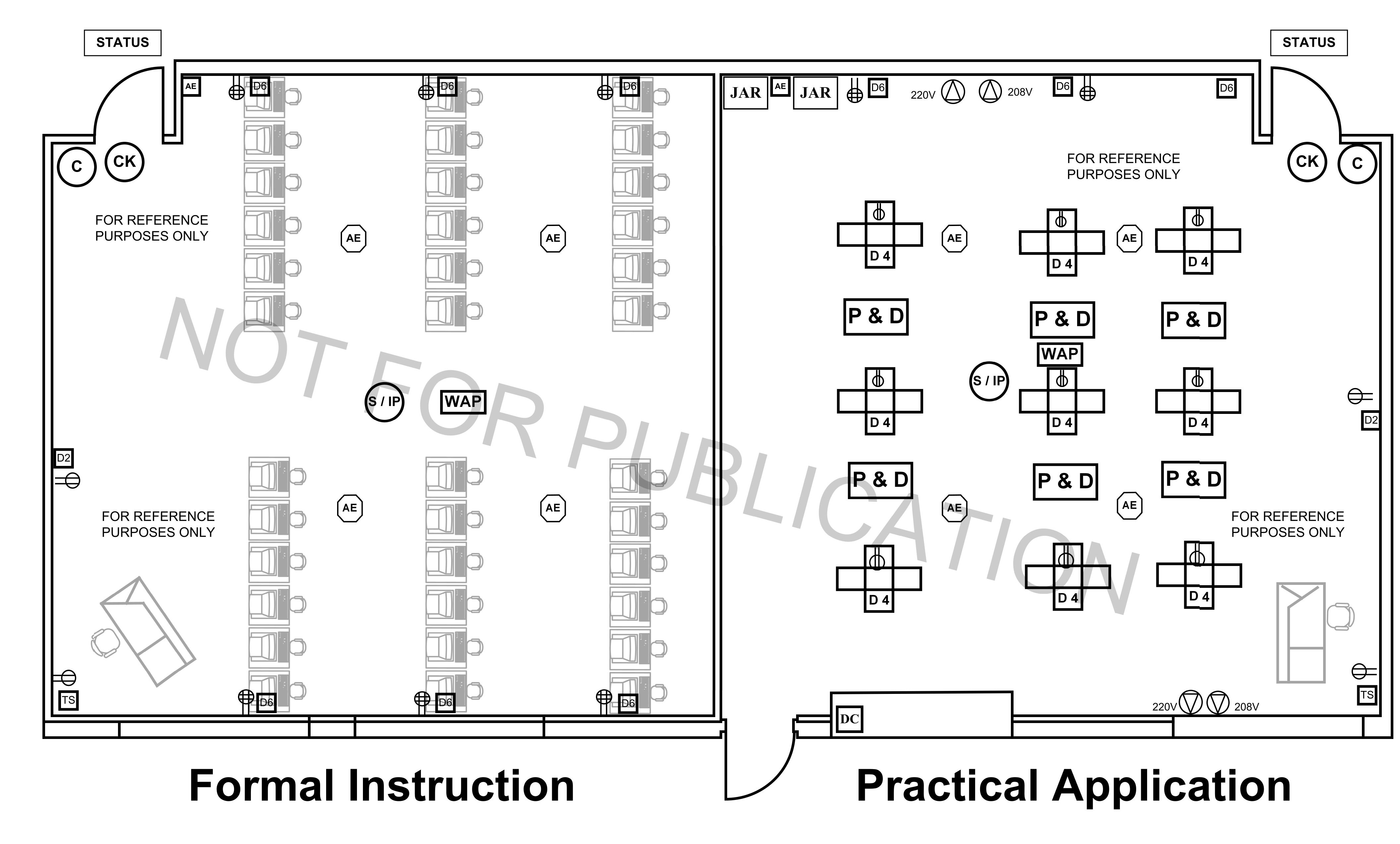
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# CONDUIT TRENCHING / BORING DETAIL (TYPICAL)





## Typical CTE Lab

Requires modification for specific applications

(1) TECHNOLOGY ASSEMBLIES SHOWN SHALL BE MOUNTED ON CONTRACTOR PROVIDED AND INSTALLED:

DOUBLE GANG EMT WALL BOX 4"H X 4"D CONSISTING OF HUBBELL GANGABLE HBL985 WALLBOX (\*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) INSTALLED WITH ONE (1) BARRIER (HUBBELL P/N# HBL989 \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) AS MANUFACTURER SPECIFIED LOW VOLTAGE PARTITION AT POWER RECEPTACLE LOCATION.

COUPLED TO EMT WALL BOX SHALL BE 1 1/4 INCH EMT CONDUIT (\*OR SDOC APPROVED EQUIVALENT PATHWAY) INSTALLED VERTICALLY AND STUBBED OUT ABOVE CEILING REAMED AND BUSHED FOR CATEGORY 6A DATA OUTLET CABLING.

(2) HUBBELL ISTATION MODULAR FACEPLATE FRAME - 1-GANG DECORATOR 1-GANG ISTATION MODULAR FACEPLATE (HUBBELL

P/N# IMFP1D10W
- \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER)

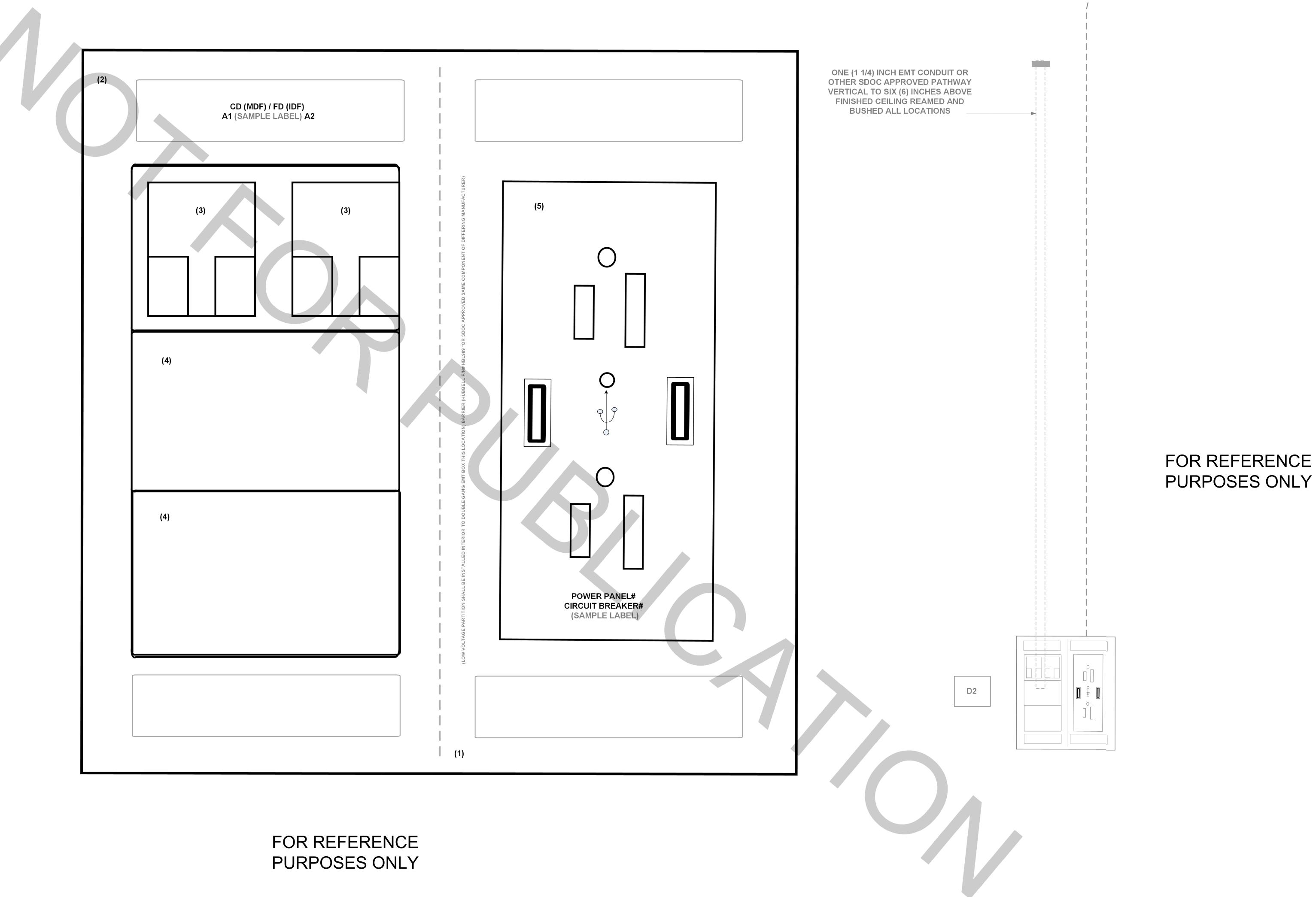
(3) TWO INSTALLED KEYSTONE MODULE FLAT, 2-PORT (HUBBELL P/N# IM2K1OW – \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) INSTALLED IN EACH KEYSTONE MODULE SHALL BE TWO (2):

NEXTSPEED CATEGORY 6A JACKS
(HUBBELL P/N# HXJ6OW – \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER)
FOR A TOTAL OF TWO (2) CATEGORY 6A JACKS WHEN COMPLETE.

(4) BLANK MODULE (HUBBELL P/N# IMB05OW - \*OR SDOC APPROVED SAME COMPONENT OF DIFFERING MANUFACTURER)

(5) DUPLEX GENERAL POWER RECEPTACLE
20A 125VAC (HUBBELL P/N# AVPS20BK \*OR SDOC APPROVED LIKE
COMPONENT OF DIFFERING MANUFACTURER)
(EACH POWER RECEPTACLE SHALL BE TERMINATED AT LOCAL
POWER PANEL AND SHALL BE LABELED ON THE RECEPTACLE WITH
THE POWER PANEL NUMBER AND CIRCUIT BREAKER NUMBER AT ALL
LOCATIONS.)
(ALL CABLING AND COMPONENTS CONTRACTOR PROVIDED AND
INSTALLED, TERMINATED, TESTED, LABELED ALL LOCATIONS)

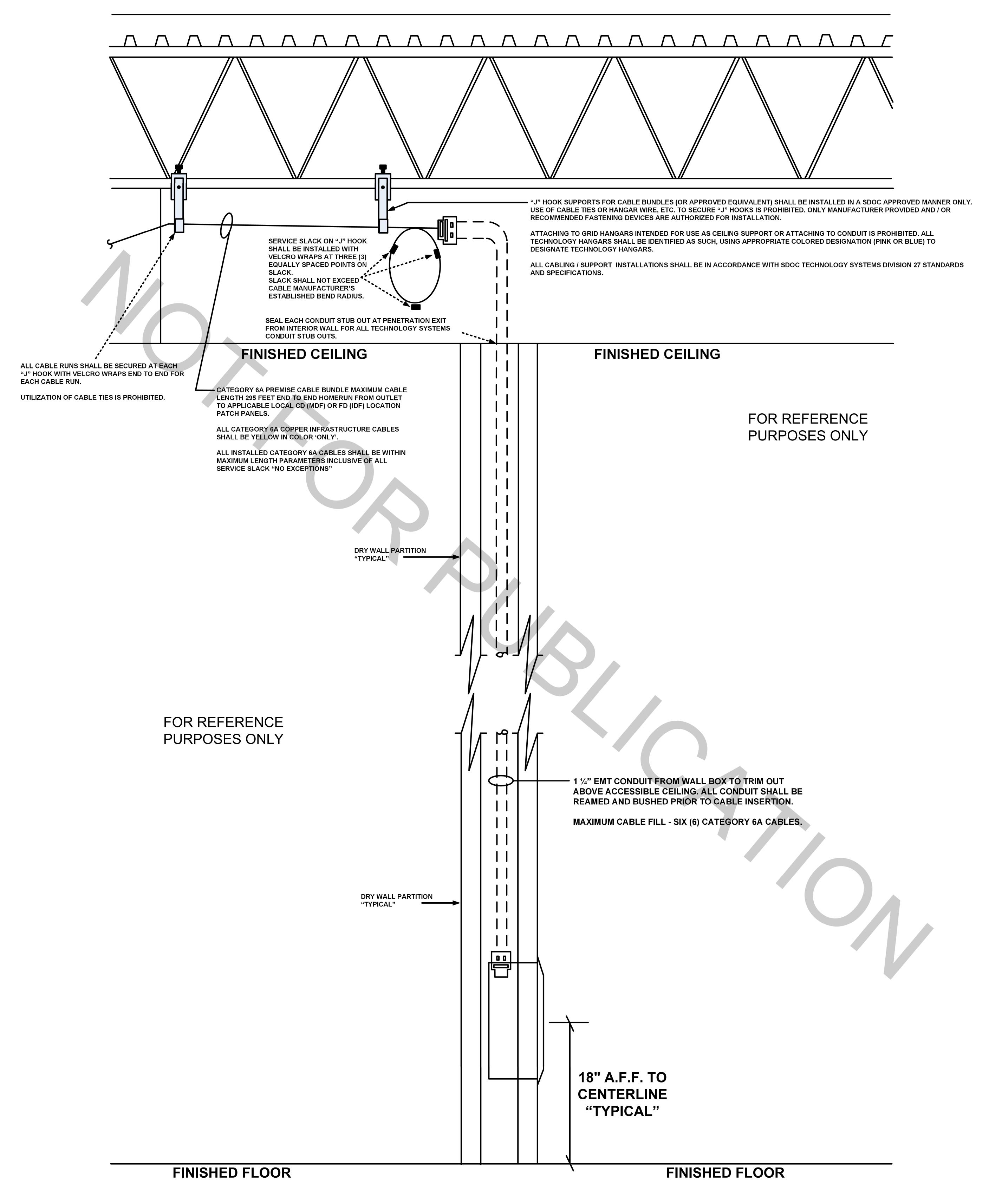
FOR REFERENCE PURPOSES ONLY



ELECTRICAL "MC" OR EMT CONDUIT
VERTICAL TO ABOVE CEILING TO
ELECTRICAL PANEL ALL LOCATIONS

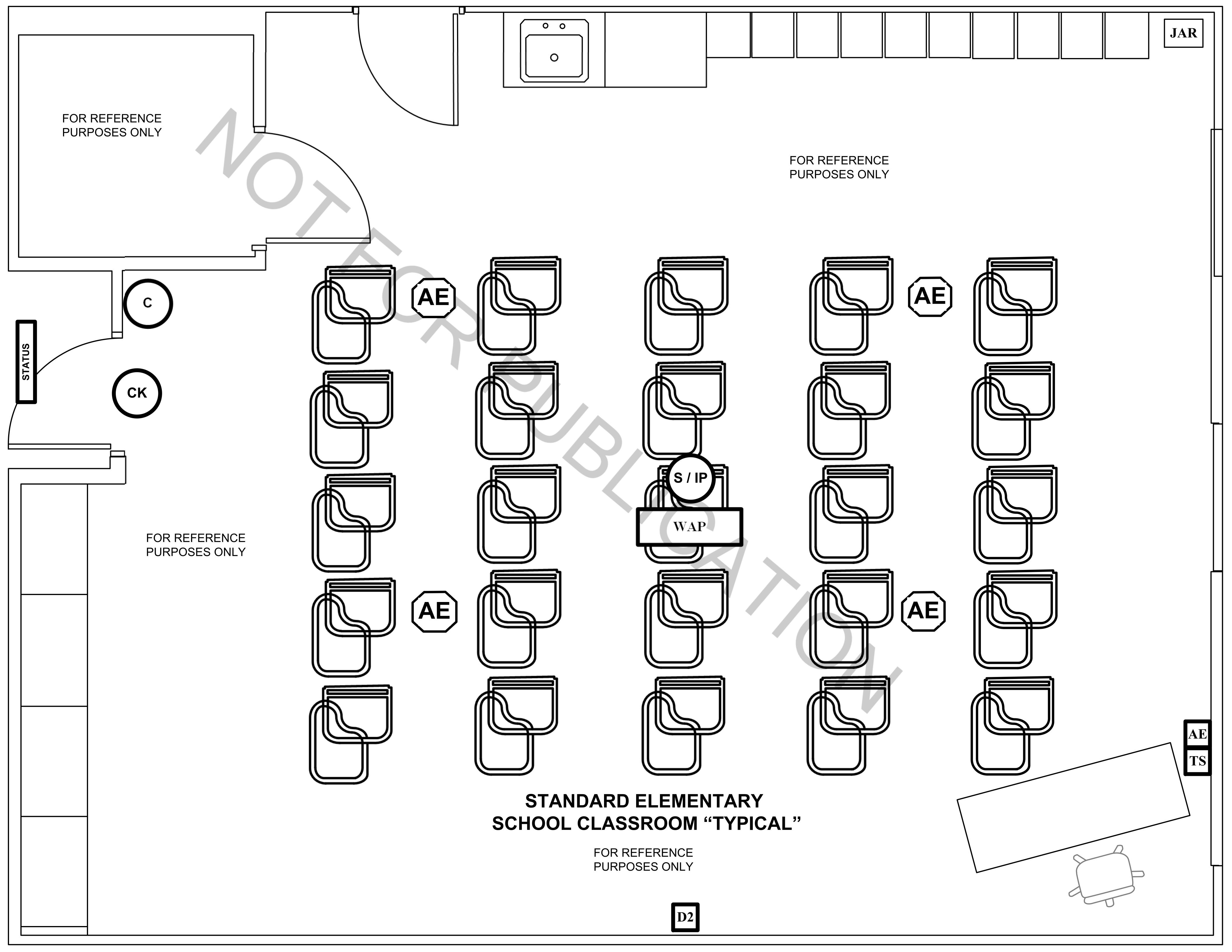
D2 DATA OUTLET DETAIL
INSTALLED AT ALL DESIGNATED DATA OUTLET WALL LOCATIONS
AT EIGHTEEN (18) INCHES TO THE CENTER OF EACH BOX ABOVE FINISHED FLOOR.

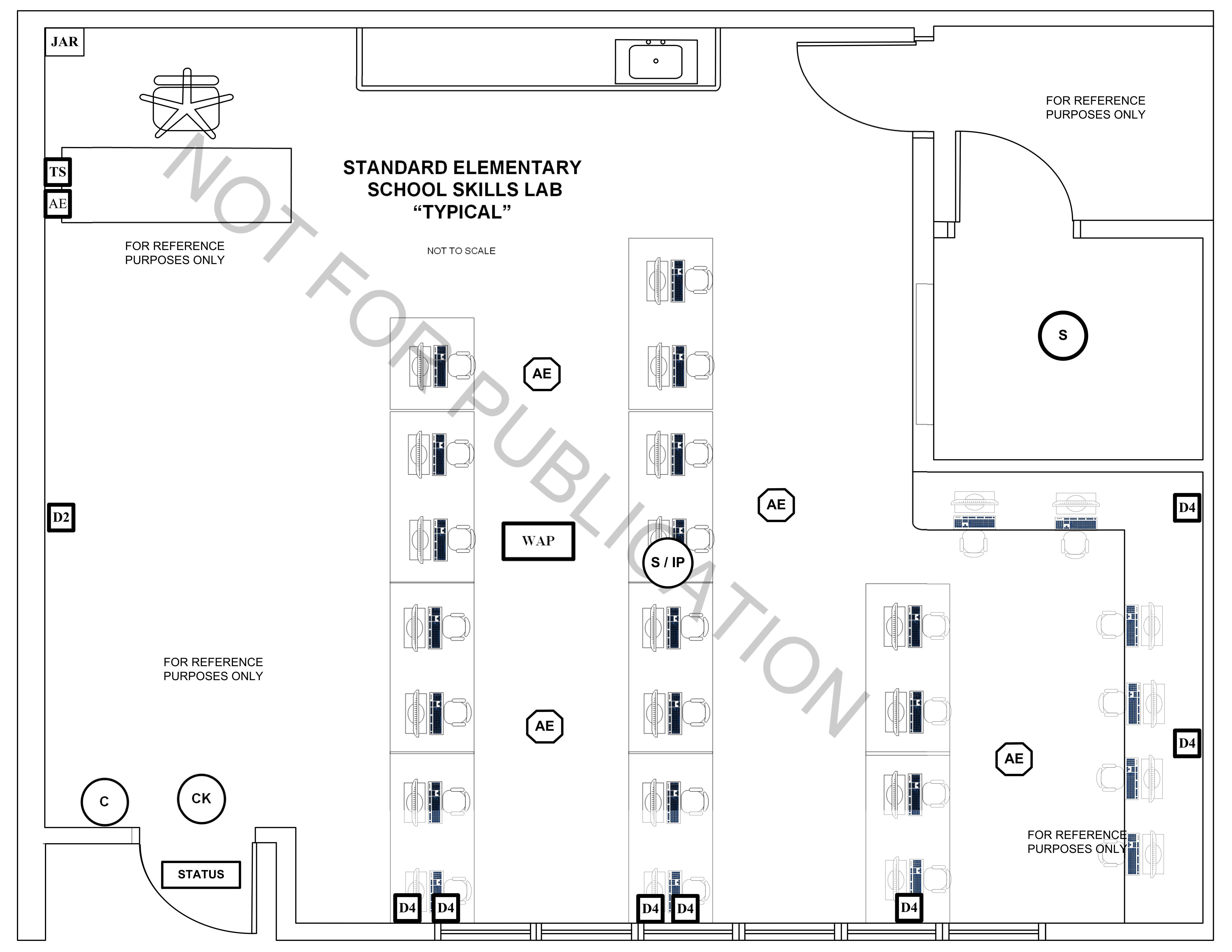
(DETAIL NOT TO SCALE)



FOR REFERENCE PURPOSES ONLY

## TYPICAL WALL MOUNTED TECHNOLOGY COMMUNICATIONS DATA OUTLET





## \_ \_ \_ \_ \_ \_ **EXTEND 2" RGS MAST** APPROXIMATELY 48" ABOVE ROOF LINE FOR REFERENCE **PURPOSES ONLY ANTENNA** ANTENNA **ANTENNA ANTENNA ANTENNA ANTENNA** ANTENNA IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS ½" FIRE RETARDANT CELLFLEX 15273530 12" STAND-OFF 3 - WAY SPLITTER COMMSCOPE MT-222L SPLITTER OR EQUAL WITH 1 ½" RGS ANTENNA MAST SPLITTER LEVEL 2 DAS ANTENNA **ANTENNA** ANTENNA **ANTENNA ANTENNA ANTENNA ANTENNA ANTENNA** IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS IXD-36V03NS **PROVIDE AND INSTALL WIRELESS** 2" RIGID CONDUIT SSM 4" PORT ENTRY TO EXTERIOR WALL FEED - THRU WITH 4" **BOOT ASSEMBLY** WITH 4 HOLES FOR ½" CABLES. MDF 3 - WAY SPLITTER 3 - WAY SPLITTER 3 - WAY SPLITTER **4" SLEEVE WEATHER SEAL AROUND PHASER SLEEVE AND PORT ENTRY** FEED - THRU LIGHTNING PAINT TO MATCH WALL PROTECTION REPEATER **IN-BUILDING** 1/2" FIRE RETARDANT DAS CELLFLEX 15273530 HELIAX 50Ω REMOTE ½" FIRE RETARDANT ION-B CELLFLEX LEVEL 1 15273530 **MASTER** FOR REFERENCE UNIT **PURPOSES ONLY** SINGLE-MODE FIBER OPTIC PROVIDE AND INSTALL 24" X 24" X 12" METAL **ENCLOSURE WITH HINGED COVER.** INSTALL PLYWOOD BACKBOARD FOR MOUNTING

## GENERAL DAS / EMS NOTES :

- THIS BUILDING HAS A FIRE SPRINKLER SYSTEM.
- ELEVATION OF THE HIGHEST OCCUPIED FLOOR IS APPROXIMATELY - -
- NFPA 72 CODE FOLLOWED 24.5.2.5.5.1: EQUIPMENT IS POWERED BY 20A CIRCUIT.
- NFPA 72 CODE FOLLOWED 24.5.2.5.5.2: SECONDARY POWER IS 12-HOUR AT 100% CAPACITY. NFPA 72 CODE FOLLOWED 24.5.2.6.2: BDA, UPS (PROVIDED BY DAS INSTALLER) AND FIBER EQUIPMENT ALARMS ARE
- NFPA 72 CODE FOLLOWED 24.5.2.5.2: ALL ACTIVE BDA EQUIPMENT AND UPS IS ENCLOSED IN FIRE ENGINE RED NEMA
- RISER HAS LEVEL 2 SURVIVABILITY PATHWAY FOR CABLE; ALL ROOMS CONTAINING EQUIPMENT IS 2-HOUR FIRE
- TOTAL NUMBER OF DEVICES INSTALLED IN THE 800MHZ SYSTEM IS - -
- THE ROOM ENCLOSING THE FACP, BOOSTER POWER SUPPLY AND BDA IS MECHANICALLY VENTILATED.
- THE FACP AMPLIFIERS AND ASSOCIATED EQUIPMENT IS PROTECTED WITH SMOKE DETECTOR.
- ALL EQUIPMENT IS CONNECTED TOA DEDICATED CIRCUIT BREAKER MARKED "BDA CIRCUIT" PER NFPA 72:10.5.5.2.1.
- THE BDA SYSTEM IS EQUIPPED WITH FCC COMPLIANT CLASS "B" SIGNAL BOOSTER.
- BDA IS LOCATED IN PLACE THAT MEETS ALL ENVIRONMENTAL CONTROLS.
- THERE ARE AT LEAST 2 INDEPENDENT AND RELIABLE POWER SUPPLIES PER NFPA 72: 24.5.2.5.5.
- BDA INSTALLED ARE FCC CERTIFIED AND COMPATIBLE WITH BOOTH ANALOG AND DIGITAL NFPA 72: 24.5.2.5.4.
- THE INTEGRITY OF THE CIRCUIT MONITORING THE BDA COMPLIES WITH NFPA 72: 10.6.9.1.1. THE BDA SYSTEM IS CAPABLE OF UPGRADE IN ACCORDANCE WITH NFPA 72: 10.6.9.

- ALL CRITICAL AREAS AND GENERAL AREAS HAVE A MINIMUM OF 99% FLOOR AREA RADIO COVERAGE IN ACCORDANCE WITH NFPA 72: 24.5.2.2.1 AND 24.5.2.2.2.
  - THERE IS A MINIMUM INBOUND AND OUTBOUND SIGNAL OF -95dBm THROUGHOUT THE COVERAGE AREA.
  - ISOLATION BETWEEN THE DONOR AND INDOOR ANTENNAS EXCEEDS 15dB ABOVE THE SIGNAL BOOSTER GAIN.
  - THERE ARE NO PERMANENT FILTERS AND ATTACHMENTS TO THE BDA SYSTEM.
  - THERE IS A GRID SYSTEM OVERLYING ALL FLOORS IN ORDER TO IDENTIFY AREAS OF DEFICIENCIES WHEN TESTED.
  - ALL EXTERIOR ANTENNAS ARE HIGH GAIN. VERTICALLY POLARIZED AND SPECIFIED FOR OPERATING FREQUENCIES.
  - CONTRACTOR SHALL BE RESPONSIBLE FOR THE CORRECT LOCATIONS AND QUANTITIES OF THE OMNI COVERAGE ANTENNAS UPON COMPREHENSIVE RADIO FREQUENCY SURVEY AND FORMAL DESIGN REQUIRED FOR THE ENTIRE PUBLIC SAFETY DAS PROJECT TO FURNISH A COMPLETELY OPERATIONAL SYSTEM PER NFPA, IFC REGULATIONS AND THE LOCAL GOVERNMENT REQUIREMENTS.
  - CONTRACTOR SHALL BE RESPONSIBLE FOR MEETING ALL CONDITIONS OF THE PLANS AND SPECIFICATIONS FOR A
  - CONTRACTOR TO PROVIDE AND INSTALL ALL EQUIPMENT, RACKS, AND CABINETS IDENTIFIED ON THE DRAWINGS OR IN THE SPECIFICATIONS.
  - CONTRACTOR TO GROUND ALL CABLE TRAY, RACKS, AND CABINETS AND BOLT ALL RACKS AND CABINETS TO THE FLOOR. SEE DETAIL SHEETS FOR ADDITIONAL REQUIREMENTS.

  - ALL ELECTRICAL POWER CONNECTION AND BUILDING GROUNDING SYSTEM BY DIVISION 26 CONTRACTOR.
  - CONTRACTOR SHALL UTILIZE BUILDING FIBER FOR DAS UPLINK. NFPA 72 ISOLATION VALUE SHALL BE MET.
  - ALL ACTIVE EQUIPMENT SHALL NOT BE LOCATED ABOVE THE CEILING. PER NFPA TOP OF EQUIPMENT SHOULD BE AT 6'

## DAS RISER DIAGRAM (TYPICAL)

TIE TO BUILDING

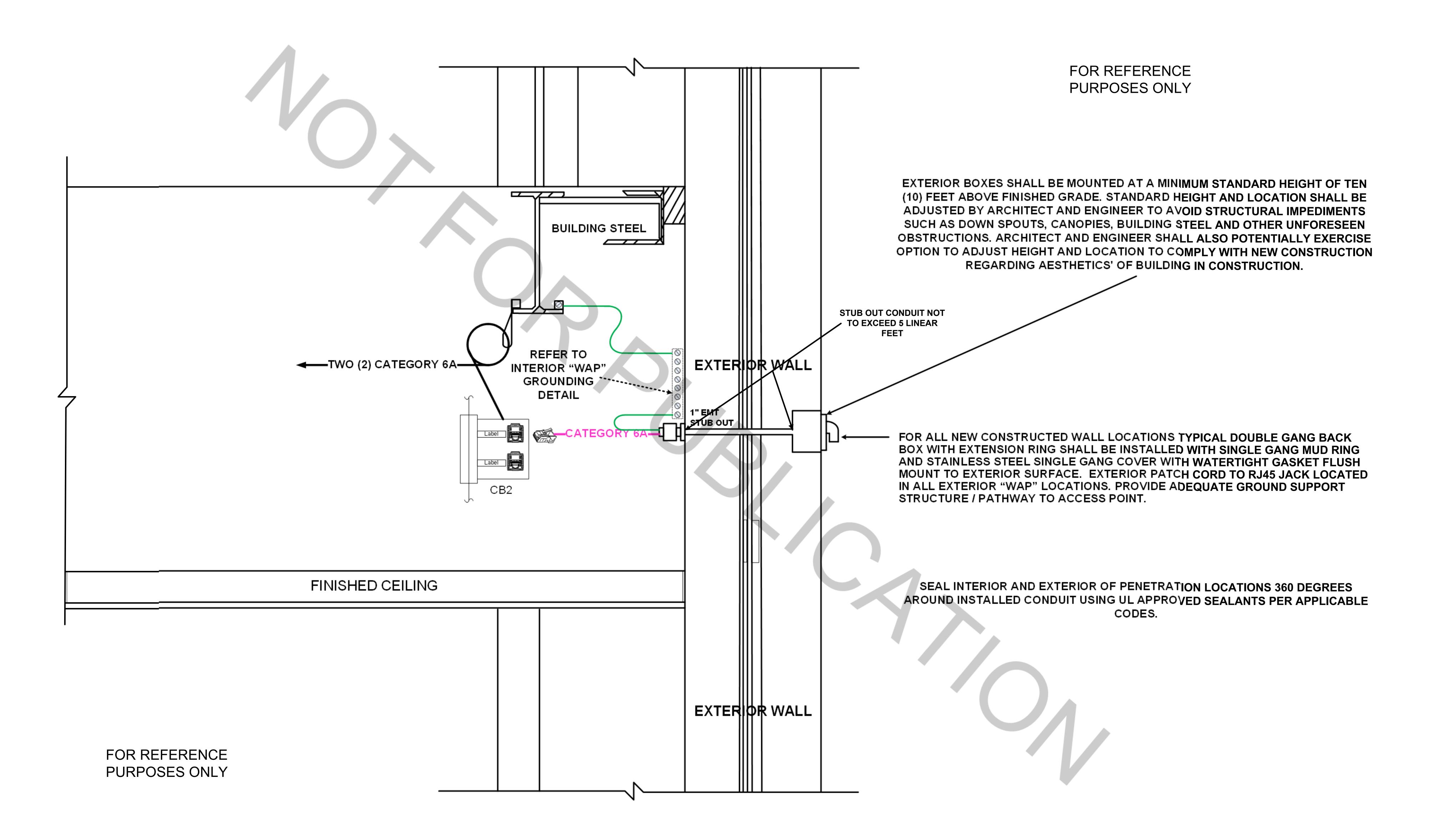
GROUNDING

SYSTEM BY

**DIVISION 26** 

LIGHTNING PROTECTION AND TGBB. INSTALL ENCLOSURE ABOVE CEILING.

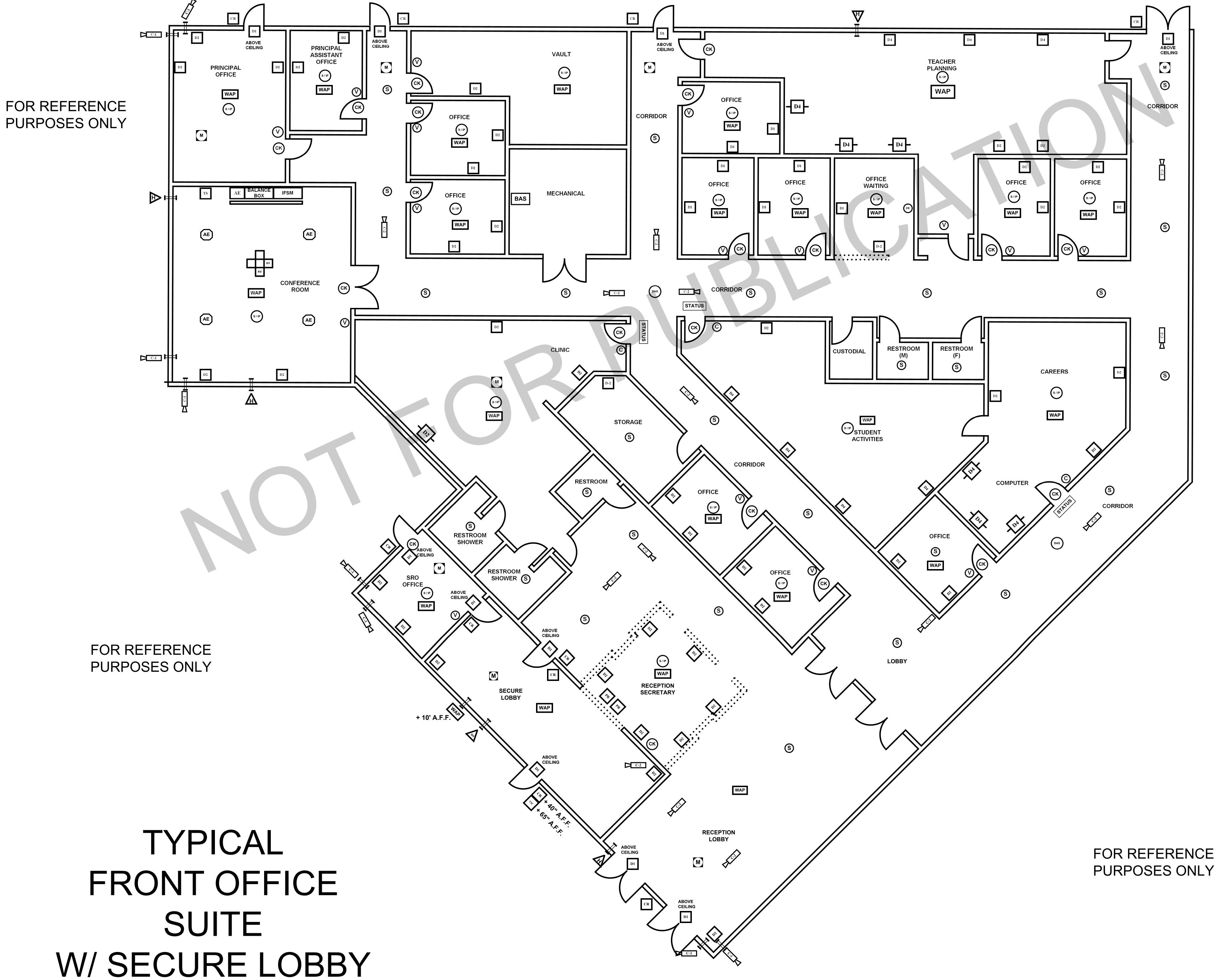
> FOR REFERENCE **PURPOSES ONLY**



## DETAIL WIRELESS ACCESS POINT BUILDOUT EXTERIOR FLUSH MOUNTED APPLICATION

NOT TO SCALE FOR REFERENCE ONLY

FOR REFERENCE PURPOSES ONLY



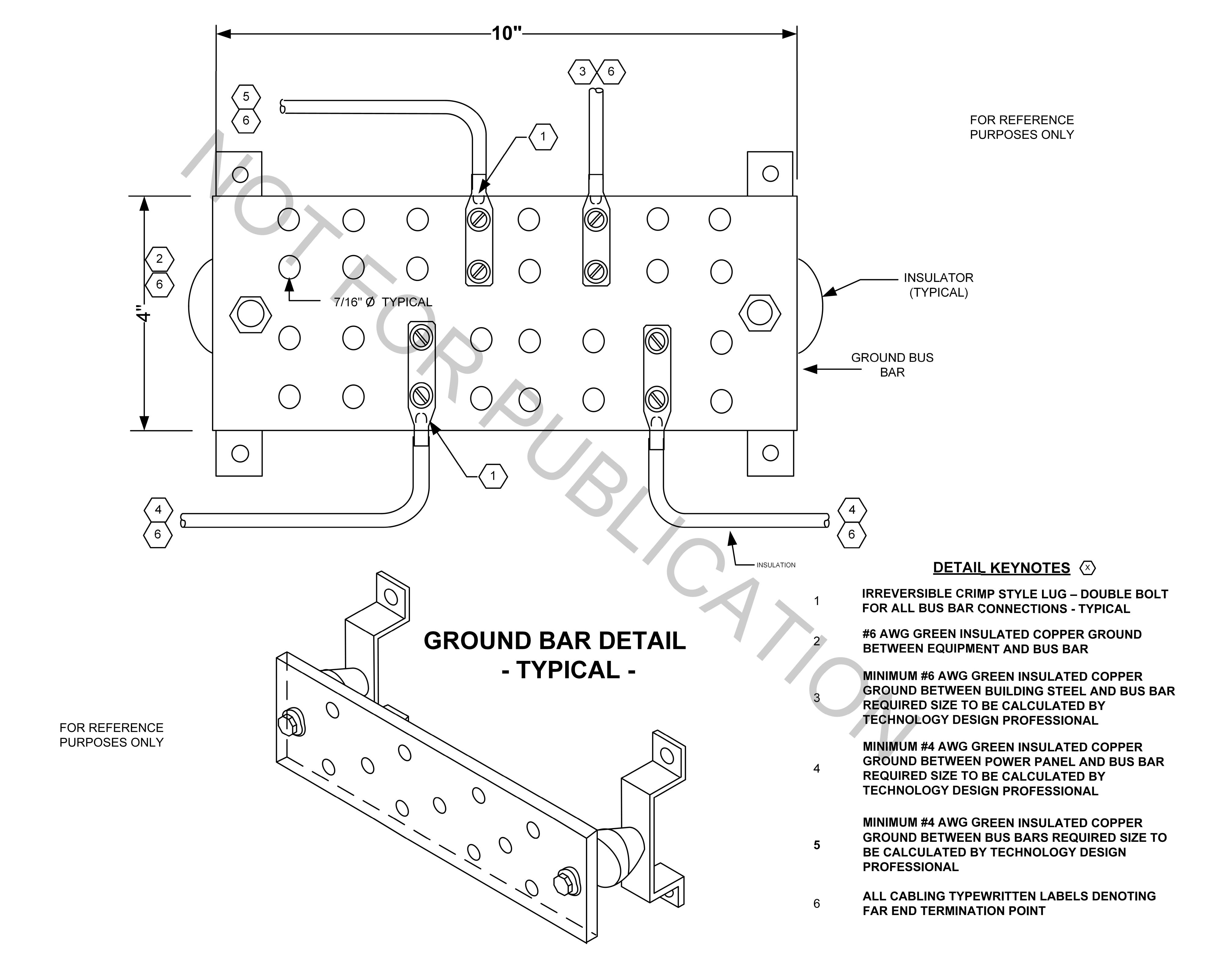
## SDOC CONFORMED DOCUMENTS GENERAL NOTES

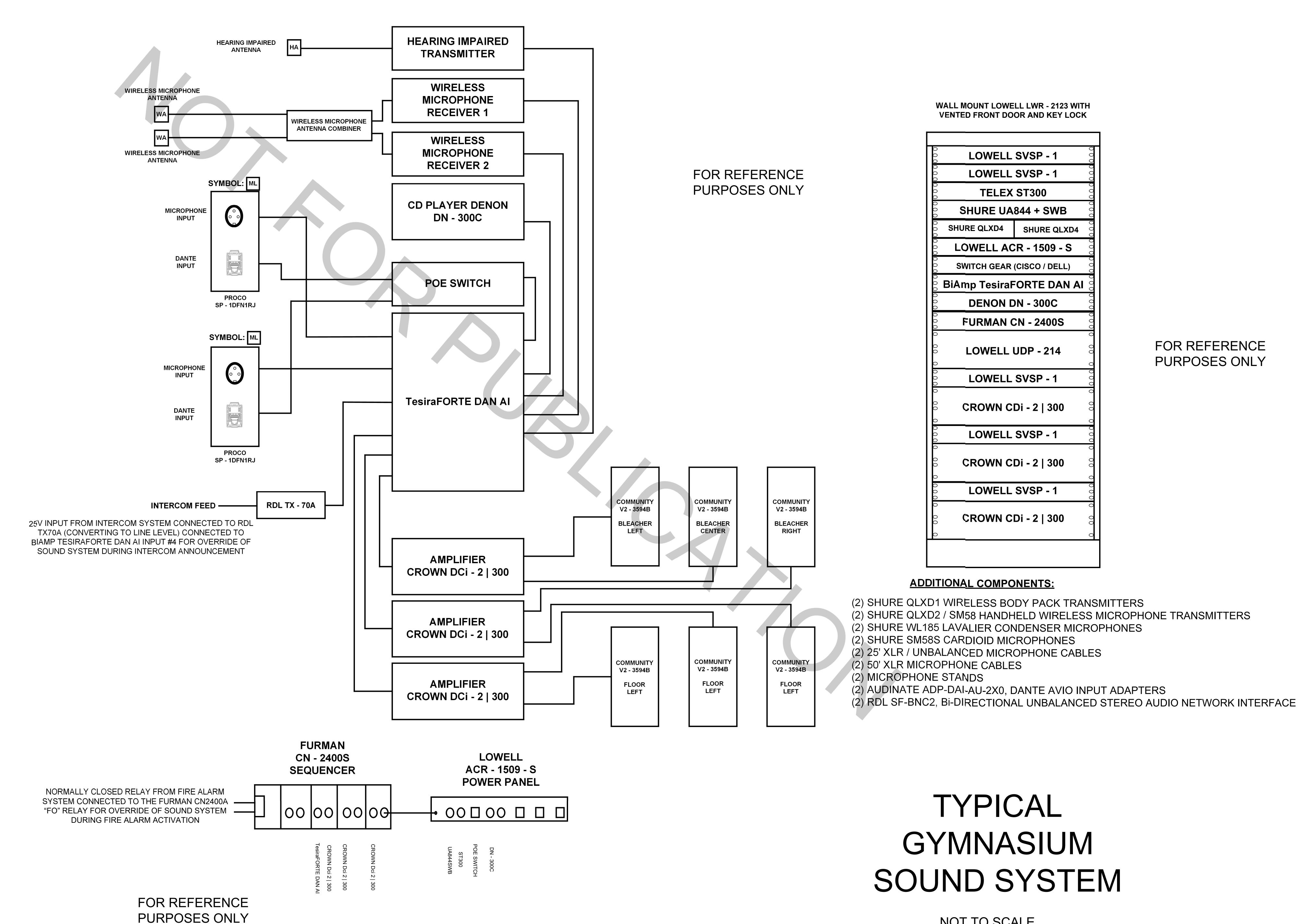
## GENERAL NOTES:

THESE GENERAL TECHNOLOGY SYSTEMS INSTALLATION NOTES ARE FOR INSERTION ON ALL SDOC TECHNOLOGY SYSTEMS CONSTRUCTION DRAWINGS AND PLANS.

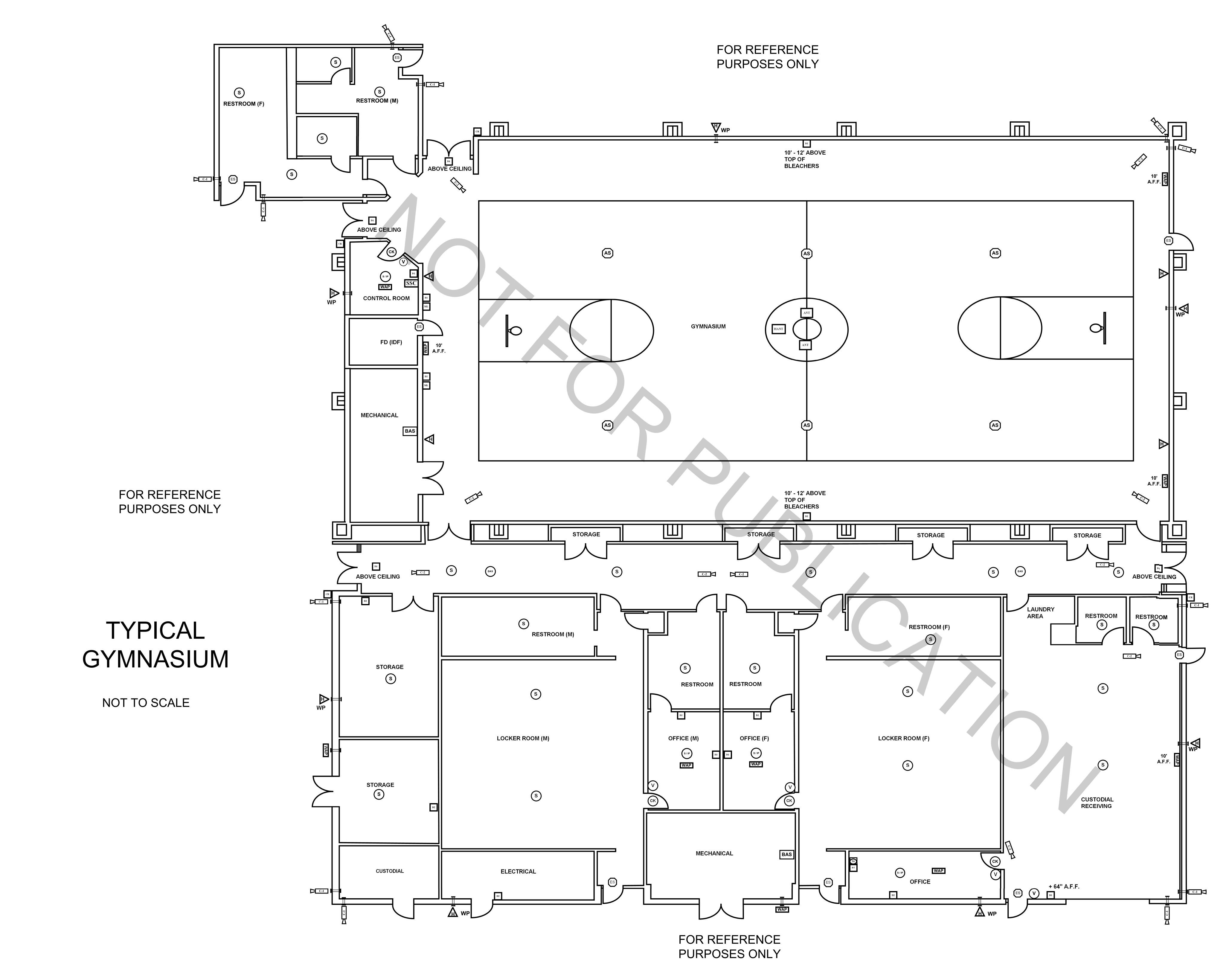
TECHNOLOGY GENERAL NOTES ARE PROVIDED TO THE ARCHITECT TO HIGHLIGHT SPECIFIC SDOC INSTALLATION CRITERIA AND AS SUPPLEMENTAL AMPLIFYING INFORMATION TO COMPLEMENT SDOC DIVISION 27 TECHNOLOGY SYSTEMS STANDARDS AND SPECIFICATIONS PROVIDED BY THE ARCHITECT AND ENGINEER ON THE CONFORMED CONSTRUCTION PLANS AND SPECIFICATIONS.

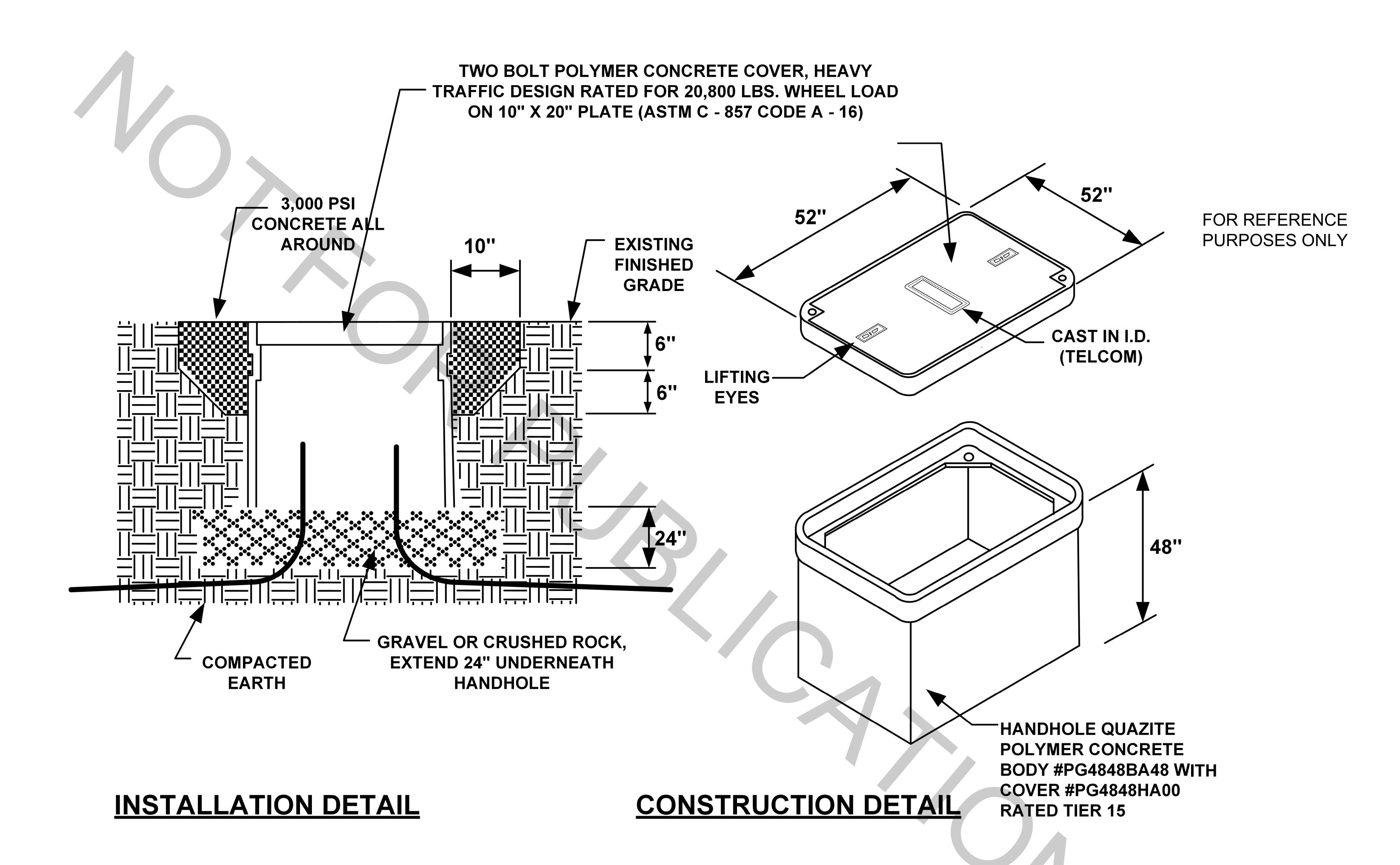
- 1. ALL SPACES, EQUIPMENT, CABLING, COMPONENTS, AND INSTALLATION PRACTICES SHALL BE IN ACCORDANCE WITH BICSI TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL (ITSIMM) LATEST EDITION.
- 2. CONTRACTOR SHALL MEET ALL QUALIFICATIONS AND REQUIREMENTS IN ACCORDANCE WITH SDOC DIVISION 27 STANDARDS AND SPECIFICATIONS COMMUNICATIONS 27 00 00 SECTION 1.5.
- . DEVICE LOCATIONS FOR ALL TECHNOLOGY SYSTEMS INDICATED ON CONDUCTED BY THE TECHNOLOGY SYSTEMS INDICATED ON CONDUCTED BY THE TECHNOLOGY SYSTEMS ENGINEER.
- 4. FOR EXACT LOCATION OF CEILING MOUNTED EQUIPMENT REFER TO THE ARCHITECTURAL REFLECTED CEILING PLAN. LOCATIONS OF EQUIPMENT NOT INCLUDED ON THE REFLECTED CEILING PLAN SHALL BE COORDINATED WITH THOSE ITEMS SHOWN.
- COORDINATION OF CEILING MOUNTED EQUIPMENT SHALL BE COMPLETED PRIOR TO ANY ROUGH-IN. NOTIFY ENGINEER OF ANY DISCREPANCY.
- 5. PRIOR TO ROUGH-IN AND INSTALLATION OF ANY FLOOR MOUNTED DEVICE, VERIFY LOCATION WITH OWNER AND ARCHITECT. ALL SPACES WITH FLOOR BOXES SHALL HAVE LVT OR CARPET FLOORING.
  6. PRODUCTS SHALL BE OF MATERIALS THAT ARE SUITABLE FOR THE ENVIRONMENT IN WHICH THEY ARE TO BE INSTALLED.
- 7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FULL COORDINATION OF ALL WORK AND EQUIPMENT IDENTIFIED IN THE DRAWINGS AND SPECIFICATIONS FOR A COMPLETE TURNKEY SOLUTION OF MULTIPLE, FULLY FUNCTIONAL TECHNOLOGY
- SYSTEMS AS DESCRIBED WITHIN THIS PACKAGE. ALL DEVICES, CABLING, AND MATERIAL SHALL BE CONTRACTOR PROVIDED AND INSTALLED UNLESS OTHERWISE NOTED.
- 8. ALL STRUCTURED CABLING SHALL BE CATEGORY 6A RATED BEYOND 750 MHZ UNLESS OTHERWISE NOTED.
  9. ALL CABLING IS TO BE HOMERUN WITHOUT SPICING UNLESS OTHERWISE NOTED. EXCEPTION: FIBER OPTIC FUSION SPLICING IS PERMITTED FOR LOOSE TUBE TERMINATIONS.
- 10. ALL CABLING BUNDLING SHALL USE VELCRO UNLESS OTHERWISE NOTED.
- 11. CONTRACTOR SHALL ENSURE ALL CONDUITS AND SLEEVES SHALL BE PROVIDED WITH PULL STRINGS OR MULE TAPE AND SECURED AT EACH END.
- 12. THE USE OF SURFACE MOUNTED RACEWAYS IN NEW CONSTRUCTION IS NOT ACCEPTABLE. ALL SURFACE MOUNTED RACEWAY INSTALLATION MUST BE APPROVED BY OWNER PRIOR TO INSTALLATION.
- 13. THE CONTRACTOR SHALL PROVIDE A SAMPLE OF LABELING FOR ALL SYSTEMS TO PROJECT ENGINEER AND OWNER FOR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF INSTALLATION.
- 14. ALL TECHNOLOGY CABLES SHALL BE LABELED ON BOTH ENDS TO IDENTIFY THE FAR END TERMINATION POINT. ALL LABELS SHALL BE TYPEWRITTEN, INDELIBLE WRAP AROUND CABLING.
- 15. ALL INTERCOM SYSTEM CABLING AND COMPONENTS SHALL BE RAULAND BORG, SCHOOL BOARD DIRECTED STANDARD APPROVED APRIL 03, 1990. INSTALLED INTERCOM SYSTEM.
- 16. ALL CLASSROOM AMPLIFICATION CABLING AND COMPONENTS SHALL BE AUDIO ENHANCEMENT, SCHOOL BOARD DIRECTED STANDARD APPROVED AUGUST 20, 2013.
- 17. TECHNOLOGY SYSTEMS CABLE BUNDLES SHALL NOT REST ON OR COME IN CONTACT WITH ANY CONDUITS, MECHANICAL SYSTEMS PIPING, VENTILATION DUCTING HANGARS, THREADED RODS, STRAPS OR OTHER SUPPORTS WHERE INSTALLED BY OTHER TRADES.
- 18. WHEN INSTALLED IN ACCESSIBLE CEILING SPACES, OPEN TOP CABLE SUPPORTS AT 90 DEGREE CORNERS.
- 19. CABLE BUNDLES SHALL BE SECURED WITH VELCRO EVERY TWO (2) FEET AND SHALL ALSO BE SECURED TO OPEN TOP CABLE SUPPORTS.
- 20. CABLE SAG BETWEEN OPEN TOP CABLE SUPPORTS SHALL NOT EXCEED 2 INCHES.
- 21. EACH TECHNOLOGY SYSTEM CABLE SHALL BE BUNDLED SEPARATELY AND SHALL SEPARATE SUPPORT STRUCTURE.
- 22. TECHNOLOGY SYSTEM PATHWAYS IN ACCESSIBLE CEILING SPACES SHALL BE PROVIDED UTILIZING DEDICATED CABLE SUPPORTS RATED FOR THE RESPECTIVE CEILING SPACE, (PLENUM OR NON-PLENUM) AND INSTALLED PER APPLICABLE CODES AND STANDARDS. FOR NON-ACCESSIBLE CEILING SPACES A CONTINUOUS PATHWAY, CONDUIT SHALL BE PROVIDED.
- 23. ALL PATHWAYS SHALL BE SIZED AS RECOMMENDED BY THE MANUFACTURER AND APPLICABLE CODES AND STANDARDS. NO PATHWAY CABLE FILL SHALL EXCEED 40% FILL.
- 24. ONLY EMT OR RIGID SHALL BE USED FOR ALL CONDUIT INSTALLATIONS ABOVE GRADE.
- 25. SLEEVING SHALL BE INSTALLED ABOVE CEILINGS WHERE ANY CABLE PENETRATES ALL BARRIERS REGARDLESS OF FIRE OR SMOKE RATING. MINIMUM SLEEVE SIZE IS 2 INCHES UNLESS OTHERWISE NOTED AND SHALL EXTEND A MINIMUM OF 4 INCHES ON EITHER SIDE OF WALL. ALL SLEEVING SYSTEMS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES. All MATERIALS SHALL BE U/L LISTED FOR THEIR USE AND SHALL MAINTAIN THE INTEGRITY OF THE AFFECTED WALL, CEILING OR FLOOR BARRIER WITH NO EXCEPTION.
- 26. FOR ALL NON-RATED BARRIER INSTALLATIONS, CABLING SHALL TRANSITION THROUGH CONTRACTOR PROVIDED AND INSTALLED SLEEVING WITH NO EXCEPTION TO SDOC SATISFACTION.
- 27. THE CONTRACTOR SHALL PROVIDE SLEEVING OF APPROPRIATE SIZE TO ACCOMMODATE A MINIMUM 25% INCREASE IN CABLE FILL AT PROJECT COMPLETION.
- 28. ALL INTERIOR WALL SLEEVING INSTALLED SHALL BE CLAMPED AROUND THE OUTER SLEEVE AT THE WALL ON BOTH SIDES OF EACH WALL WITH U/L APPROVED MATERIALS TO PREVENT EACH SLEEVE INSTALLED FROM SLIDING WHEN INSTALLATION IS COMPLETE.
- 29. IF AN OUTLET BOX IS REQUIRED TO BE LOCATED IN AN ASSEMBLY OR PARTITION RATED AS "FIRE/SMOKE" OR "SMOKE" OR IDENTIFIED AS SUCH, THEN ALL OF THE FOLLOWING CONDITIONS SHALL BE MEET:
  - a. THE OUTLET BOX SHALL BE METALLIC.
  - b. THE OUTLET BOX OPENINGS SHALL OCCUR ONLY ON ONE SIDE OF THE FRAMING SPACE.
  - c. THE OUTLET BOX OPENINGS SHALL NOT EXCEED 16 SQUARE INCHES.
  - d. ALL CLEARANCES BETWEEN THE OUTLET BOX AND THE WALL BOARD MATERIALS IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS FOR THE PROJECT.
  - e. PROVIDE A SUPPLEMENTAL BARRIER AROUND OUTLETS LARGER THAN 16 INCHES SO THAT THE ORIGINAL RATING OF THE PENETRATION IS MAINTAINED.
  - f. THE TOTAL AGGREGATE SURFACE AREA OF THE OUTLET BOX SHALL NOT EXCEED 100 SQUARE INCHES PER 100 SQUARE FEET.
  - g. THE OUTLET BOX SHALL BE SEPARATED FROM OPENINGS ON THE OPPOSITE SIDE OF THE RATED PARTITION BY A MINIMUM HORIZONTAL DISTANCE OF 24 INCHES.
  - h. THE OUTLET BOX SHALL BE SECURELY FASTENED TO A PARTITION FRAMING MEMBER BY MEANS OF AN APPROVED ATTACHMENT METHOD.
  - i. OPENINGS CUT INTO THE WALL BOARD MATERIAL SHALL NOT EXCEED 1/8 INCH BETWEEN THE EDGES OF THE OUTLET BOX AND THE EDGES OF THE OPENING.
- 30. AT ALL IN-SLAB FLOOR BOX INSTALLATIONS, THE CONTRACTOR SHALL INSTALL INDOOR / OUTDOOR RATED CABLE.
- 31. CONTRACTOR SHALL SEAL ALL EXTERIOR PENETRATION LOCATIONS WITH U/L APPROVED WEATHER PROOF CAULK OR APPROPRIATE MECHANICAL DEVICES.
- 32. ALL BURIED TECHNOLOGY SYSTEMS CONDUITS SHALL BE INSTALLED AT A MINIMUM OF TWENTY-FOUR (24) INCHES BELOW FINISHED GRADE TO THE TOP OF EACH CONDUIT WITH A HORIZONTAL SEPARATION OF TWELVE (12) INCHES BETWEEN ALL POWER CONDUITS.
- 33. FIRE ALARM CONDUIT AND CABLING SHALL NOT BE INSTALLED IN THE SAME TECHNOLOGY SYSTEMS CABLING IS INSTALLED.
- 34. THE CONTRACTOR SHALL INSTALL AND ENSURE ALL CONDUIT ENTRY PENETRATION POINTS ON THE INTERIOR AT ALL BUILDING COMMUNICATION ROOMS SHALL BE PROPERLY SEALED AND PACKED TO ELIMINATE THE POTENTIAL FOR MOISTURE, GAS, RODENT AND INSECT INTRUSION.
- 35. THE CONTRACTOR SHALL PROVIDE VAULTS, PULL BOXES AND HAND HOLES WHICH SHALL HAVE TRAFFIC RATED SPRING LOADED COVERS WHICH SHALL HAVE TRAFFIC RATED.
- 36. THE CONTRACTOR SHALL INSTALL A MINIMUM TWENTY-FOUR (24) INCH AGGREGATE GRAVEL BASE AT THE OPEN FLOOR OF EACH COMMUNICATIONS HAND HOLE.
- 37. ALL CABLES TRANSITIONING THROUGH VAULTS, PULL BOXES AND HAND HOLES SHALL BE ADEQUATELY AND SUPPORTED OFF THE FLOOR TO THE SATISFACTION OF SDOC TECHNOLOGY SERVICES DEPARTMENT.
- 38. ALL UNDERGROUND CONDUITS SHALL BE CLEANED USING A MANDREL AFTER INSTALLATION AND PRIOR TO SYSTEM TURN-OVER.
- 39. BACKBONE RACEWAYS SHALL HAVE A MINIMUM SIZE OF 4 INCH UNLESS OTHERWISE NOTED.
- 40. SECURITY SYSTEMS (VIDEO SURVEILLANCE, ACCESS CONTROL, INTRUSION DETECTION) DEVICES AND CABLING SHOWN ON TECHNOLOGY DRAWINGS SHALL MEET ALL DIVISION 27 REQUIREMENTS.
- 41. IN ALL COMMUNICATION ROOMS, THE CONTRACTOR SHALL PROVIDE AND INSTALL ON ALL FOUR (4) WALLS READYSPEC MANUFACTURED BACKBOARDS UREA-FORMALDEHYDE RESIN FREE PART NUMBER #RB-A4848-PPG-FS-TU32 FACTORY PAINTED WITH FIRE RETARDANT PAINT WHITE IN COLOR ON FACTORY PROVIDED 34 INCH "AC" GRADE PLYWOOD WITH 2 COATS ON ALL SIDES.
- 42. ALL READYSPEC VOICE AND DATA BACKBOARDS SHALL BE INSTALLED WITH MANUFACTURER PROVIDED FASTENERS IN ACCORDANCE WITH MANUFACTURER INSTALLATION SPECIFICATIONS.
- 43. ALL WALL FIELD AREAS SHALL HAVE PAINTED BORDERS CONSISTING OF TWO (2) INCH STENCILED LETTERING OF SDOC SPECIFIED COLORS FOR EACH DESIGNATED TECHNOLOGY SYSTEM AREA. REFERENCE MDF AND IDF DETAILS.
- 44. ALL TELECOMMUNICATIONS OUTLETS (D-1, D-2, D-4, D-6) SHALL HAVE AN APPROPRIATELY SIZED POWER RECEPTACLE WITHIN 12 INCHES.
- 45. EACH RACK LOCATION IN COMMUNICATION ROOMS SHALL HAVE ONE (1) NEMA 5-20R RECEPTACLES AT 80 INCHES ABOVE FINISHED FLOOR LOCATED ON BACKBOARD DIRECTLY BEHIND THE RACK.
- 46. COMMUNICATION ROOM SHALL HAVE NEMA 5-20R CONVENIENCE RECEPTACLES EVERY SIX (6) FEET AT 18 INCHES ABOVE FINISHED FLOOR.





NOT TO SCALE





FOR REFERENCE

PURPOSES ONLY

FOR REFERENCE

PURPOSES ONLY

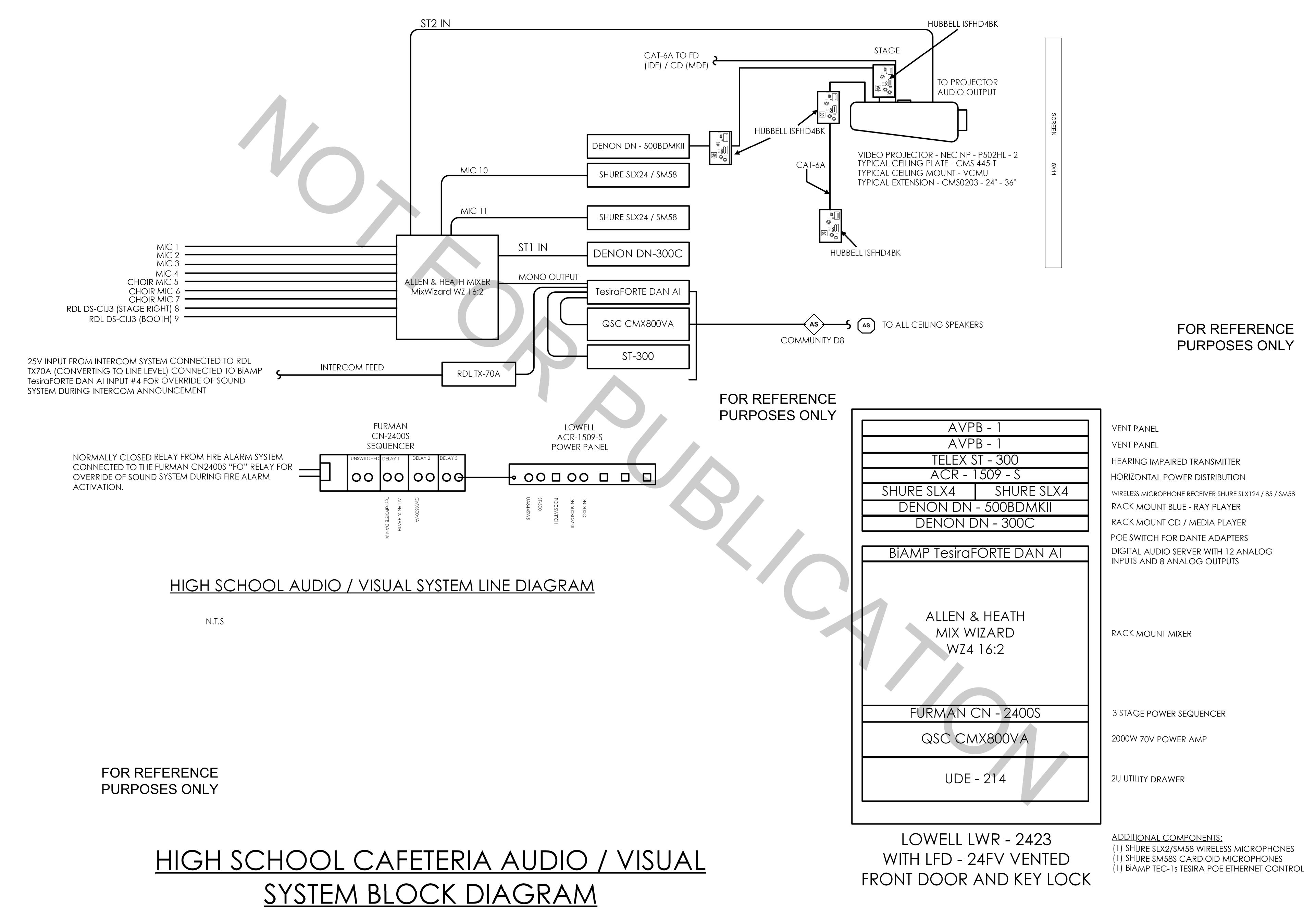
## **CONSTRUCTION HANDHOLE NOTES:**

1. HANDHOLE WITH COVER (LOGO = TELECOM) SHALL BE QUAZITE OR EQUAL. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS AND THESE REQUIREMENTS.

2. TERMINATE CONDUITS ENTERING HANDHOLE WITH END BELL (CARLON E997). CONSTRUCT CONDUIT RISE TO ENTER BOX FROM SIDE WITH 22 - 1/2" SWEEP ELBOWS.

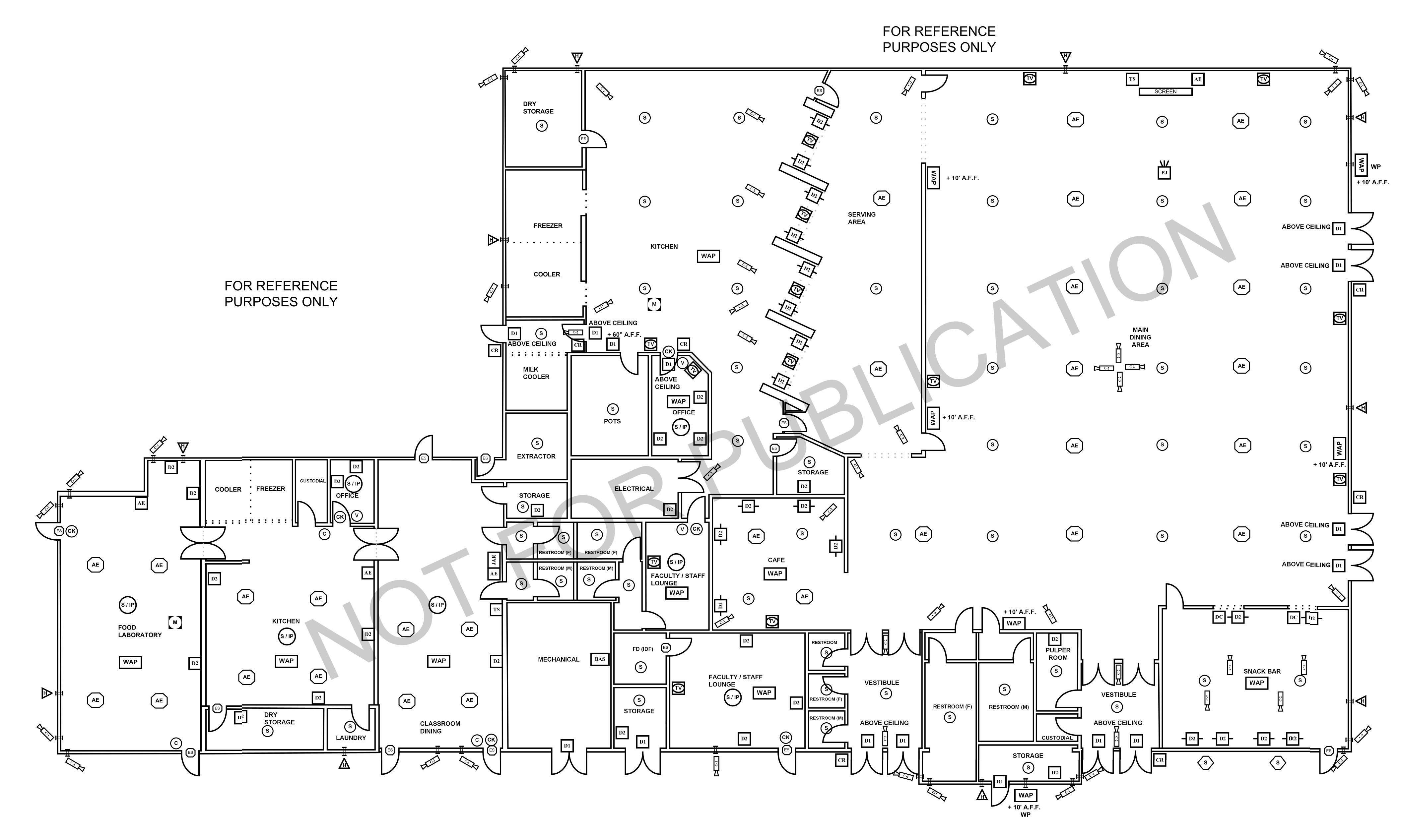
## TYPICAL HANDHOLE DETAIL

FOR REFERENCE PURPOSES ONLY



HIGH SCHOOL AUDIO / VISUAL SYSTEM CABINET

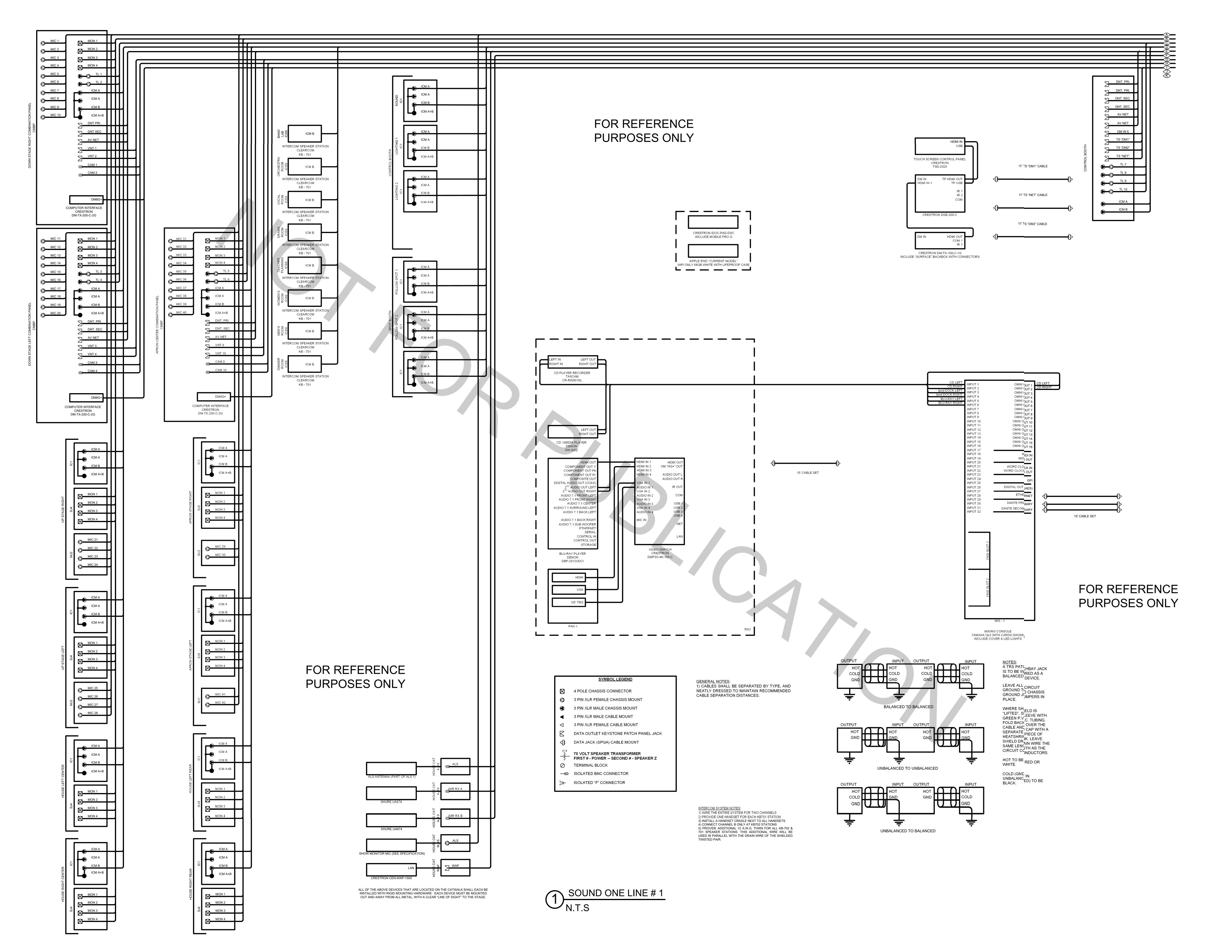
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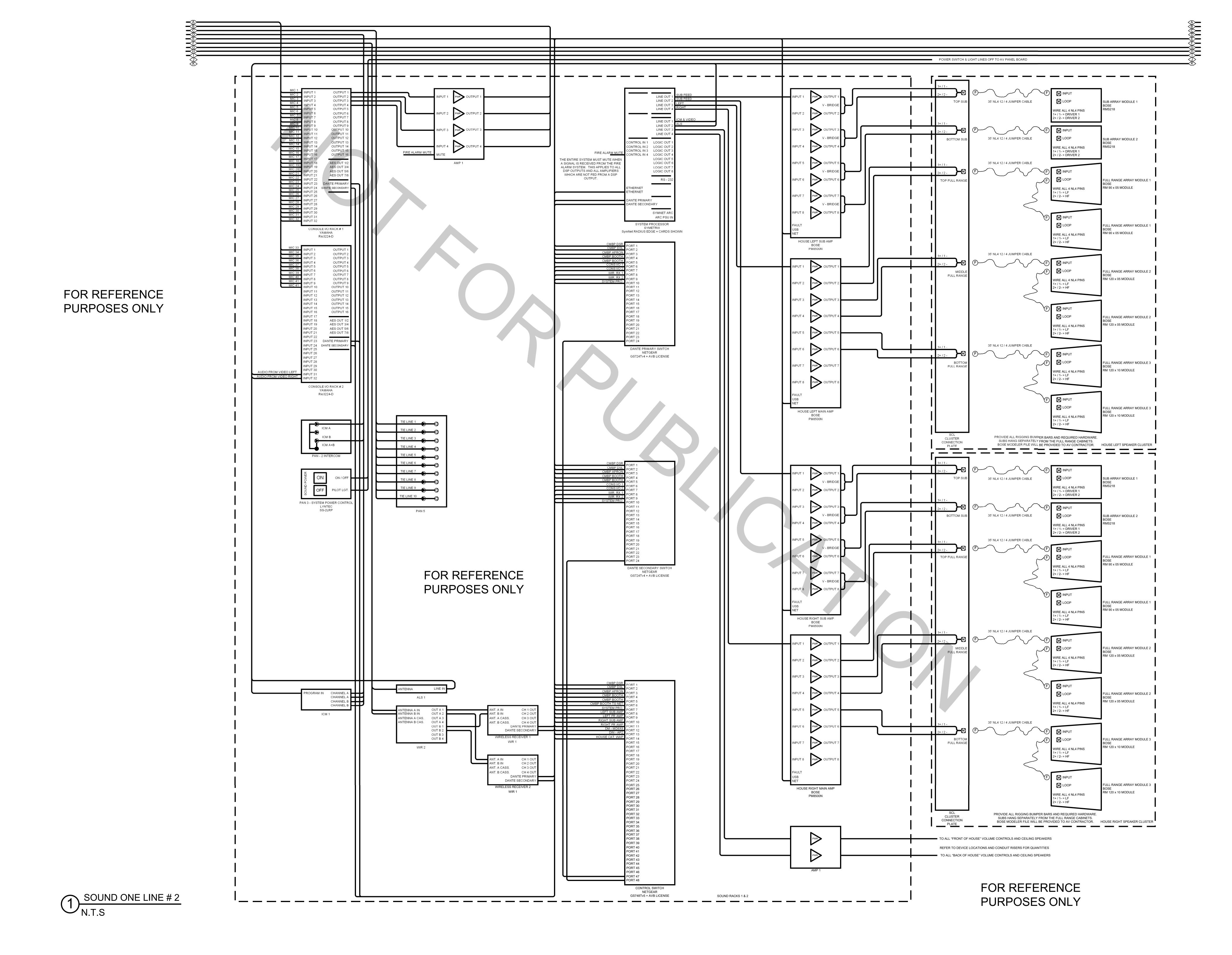


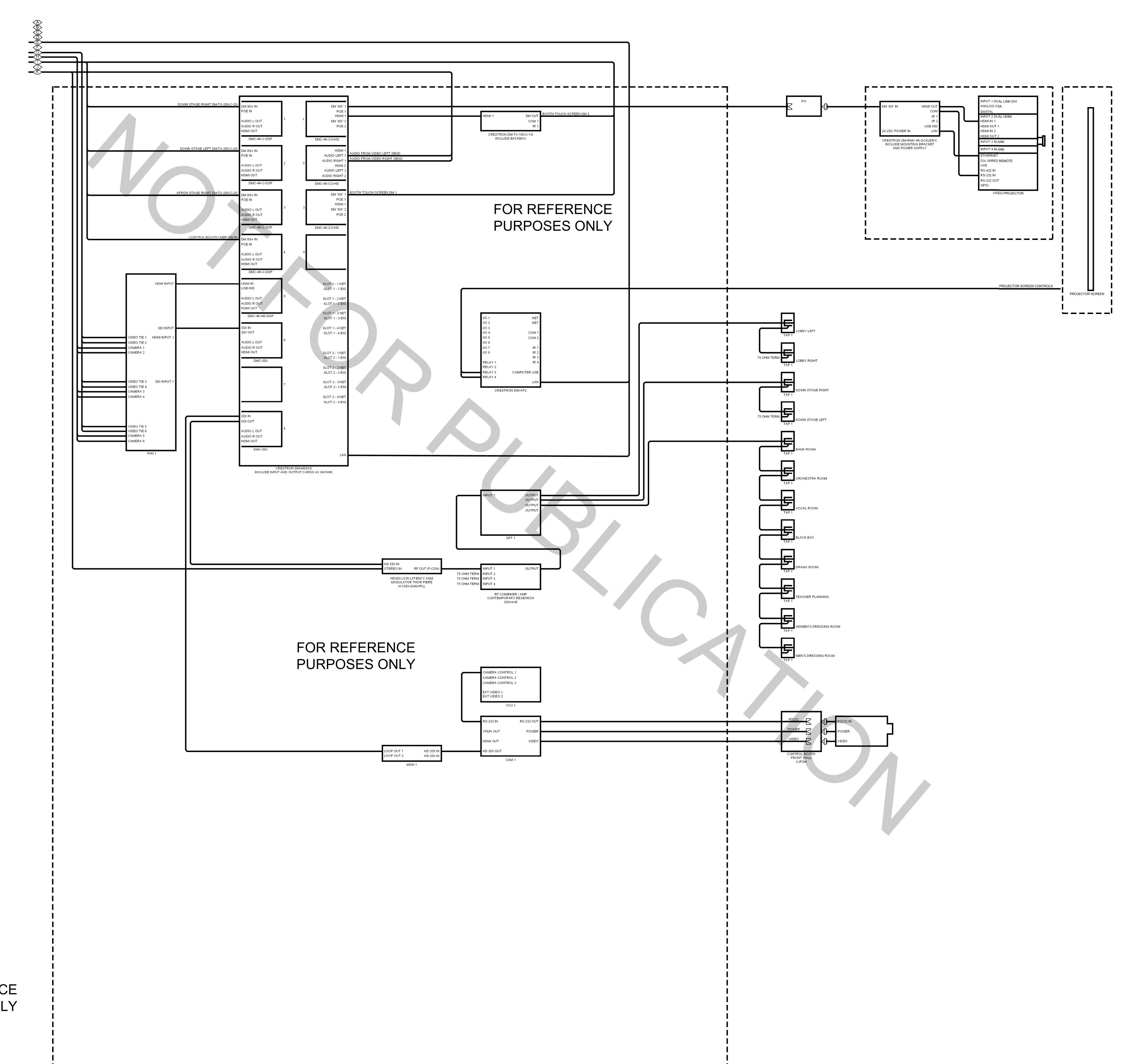
## TYPICAL HIGH SCHOOL CAFETERIA

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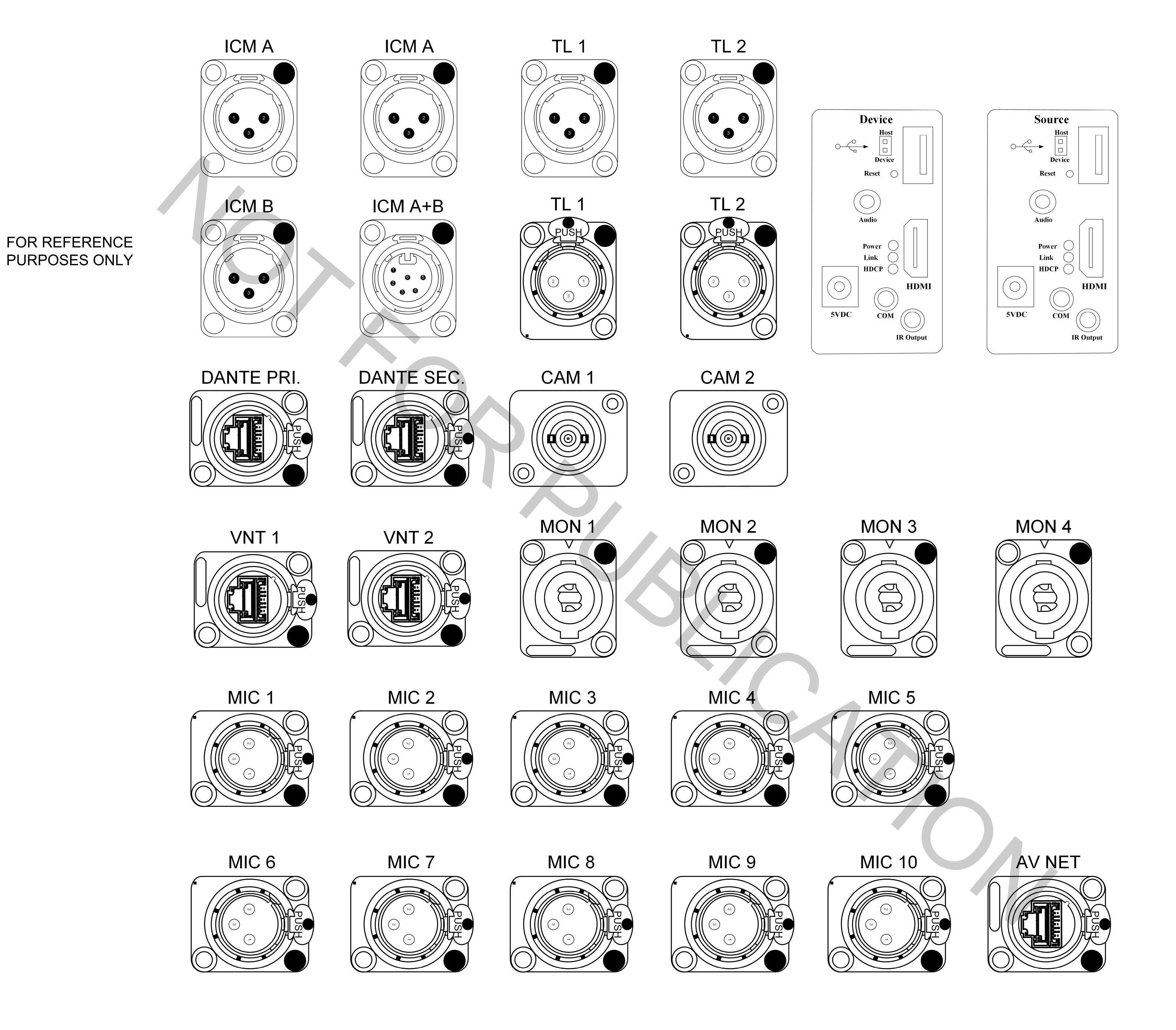






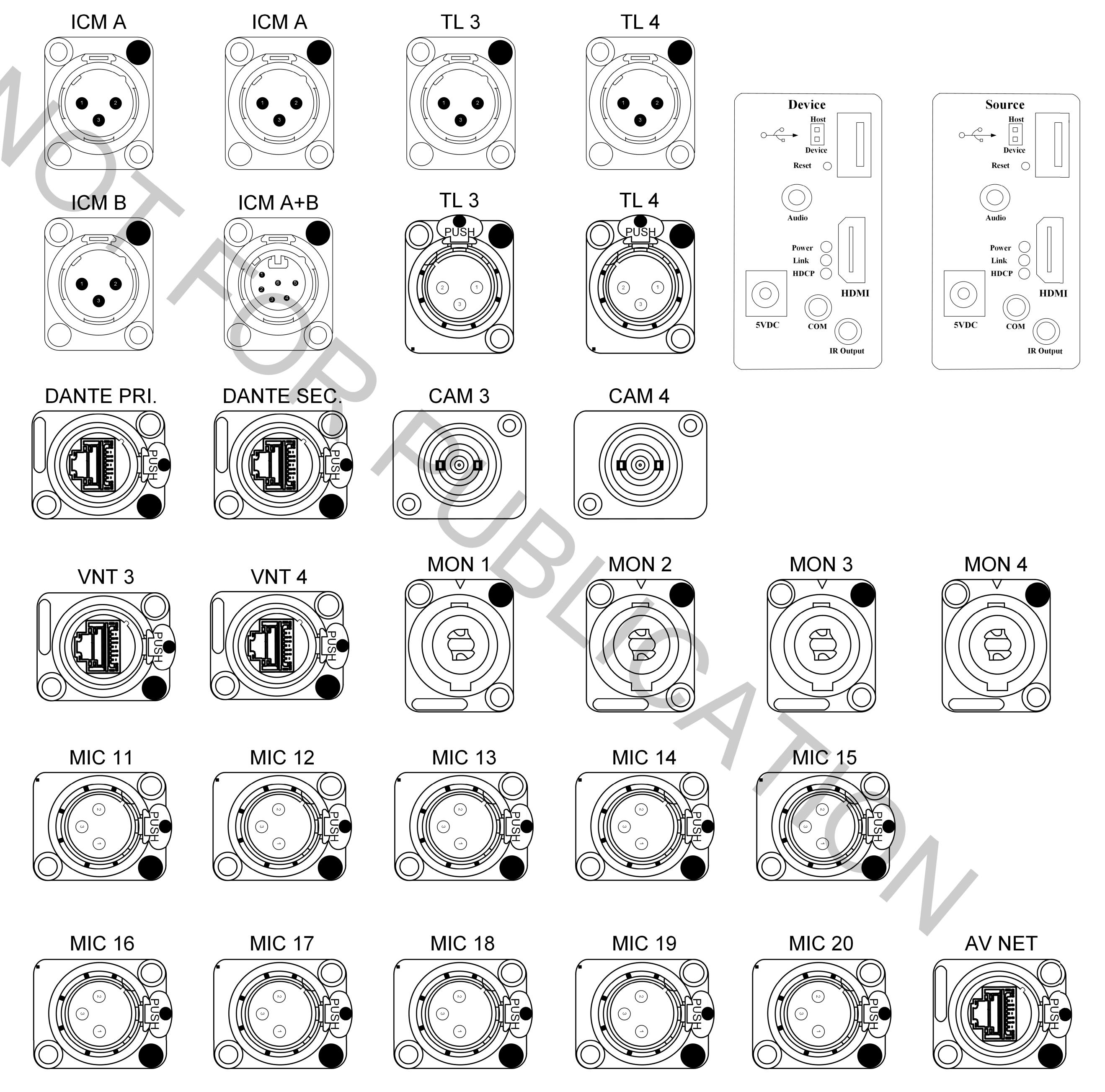
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VIDEO ONE LINE

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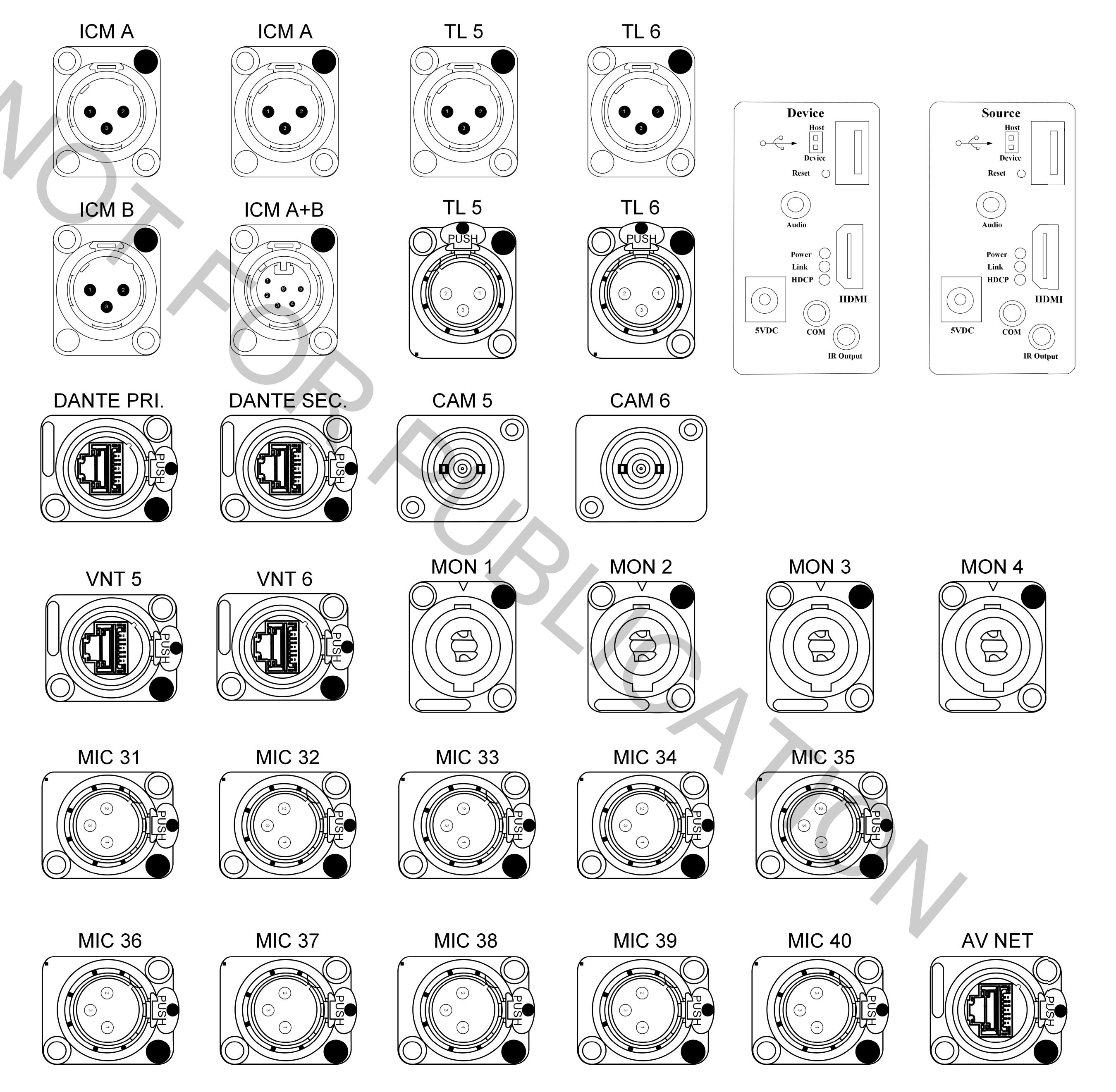
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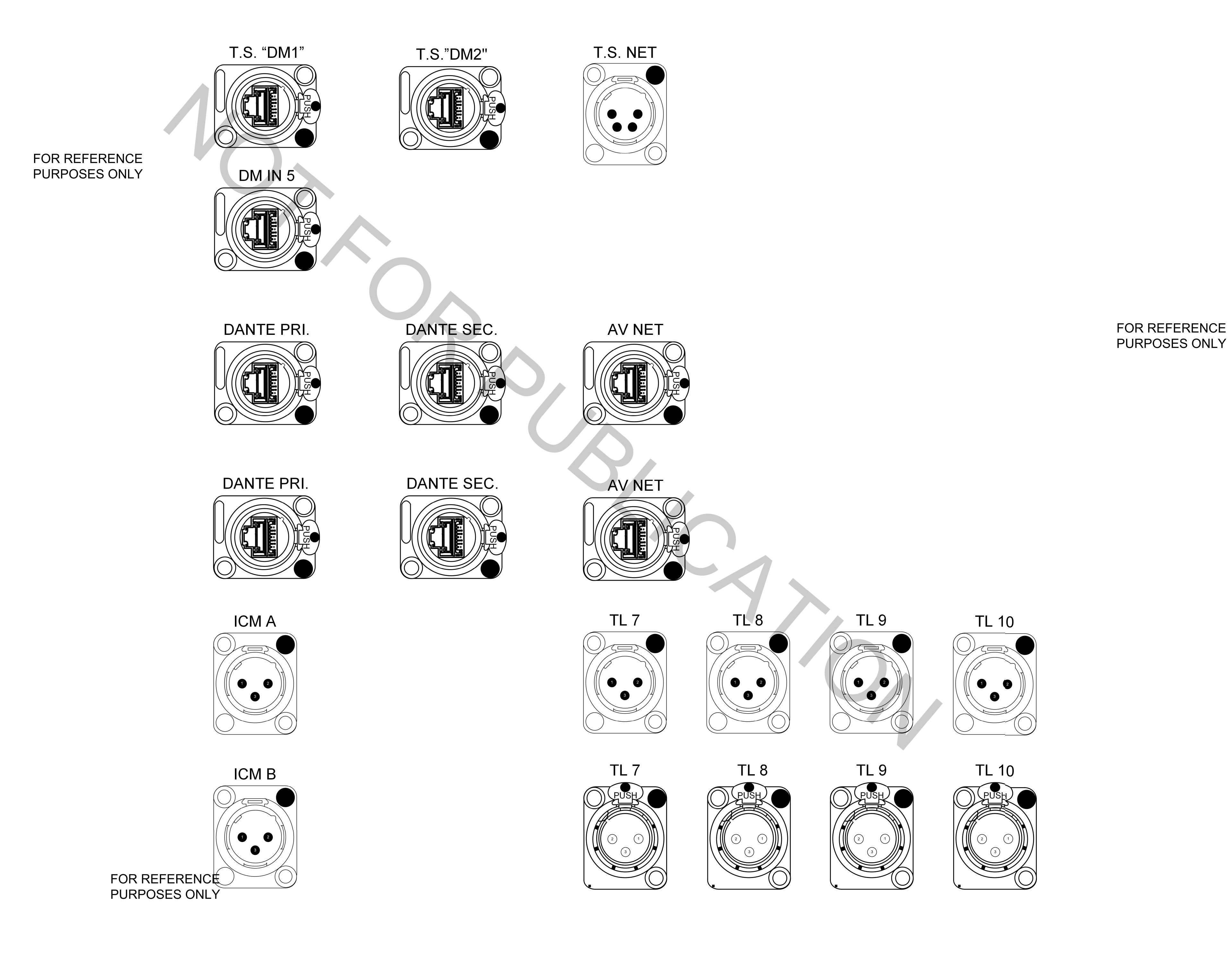
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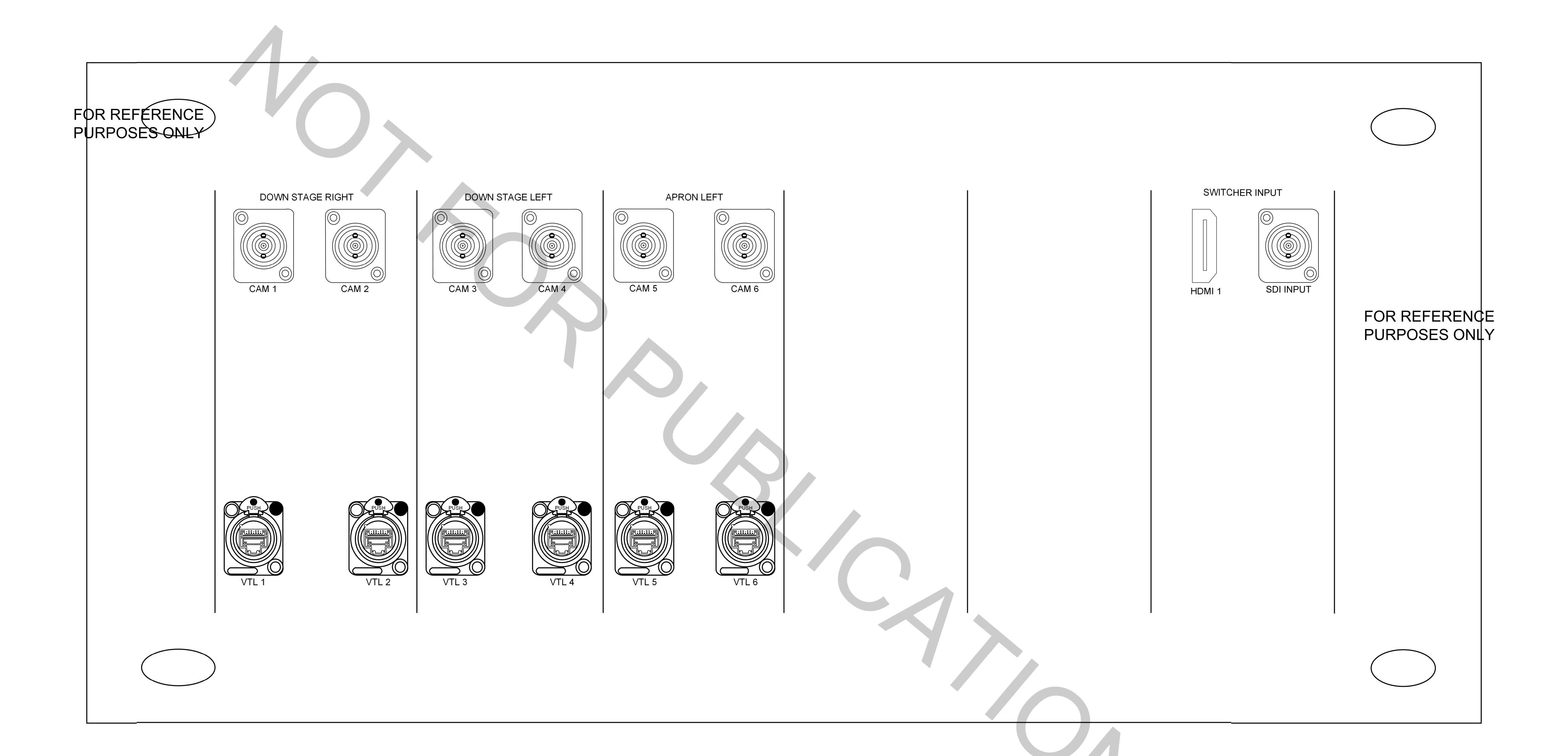
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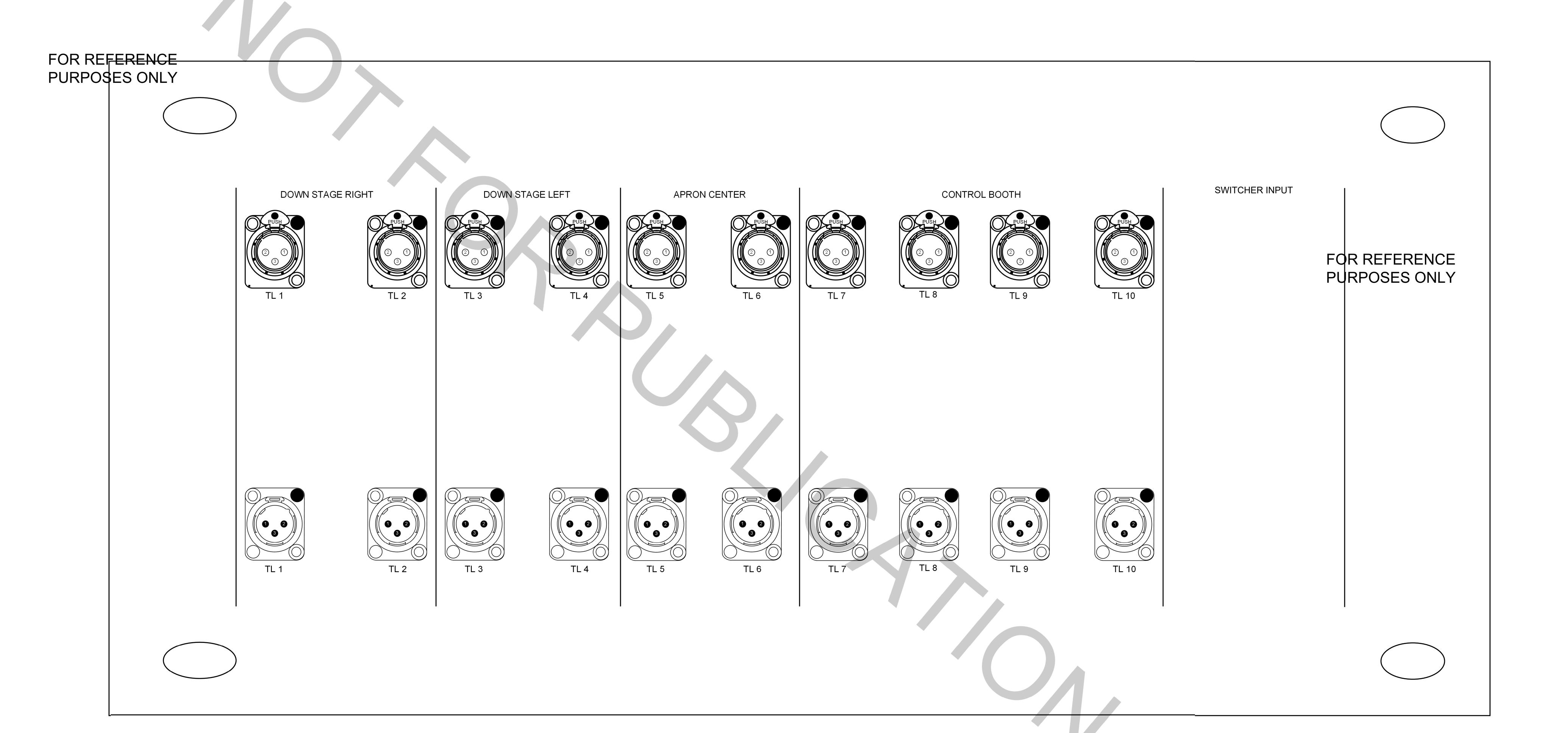
PAN 2 NOT TO SCALE

PAN 3
NOT TO SCALE



#### PAN 4

NOT TO SCALE



FOR REFERENCE PURPOSES ONLY

LGT 1	LGT 1
PAN 3	SYSTEM PROCESSOR
PAN 2	ALS 1
ICM 1	WIRELESS RX 1
	WIRELESS RX 2
VENT	VIII VIII VIII VENT PANEL
BLANK	WR 2
VENT	BRUSH PANEL
MOD 1	DANTE PRI. SWITCH
VENT	BRUSH PANEL
QUICK CONNECT CCU 1	DANTE SEC. SWITCH
	BRUSH PANEL
CAM PREVIEW MON	AV NETWORK SWITCH
	BRUSH PANEL
<u> </u>	BRUSH PANEL
$\vdash$	
	CONSOLE I/O RACK 1
$\vdash$	
PTZ CONTROLLER	
CUSTOM RACK EARS	BRUSH PANEL
$\vdash$	
HEAVY DUTY	
SLIDING SHELF	CONSOLE I/O RACK 2
BLANK	
<u> </u>	
PANEL 5	BRUSH PANEL
BLANK	BLANK
DLAINN	MONITOR AMP 1
70 V AMP	BLANK
BLANK	LEFT SUB AMP
	BLANK
PANEL 4	LEFT FULL RANGE AMP
BLANK	BLANK
	RIGHTT SUB AMP
DM - MD8X8	BLANK
F	-RIGHT FULL RANGE AMP-
BLANK	BLANK
MIDDLE ATLANTIC PRODUCTS WR - 44 - 32	MIDDLE ATLANTIC PRODUCTS WR - 44 - 32
SOUND RACK 2 (RS2)	SOUND RACK 1 (RS1)

FOR REFERENCE PURPOSES ONLY

-- BLU - RAY DVD PLAYER --- "iDEVICE" DOCK --- PAN 1 --- DRAWER --

12U RACK

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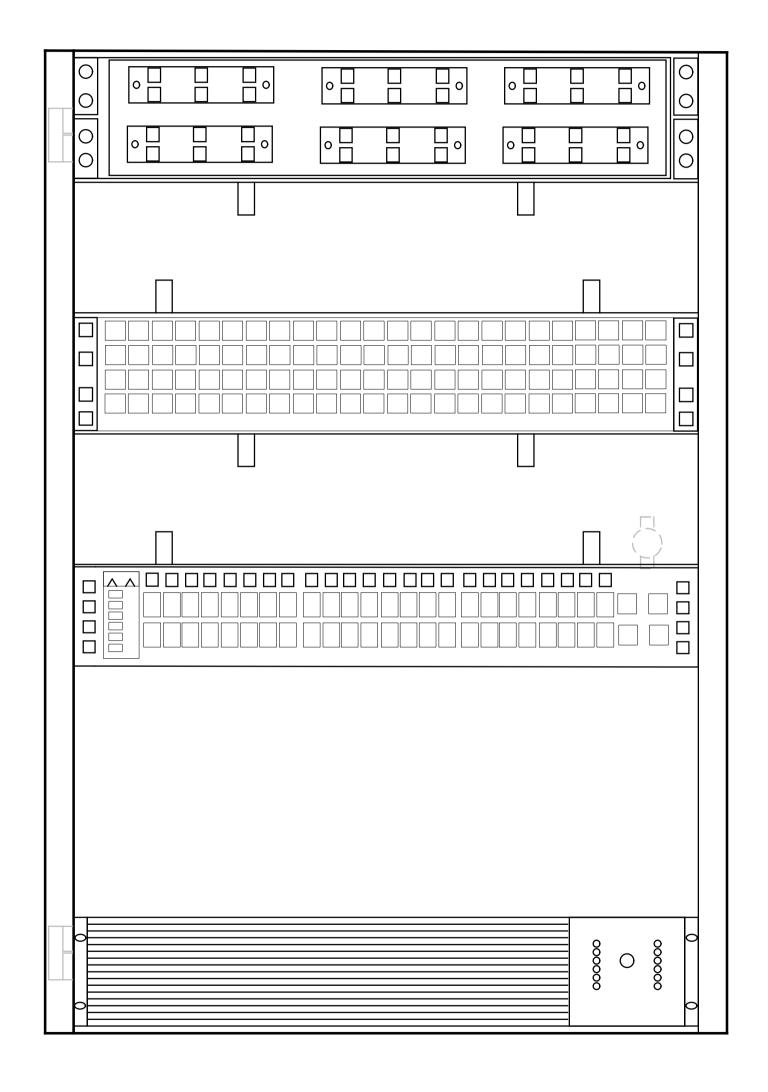
LGT 1

-CD PLAYER / RECORDER-

FOR REFERENCE PURPOSES ONLY







TRIPP\*LITE IDF CABINET LAYOUT (Typical)

FOR REFERENCE FOR REFERENCE **PURPOSES ONLY** PURPOSES ONLY DAS / EMS **HVAC / AUX SECURITY RACK FRONT** 11 LIGHT FIXTURE (ES) 10 **TYPICAL** (NOT TO SCALE)  $\langle 8,12 \rangle$ FIRE ALARM **INTERCOM** FOR REFERENCE PURPOSES ONLY -MINIMUM TEN (10) FEET LONG- -TYPICAL FD (IDF) SPACE

CONFIGURATION

## FD (IDF) KEYNOTES (X)

1. WALL FIELD FOR SERVICES INDICATED – BEGINNING SIX (6) INCHES A.F.F. PROVIDE AND INSTALL READYSPEC 4' BY 4' SECTIONS OF VOICE AND DATA BACKBOARD 8' HIGH, PROVIDED WITH MANUFACTURER PAINTED TWO (2) COATS OF WHITE FIRE RETARDANT PAINT. PAINT TWO (2) INCH STENCIL LETTERS ON BOTH SIDES TOP AND BOTTOM. LETTERS FOR EACH APPLICABLE SYSTEM TO BE INSTALLED SHALL BE IN DISTINCT COLORS AS LISTED BELOW:

VOICE / DATA:
INTERCOM:
SECURITY:
SECURITY:
FIRE ALARM:
HVAC / AUX:

YELLOW
GREEN
ORANGE
RED
BLACK

2. RE-ENTERABLE AND RE-USEABLE FIREWALL PENETRATION ASSEMBLIES, QUANTIFY AND LOCATIONS PROJECT SPECIFIC AS INDICATED. "EZPATH" PRODUCT OR EQUIVALENT MECHANICAL FIRE PROTECTION AS APPROVED BY PROJECT ENGINEER.

MINIMUM THREE (3) NEMA L6 30R 208VAC TWIST LOCK POWER

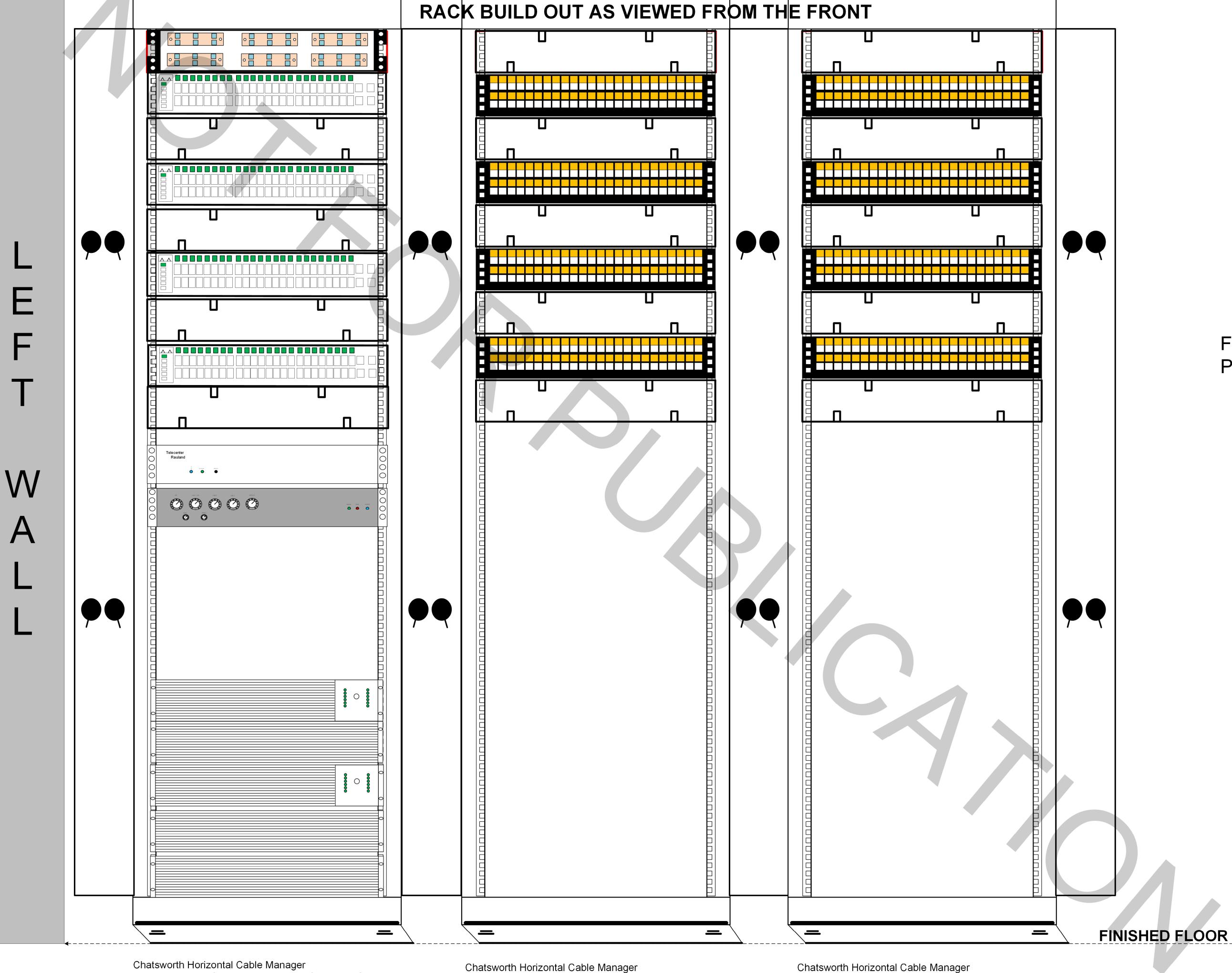
- RECEPTACLE TO BE INSTALLED IN THE IDF AT LOCATIONS INDICATED. ALL POWER RECEPTACLES INSTALLED VERTICAL AT 80" A.F.F. ALL LOCATIONS TYPICAL. SURFACE MOUNTED APPLICATION NOT ACCEPTABLE IN NEW CONSTRUCTION U.O.N.

  MINIMUM ONE (1) NEMA 5 20R 120VAC DUPLEX POWER RECEPTACLE INSTALLED EVERY EIGHT FEET HORIZONTAL 360 DEGREES AROUND PERIMETER OF SPACE. ALL POWER RECEPTACLES INSTALLED VERTICAL AT 80" A.F.F. ALL LOCATIONS TYPICAL. SURFACE MOUNTED APPLICATION NOT ACCEPTABLE IN NEW CONSTRUCTION U.O.N.
- 4. DATA OUTLETS SHALL BE INSTALLED PROJECT SPECIFIC AS INDICATED TYPICAL AT 80" A.F.F. WITHIN 12" HORIZONTAL OF DUPLEX POWER RECEPTACLE.
- 5. TELECOMMUNICATIONS GROUNDING BUS BAR "TGBB" SYSTEMS GROUND BAR REFER TO SYSTEMS GROUNDING RISER AS DETERMINED BY PROJECT ENGINEER.
- 6. 12" WIDE LADDER RACK INSTALLED CONTINUOUSLY AS SHOWN TYPICAL. LAYOUT REQUIREMENTS SHALL BE PROJECT SPECIFIC.
- 7. AIR CONDITIONER SPLIT UNIT INSTALLED OVER THE DOOR AS SHOWN. ALL HVAC PIPES AND DRAINS SHALL IMMEDIATELY TURN AND BE PIPED BY HVAC TRADES TO THE OUTSIDE OF THE FD (IDF) SPACE.
- 8. MINIMUM THREE (3) FOUR INCH TELECOMMUNICATIONS BACKBONE CONDUITS WITH THREE (3) THREE CELL FABRIC INNERDUCTS (FOR MULTIPLE STORY FLOORS MINIMUM TWO (2) FOUR INCH TELECOMMUNICATIONS SLEEVES) PER FD (IDF) SPACE.
- 9. FINAL RACK PLACEMENT SHALL BE CONFIRMED BY PROJECT ENGINEER AND SDOC TECHNOLOGY SERVICES DEPARTMENT REPRESENTATIVE PRIOR TO ANCHORING.
- 10. ALL FD (IDF) SPACES SHALL BE MINIMUM TEN (10) FEET LONG BY TEN (10) FEET WIDE.
- ALL IDF ENTRY DOOR OPENINGS SHALL BE MINIMUM FOUR (4) FEET WIDE.

  ACCESS CONTROL SHALL PROTECT ENTRANCE
  - ALL UNDERGROUND BACKBONE CONDUIT SHALL CONTAIN DETECTABLE MAXCELL THREE (3) THREE CELL FABRIC INTERDUCT. ALL UNDERGROUND
- BACKBONE CONDUIT SHALL ENTER SPACE WITHIN 2 INCHES OF INTENDED WALL LOCATION NO EXCEPTIONS

# IDF (FD) RACK CONFIGURATION TYPICAL

(DETAIL NOT TO SCALE)



FOR REFERENCE PURPOSES ONLY

FOR REFERENCE PURPOSES ONLY

FOR REFERENCE

**PURPOSES ONLY** 

Chatsworth Horizontal Cable Manager
P/N 30330-719 - Contractor provided / Quantities Site
Specific

Fiber optic Campus Box (LIU) - Contractor Provided / Installed

Network Switch Components - Owner Provided / Installed

TCU Headend Equipment - Provided / Installed Rauland Borg 14 U above UPS U.O.N.

APC 2200 UPS / APC 72V Battery pack - Owner Provided / Installed

APC 5K UPS / APC 192V Battery pack - Owner Provided / Installed

NEMA L6 - 30R receptacle located behind rack at 80" A.F.F.U.O.N. - Contractor Provided / Installed

NEMA 5 - 20R quad receptacle located behind rack at 80" A.F.F.U.O.N - Contractor Provided / Installed

Rack units 1 - 14 to remain empty (free of patch panels / LIU (Bottom up))

Standard Rack - 7 feet tall (45U) / 19 inches wide - Black - Contractor Provided / Installed

P/N 30330-719 - Contractor provided / Quantities Site Specific

Patch Panel Components / Hardware - Contractor Provided / Installed

Rack units 1-14 to remain empty (free of patch panels / LIU (Bottom up))

Standard Rack - 7 feet tall (45U) / 19 inches wide - Black - Contractor Provided / Installed

P/N 30330-719 - Contractor provided / Quantities Site Specific

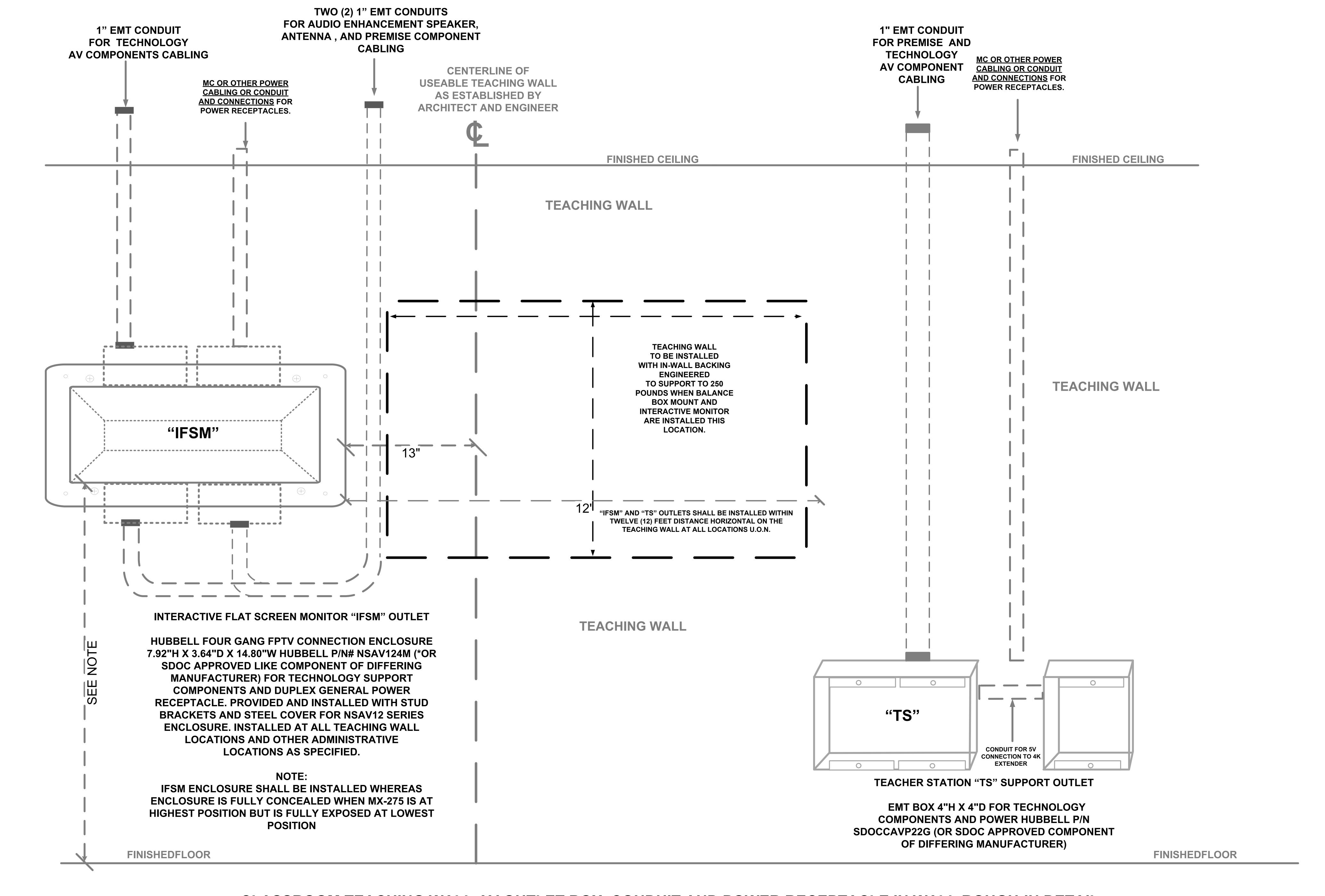
Patch Panel Components / Hardware - Contractor Provided / Installed

NEMA 5 - 20R quad receptacle located behind rack at 80" A.F.F.U.O.N. - Contractor Provided / Installed

Rack units 1-14 to remain empty (free of patch panels / LIU (Bottom up))

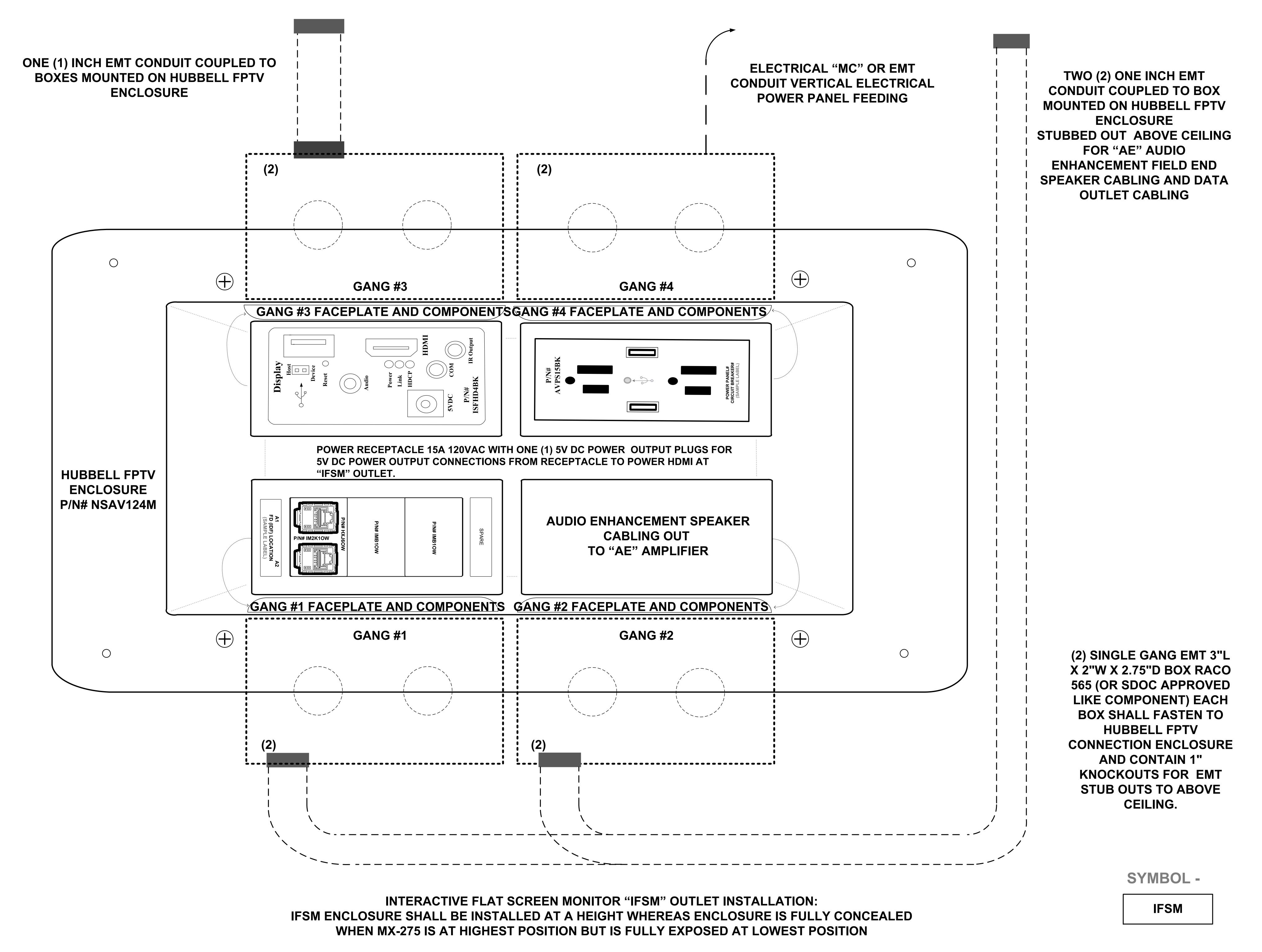
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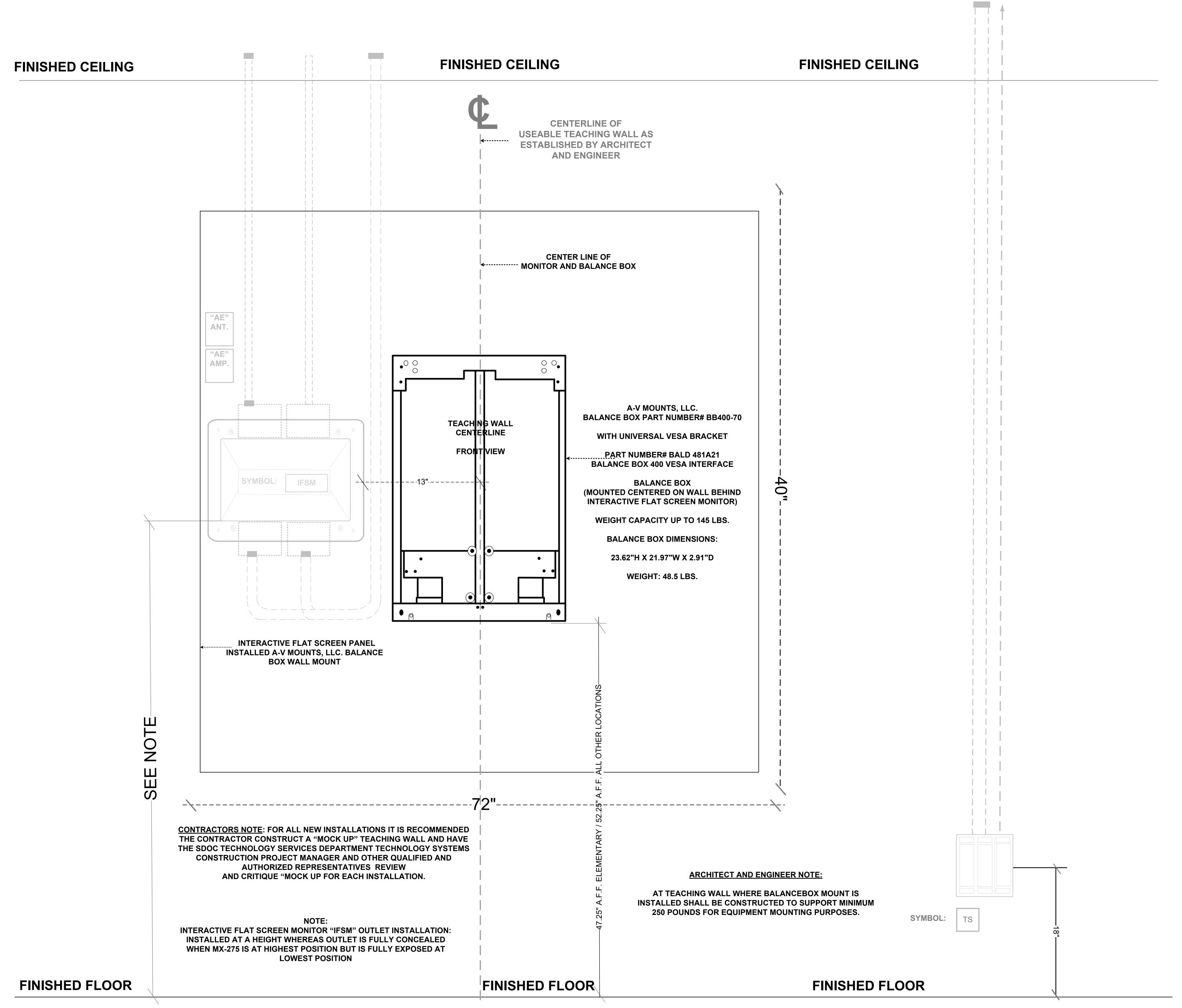


CLASSROOM TEACHING WALL AV OUTLET BOX, CONDUIT AND POWER RECEPTACLE IN WALL ROUGH-IN DETAIL

DETAIL NOT TO SCALE



ENCLOSURE SHALL BE INSTALLED HORIZONTAL AT THIRTEEN (13) INCHES OFFSET FROM CENTERLINE OF WALL AS ESTABLISHED BY PROJECT ARCHITECT AND ENGINEER (DETAIL NOT TO SCALE)



STANDARD CLASSROOM TEACHING WALL "IFSM" TECHNOLOGY INSTALLATION DETAIL "TYPICAL"

(DETAIL NOT TO SCALE)

@ 48"

A.F.F.

CLASSROOM INTERCOM
CALL SWITCH "C" OR
VOLUME CONTROL "V"
AND INTERIOR SPEAKER "IP/S" WITH
MESSAGE BOARD (CLOCK)
BUILD OUT CONFIGURATION
"TYPICAL"

FINISHED CEILING

RACEWAY / PATHWAY NOTE:
FOR RENOVATION AND RETROFIT CLASSROOMS AND OFFICE SPACES WHERE AN INTERCOM STUBOUT IS NOT PPOSSIBLE FOR IN-WALL INSTALLATION SUCH AS FILLED CONCRETE WALLS, PANDUIT T-70 OR SDOC APPROVED EQUIVALENT NON-METALLIC SURFACE MOUNT

RACEWAY WITH ALL ASSOCIATED REQUIRED OUTLET COMPONENT PIECES AND PARTS

SHALL BE INSTALLED. ALL RACEWAYS AND OUTLETS SHALL BE COMPLETE AND INSTALLED

IAW SDOC DIVISION 27 TECHNOLOGY SYSTEMS APPROVED MEANS AND METHODS TO SDOC

TECHNOLOGY SYSTEMS CONSTRUCTION PROJECT MANAGER SATISFACTION. PRIOR TO

PROJECT ACCEPTANCE AND COMPLETION.

INTERCOM CONDUIT

THIRTY SIX (36) INCHES

**HORIZONTAL TO EXIT** 

DOOR TO SPACE

AND BOX ASSEMBLY ← INSTALLED WITHIN

34 INCH EMT CONDUIT STUBBED OUT REAMED AND BUSHED ABOVE CEILING. PROVIDED AND INSTALLED BY CONTRACTOR

34 INCH EMT INTERCOM CONDUIT AND DOUBLE GANG EMT BOX WITH SINGLE GANG MUDRING INSTALLED IN WALL CLASSROOM CEILING MOUNT INTERCOM SPEAKER SYMBOL -



FOR CLASSROOMS
CEILING TILES
INSTALLED FOR
SPEAKERS SHALL BE
CEILING MOUNT
(WHITE IN COLOR)
CENTERED IN THE
ROOM. A IP
CLASSROOM MODULE
SHALL BE INSTALLED
AT THIS LOCATION
(AS NECESSARY).

**MESSAGE BOARD SYMBOL -**



#### INTERCOM CONTRACTOR NOTE:

FOR RETROFIT AND RENOVATION INSTALLATIONS AT SITES CONTRACTOR SHALL INSTALL ROUGH IN COMPONENTS, MESSAGE BOARD COMPONENTS OVER MAIN EGRASS INTO THE SPACE AND A STATUS LIGHT INTERCOM NOTIFICATION MODULE INSTALLED ON THE EXTERIOR OF THE MAIN EGRASS INTO THE SPACE.

ALL INTERCOM COMPONENTS SHALL BE PROVIDED AND INSTALLED BY SDOC APPROVED INTERCOM CONTRACTOR "ONLY".



EACH OFFICE, CLASSROOM, EXTERIOR SPEAKER / HORN GROUP, OR CORRIDOR SPEAKER GROUP SHALL BE HOMERUN TO INTERCOM WALL-FIELD IN THE NEAREST MDF / IDF SPACE.

MAXIMUM FIVE (5) SPEAKERS PER CIRCUIT (WITH OR WITHOUT VOLUME CONTROLS)

> MAXIMUM ONE (1) CALL SWITCH PER CIRCUIT

MAXIMUM TWO (2) EXTERIOR SPEAKERS / HORNS PER CIRCUIT

INTERCOM CALL

CALL SWITCH SYMBOL -



V

INTERCOM

VOLUME

CONTROL

SYMBOL -

DOUBLE GANG EMT BOX WITH SINGLE GANG MUDRING INSTALLED IN WALL PROVIDED AND INSTALLED BY CONTRACTOR

STAINLESS STEEL COVER WITH ROCKER PANEL HOLE AND INTERCOM CALL SWITCH MOUNTED OVER "IN WALL" DOUBLE GANG EMT BOX WITH SINGLE GANG MUDRING

Ø

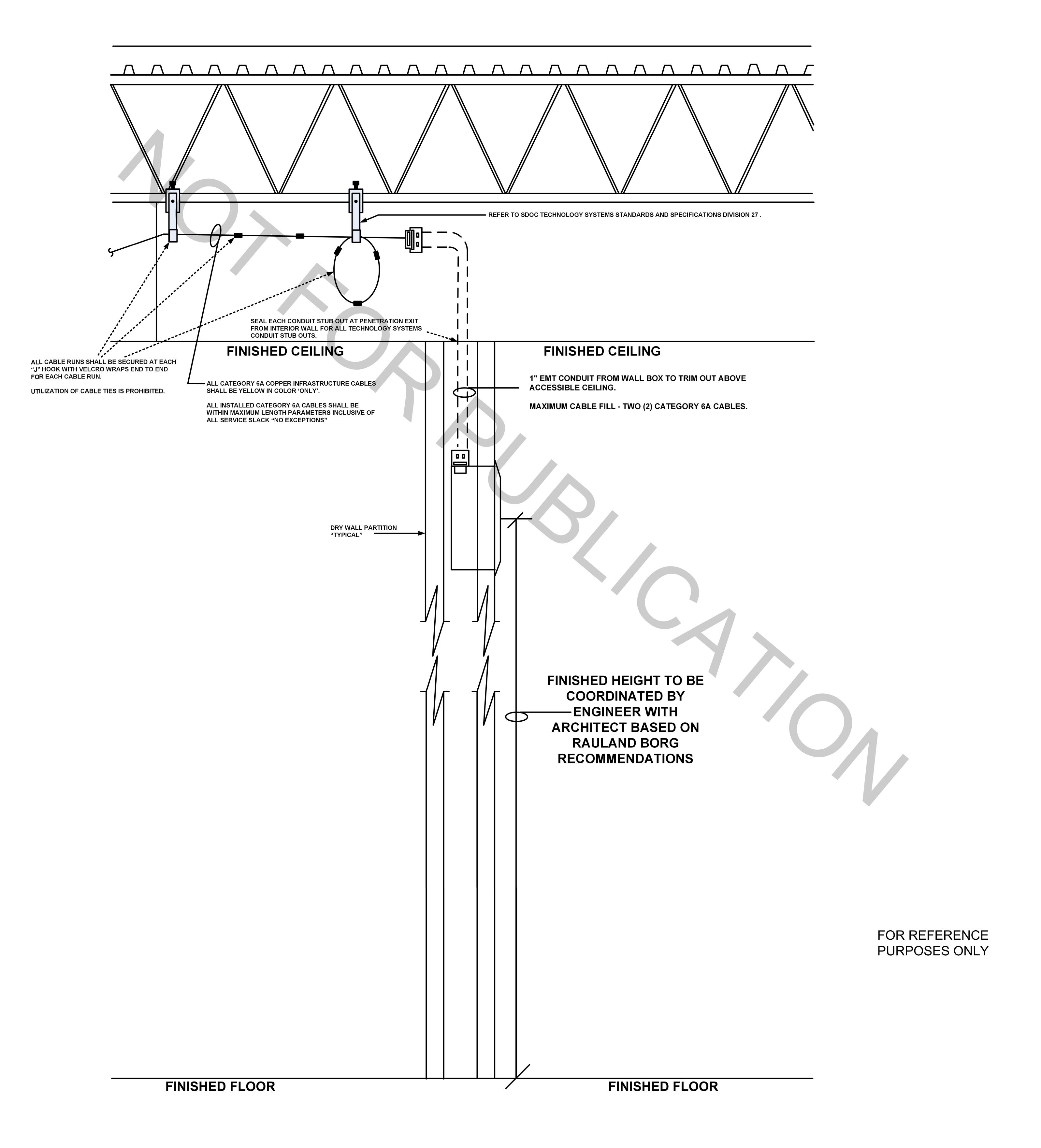
#### CLASSROOM INTERCOM CEILING MOUNT SPEAKER AND CALL SWITCH OR VOLUME CONTROL

ALL INTERCOM RELATED CABLING SHALL BE TERMINATED WITH PATCH PANEL JACK INSERTS "GREEN" IN COLOR

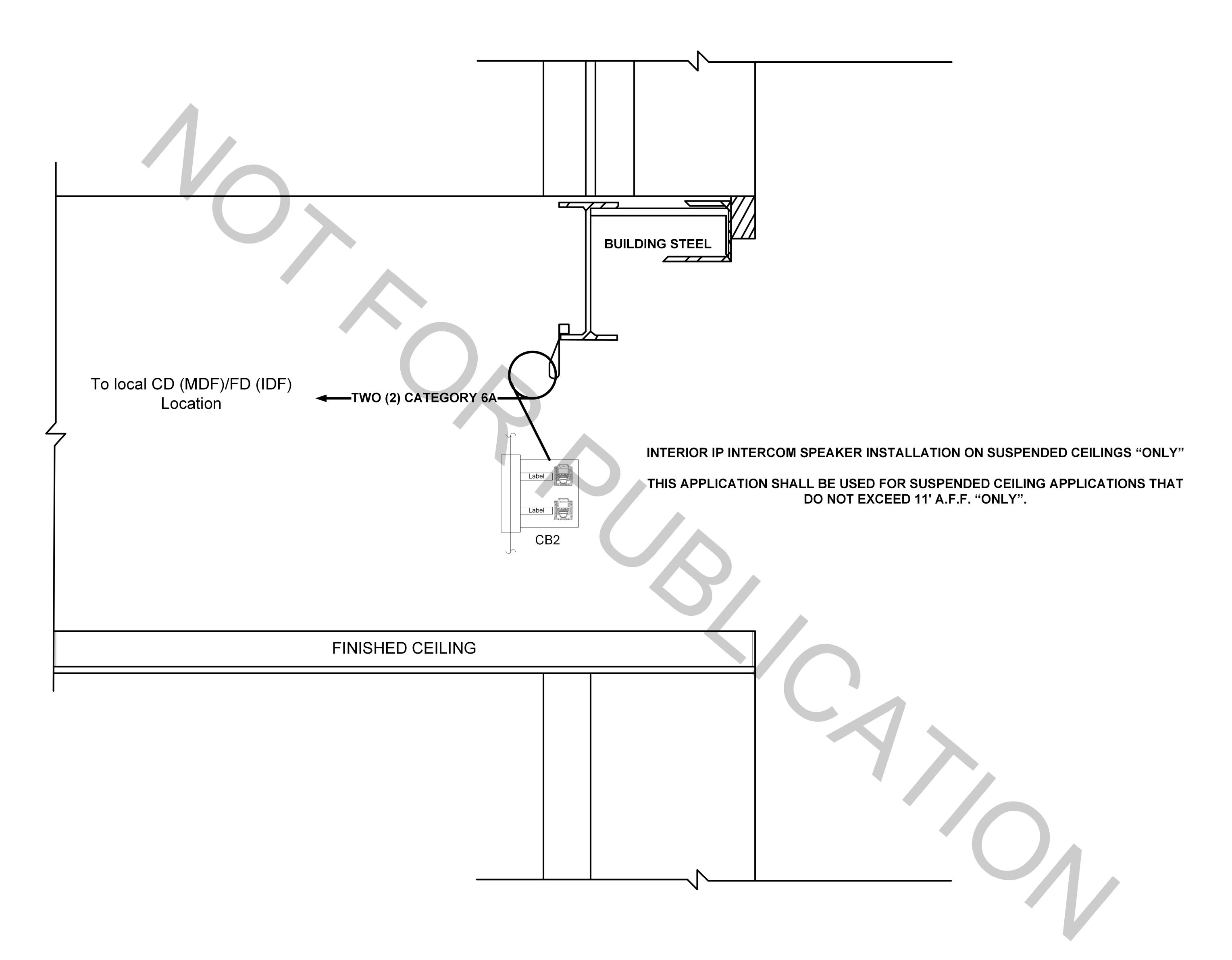


FINISHED FLOOR

**FINISHED FLOOR** 

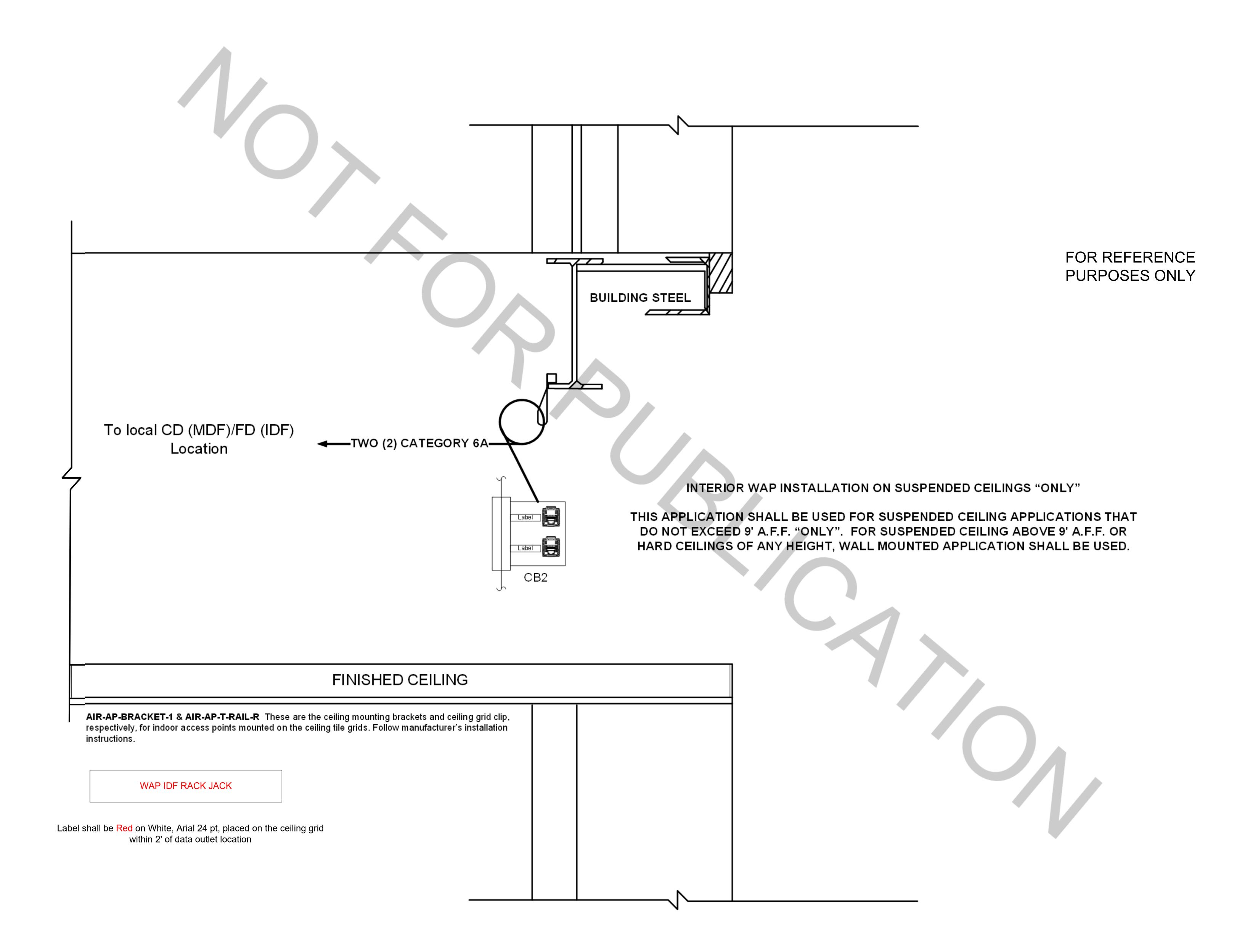


# TYPICAL WALL MOUNTED INTERCOM SPEAKER / MESSAGE BOARD OUTLET



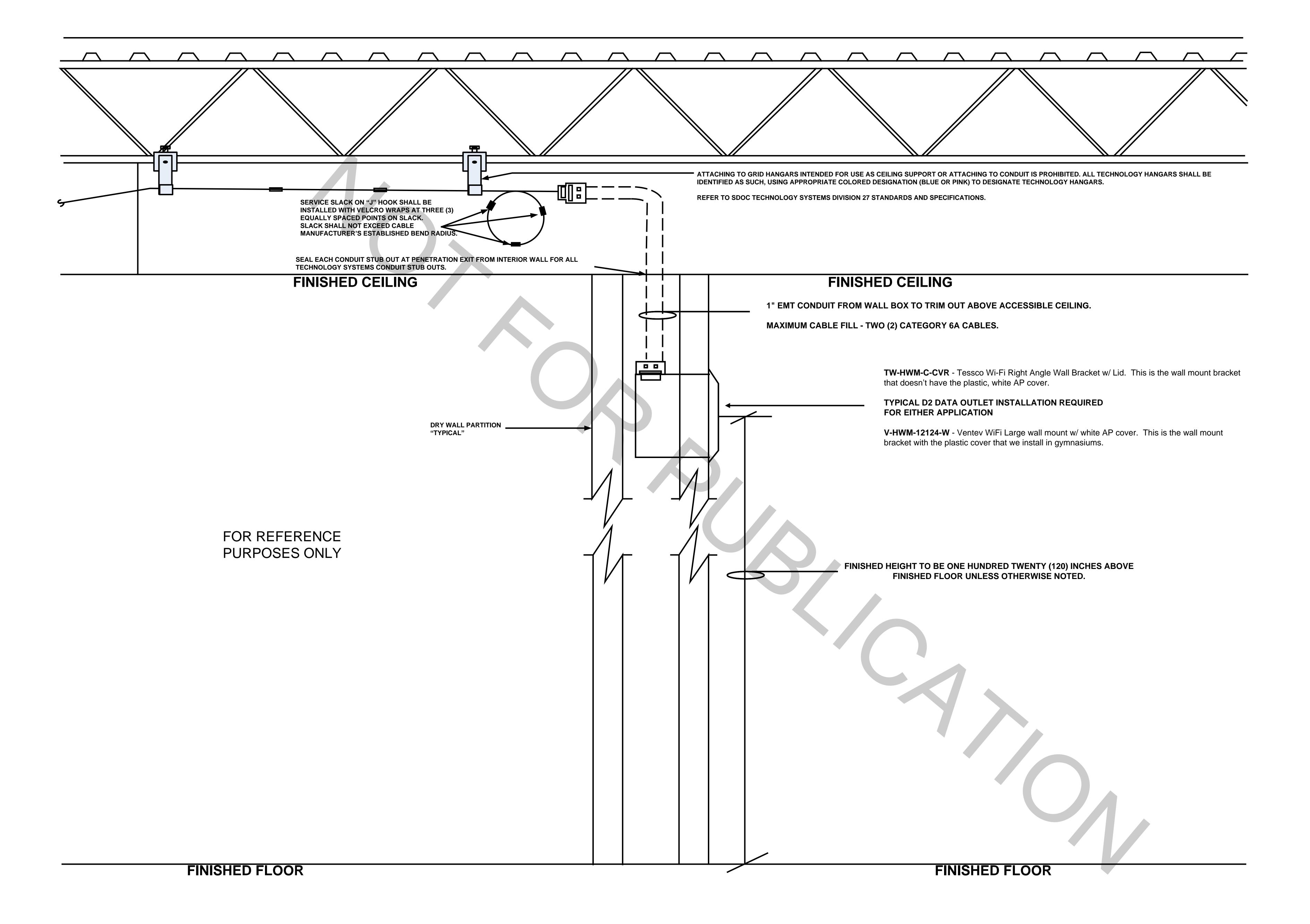
## TYPICAL SUSPENDED CEILING IP INTERCOM SPEAKER INSTALLATION DETAIL

NOT TO SCALE FOR REFERENCE ONLY

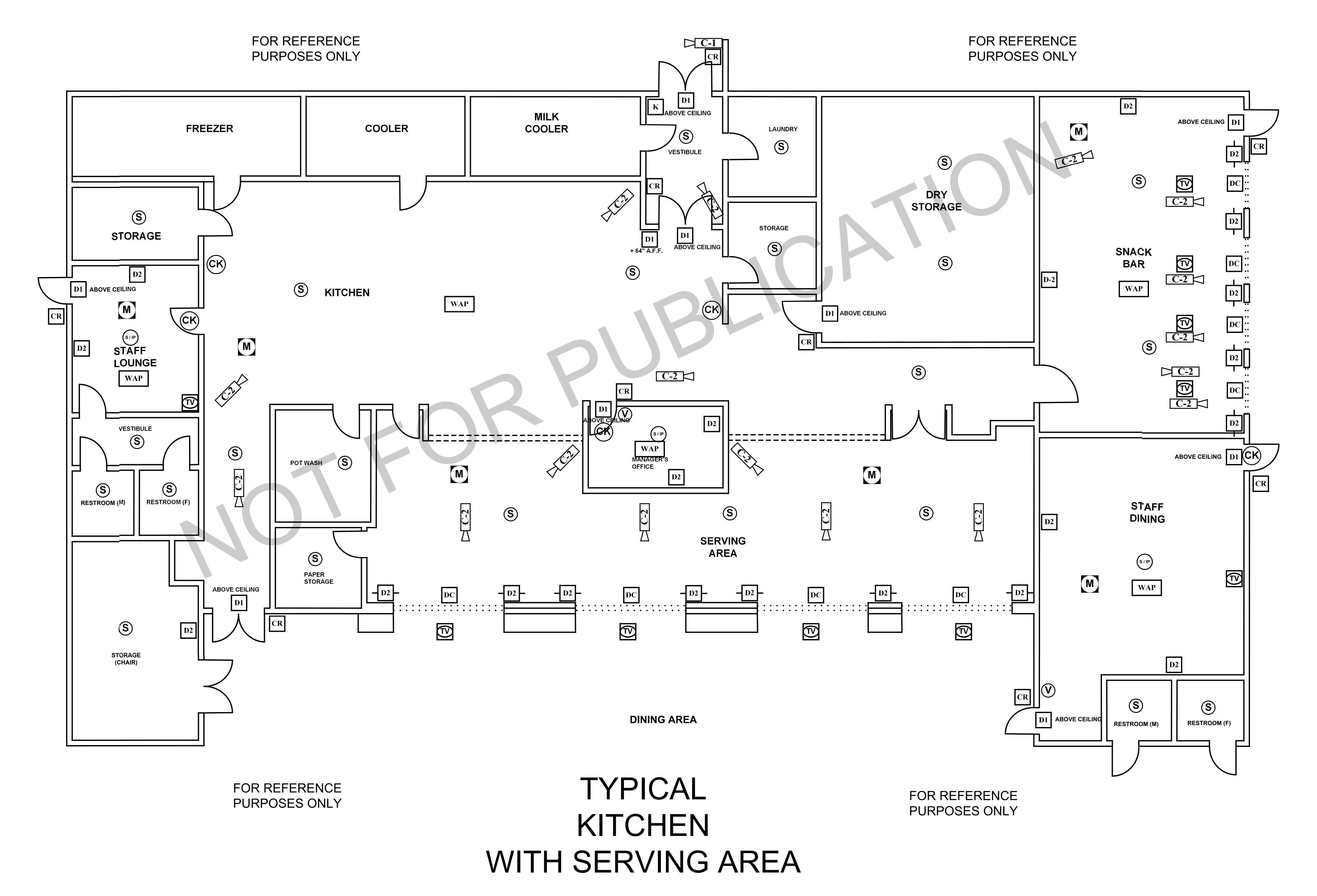


# TYPICAL SUSPENDED CEILING WAP INSTALLATION DETAIL FOR SUSPENDED CEILINGS UNDER 11' A.F.F.

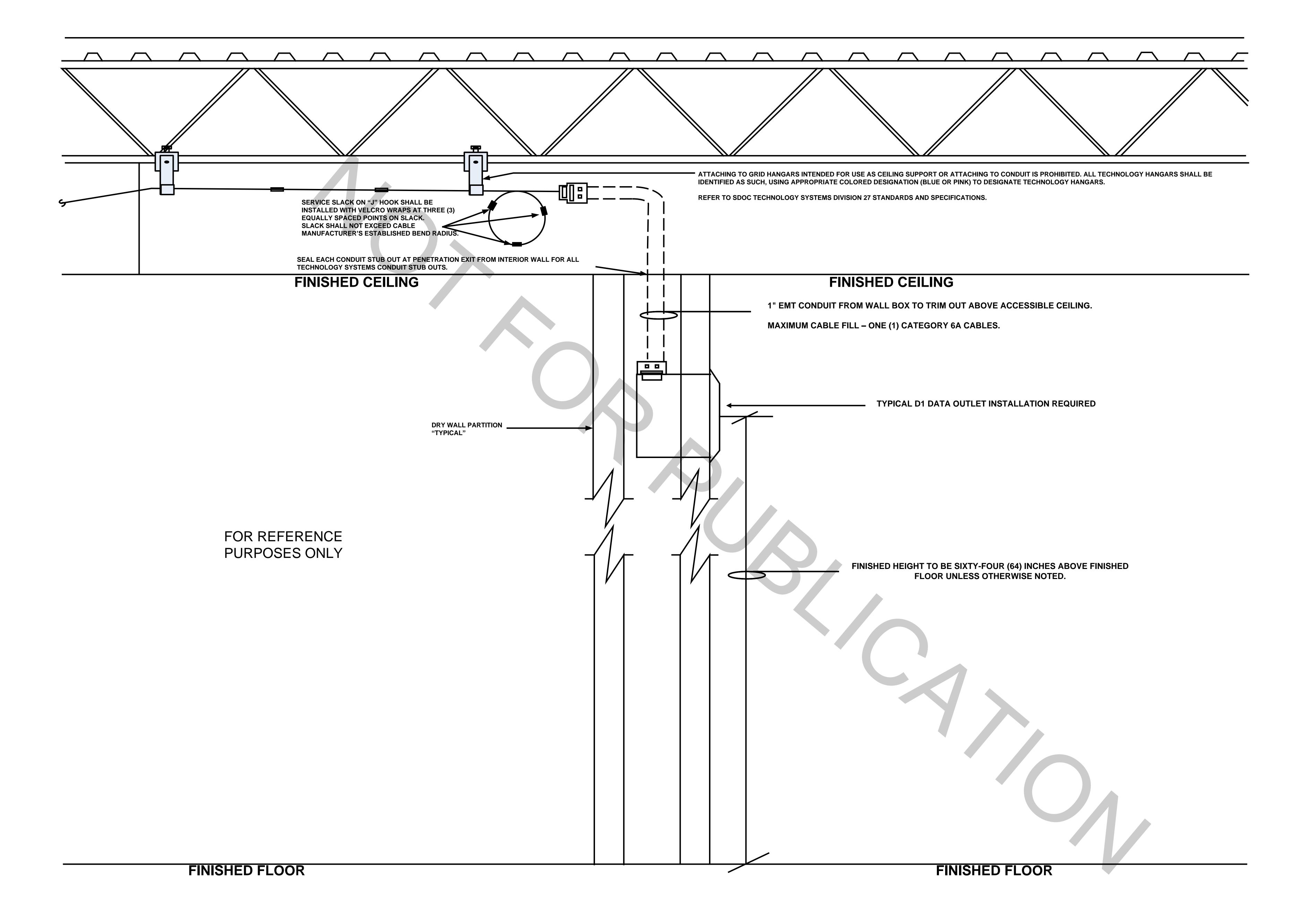
NOT TO SCALE FOR REFERENCE ONLY



## TYPICAL WIRELESS ACCESS POINT (WALL MOUNTED APPLICATION)

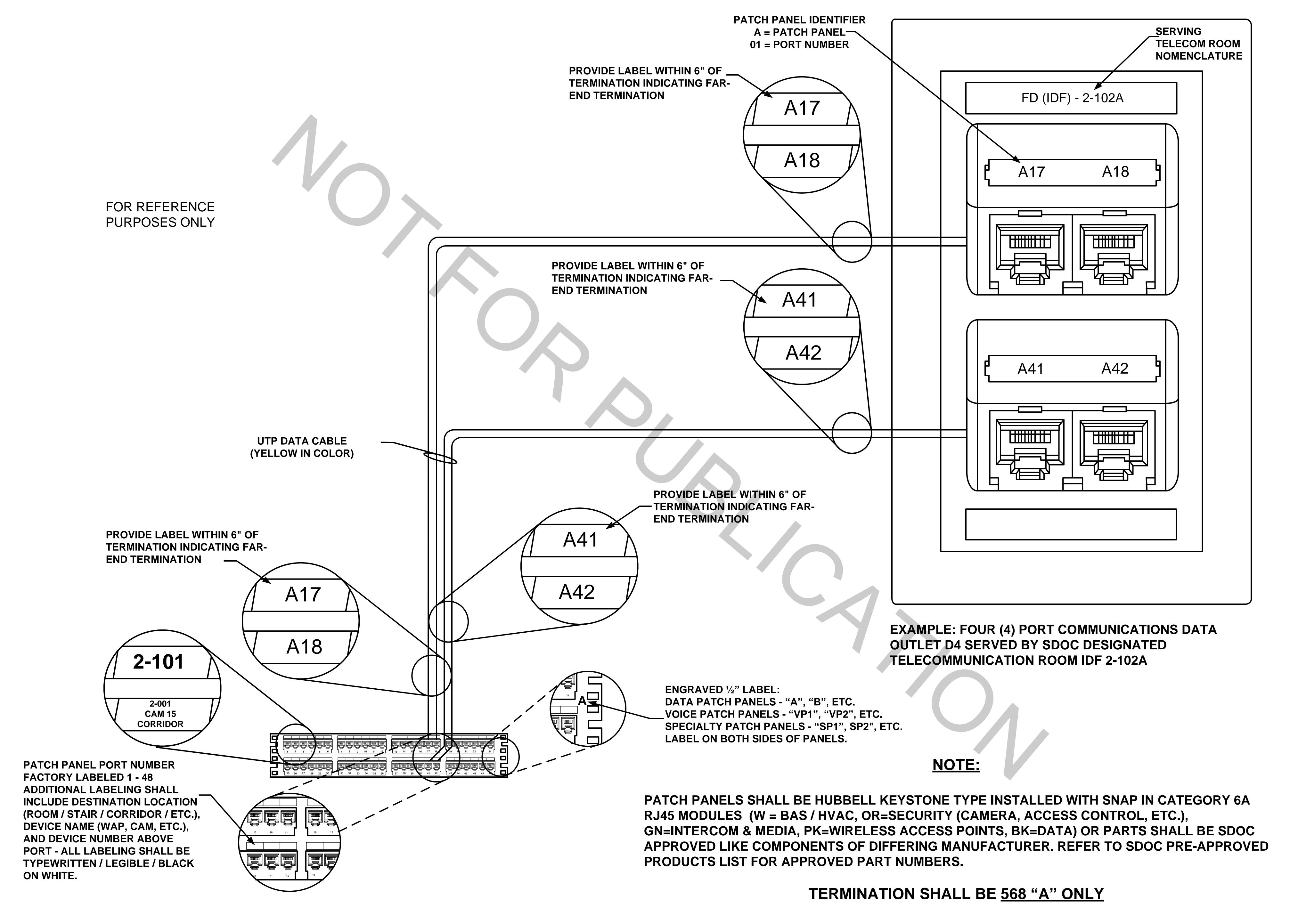


NOT TO SCALE



## TYPICAL KRONOS CLOCK INSTALLATION

(DETAIL NOT TO SCALE)



COMMUNICATIONS DATA PATCH PANEL AND DATA OUTLET WIRING DETAIL "TYPICAL"

#### MASTER TECHNOLOGY SYSTEMS SYMBOLS LEGEND

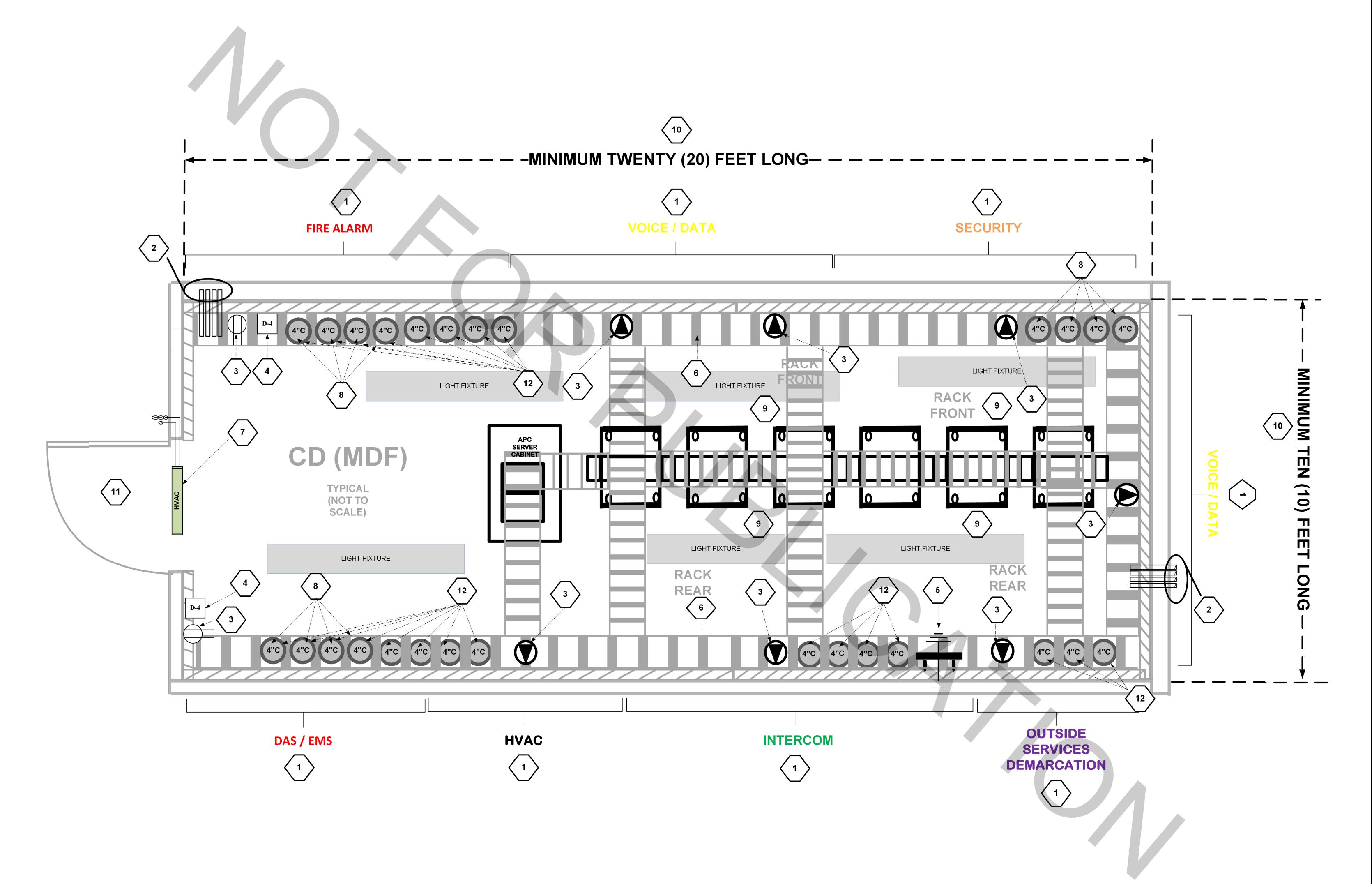
### NETWORK DISTRIBUTION SINGLE PORT VOICE / DATA OUTLET **DUAL PORT VOICE / DATA OUTLET** QUAD PORT VOICE / DATA OUTLET SIX (6) PORT VOICE / DATA OUTLET EIGHT (8) PORT VOICE / DATA OUTLET VOICE / DATA OUTLET INSTALLED AT TWO (2) INCHES ABOVE COUNTER / BACKSPLASH VOICE / DATA OUTLET INSTALLED IN DUAL CHANNEL POWER POLE RACEWAY FLOOR BOX VOICE / DATA OUTLET LOCATION JAR SYSTEMS CHARGING STATION - WITH APPROPRIATE POWER **BUILDING AUTOMATION SYSTEM CABINET - HVAC APPLICATIONS** WIRELESS ACCESS POINT "WAP" VOICE / DATA PORT - D2 CAT6A (W/ CB-2 BRACKET) CEILING PLATE WITH NEMA L5 TWIST LOCK 20A / SIX (6) PORT VOICE / DATA OUTLET LOCATION "E" DENOTES ANY EXISTING FIELD DEVICE WHEN USED IN CONJUNCTION WITH ALL TECHNOLOGY **INTERCOM ANNOUNCING SYSTEM** CEILING-MOUNT INTERIOR INTERCOM SPEAKER CEILING-MOUNT INTERIOR INTERCOM SPEAKER WITH IP MODULE (D-2 W/ CB-2 BRACKET) INTERCOM NOTIFICATION MODULE INTERCOM VOLUME CONTROL ACC3011L - MESSAGE BOARD / SPEAKER ASSEMBLY (D-1 W/ BACKBOX) - ABOVE DOOR WALL MOUNT EXTERIOR INTERCOM HORN STATUS LIGHT MODULE - EXTERIOR **AUDIO SOUND SYSTEMS** CEILING - MOUNT AUDIO SPEAKER WALL - MOUNT AUDIO SPEAKER MICROPHONE / LINE-LEVEL I/O PLATE SUSPENDED MICROPHONE - OVERHEAD OUTLET SOUND SYSTEM HEAD END AMPLIFIER AND COMPONENT ASSEMBLY CABINET SOUND SYSTEM CONNECTION PANEL **AUXILIARY I/O PLATE**

INTERCOM BELT PACK WALLPLATE

#### **AUDIO / VISUAL SYSTEM OUTLETS, ASSEMBLIES AND CONDUITS**

TV	SMART TV (42" - 60") HEIGHT DETERMINED BY APPLICATION	
PJ	CEILING MOUNT 24" X 24" METALLIC DROP IN PROJECTOR PLATE ASSEMBLY LOCATION	
ВВ	BALANCE BOX	
тѕ	TEACHER STATION "TS" D2 with Power P/N# AVPS15BK	
IFSM	INTERACTIVE FLAT SCREEN MONITOR / COMPONENT, DEVICE, POWER LOCATION	
CLASSROOM AUDIO ENHANCEMENT "AE" VOICE SYSTEM		
AE	AUDIO ENHANCEMENT WALL MOUNTED VOICE SYSTEM AMPLIFIER	
AE	CEILING - MOUNT "AE" SPEAKER	
3.5MM	AUDIO ENHANCEMENT 3.5MM "AE" WALL PLATE	
AEN	AUDIO ENHANCEMENT "AE" ANTENNA	
INTRUSION DETECTION SYTEM		
ES	ELECTRIC DOOR LOCK – ACCESS CONTROL	
DC	DOOR CONTROLLER FOR ACCESS CONTROL / CARD READER	
VIC	VIDEO INTERCOM WEATHER-PROOF SPEAKER WITH D1 DATA OUTLET (ACCESS CONTROL)	
CR	CARD READER – ACCESS CONTROL	
D	DOOR CONTACT – ACCESS CONTROL	
DR	DOOR RELEASE OVERRIDE BUTTON	
К	SECURITY KEYPAD	
M	SECURITY MOTION DETECTOR	
SH	SECURITY EXTERIOR SIREN / STROBE HORN / BLUE STROBE	
VIDEO SURVEILLANCE SECURITY SYSTEM		
C1 <	EXTERIOR VIDEO SURVEILLANCE CAMERA	
C2 <	INTERIOR VIDEO SURVEILLANCE CAMERA	
	RADIO MASTER UNIT	
RMU	HANDHELD RADIO MASTER UNIT LOCATION	

FOR REFERENCE
PURPOSES ONLY



FOR REFERENCE PURPOSES ONLY

TYPICAL CD (MDF) SPACE CONFIGURATION

#### CD (MDF) KEYNOTEX

WALL FIELD FOR SERVICES INDICATED –
BEGINNING SIX (6) INCHES A.F.F. PROVIDE AND
INSTALL READYSPEC 4' BY 4' SECTIONS OF VOICE
AND DATA BACKBOARD 8' HIGH, PROVIDED WITH
MANUFACTURER PAINTED TWO (2) COATS OF
WHITE FIRE RETARDANT PAINT. PAINT TWO (2)
INCH STENCIL LETTERS ON BOTH SIDES TOP AND
BOTTOM. LETTERS FOR EACH APPLICABLE
SYSTEM TO BE INSTALLED SHALL BE IN DISTINT
COLORS AS LISTED BELOW:

VOICE / DATA: YELLOW

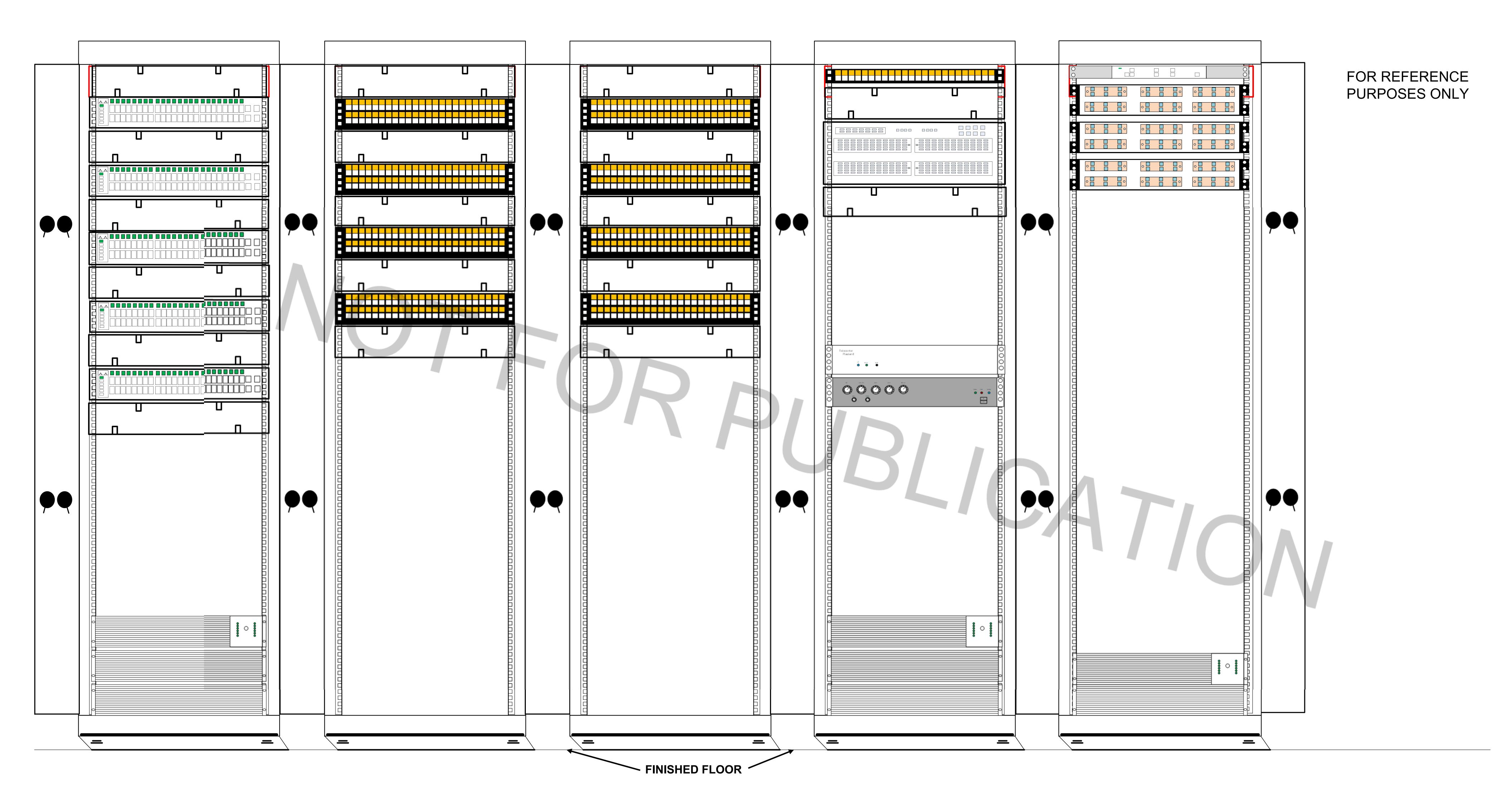
INTERCOM: GREEN
SECURITY: ORANGE
FIRE ALARM: RED

HVAC: BLACK
OUTSIDE SERVICES: PURPLE

- RE-ENTERABLE AND RE-USEABLE FIREWALL PENETRATION ASSEMBLIES, QUANTIFY AND LOCATIONS PROJECT SPECIFIC AS INDICATED. "EZPATH" PRODUCT OR EQUIVALENT AS APPROVED BY PROJECT ENGINEER.
- 3. MINIMUM SIX (6) NEMA 208VAC L6 30R TWISTLOCK POWER RECEPTACLE TO BE INSTALLED IN THE IDF AT LOCATIONS INDICATED. ALL POWER RECEPTACLES INSTALLED VERTICAL AT 80" A.F.F. ALL LOCATIONS TYPICAL. SURFACE MOUNTED APPLICATION NOT ACCEPTABLE IN NEW CONSTRUCTION U.O.N.

  MINIMUM ONE (1) 120VAC 15A DUPLEX POER RECEPTACLE INSTALLED EVERY EIGHT FEET HORIZONTAL 360 DEGREES AROUND PERIMETER OF SPACE. ALL POWER RECEPTACLES INSTALLED VERTICAL AT 80" A.F.F. ALL LOCATIONS TYPICAL. SURFACE MOUNTED APPLICATION NOT ACCEPTABLE IN NEW CONSTRUCTION U.O.N.
- DATA OUTLETS SHALL BE INSTALLED PROJECT SPECIFIC AS INDICATED TYPICAL AT 80" A.F.F. WITHIN 12" HORIZONTAL OF DUPLEX POWER RECEPTACLE.
- TELECOMMUNICATIONS GROUNDING BUS BAR
  "TGBB" SYSTEMS GROUND BAR REFER TO
  SYSTEMS GROUNDING RISER AS DETEMINED BY
  PROJECT ENGINEER.
- 12" WIDE LADDER RACK INSTALLED
  CONTINUOUSLY AS SHOWN TYPICAL. LAYOUT
  REQUIREMENTS SHALL BE PROJECT SPECIFIC.
- AIR CONDITIONER SPLIT UNIT INSTALLED OVER THE DOOR AS SHOWN. ALL HVAC PIPES AND DRAINS SHALL IMMEDIATELY TURN AND BE PIPED BY HVAC TRADES TO THE OUTSIDE OF THE IDF SPACE.
- MINIMUM THREE (3) FOUR INCH TELECOMMUNICATION BACKBONE CONDUITS WITH THREE FABRIC INNERDUCTS (FOR MULTIPLE STORY FLOORS MINIMUM TWO (2) FOUR INCH TELECOMMUNICATIONS
- SLEEVES) PER IDF SPACE.

  FINAL RACK PLACEMENT SHALL BE CONFIRMED BY
- 9. PROJECT ENGINEER AND SDOC TECHNOLOGY SERVICES DEPARTMENT REPRESENTATIVE PRIOR TO ANCHORING.
- 10. ALL MDF SPACES SHALL BE MINIMUM TWENTY (20) FEET LONG BY TEN (10) FEET WIDE.
- ALL IDF ENTRY DOOR OPENINGS SHALL BE MINIMUM FOUR (4) FEET WIDE. ACCESS CONTROL SHALL PROTECT ENTRANCE
- ALL UNDERGROUND BACKBONE CONDUIT SHALL CONTAIN DETECTABLE MAXCELL THREE (3) THREE 12. CELL FABRIC INTERDUCT. ALL UNDERGROUND BACKBONE CONDUIT SHALL ENTER SPACE WITHIN 2 INCHES OF INTENDED WALL LOCATION NO EXCEPTIONS



Chatsworth Horizontal Cable Manager P/N 30330-719 - Contractor provided / Quantities Site Specific

Network Components - Owner Provided / Installed

APC 5K UPS / APC 192V Battery pack - Owner Provided / Installed

NEMA L6 - 30R receptacle located behind rack at 80" A.F.F.U.O.N. - Contractor Provided / Installed

NEMA 5 - 20R quad receptacle located behind rack at 80" A.F.F.U.O.N. - Contractor Provided / Installed

Rack units 1 - 14 to remain empty (free of patch panels / LIU (Bottom up))

Standard Rack - 7 feet tall (45U) / 19 inches wide - Black - Contractor Provided / Installed

Chatsworth Horizontal Cable Manager P/N 30330-719 - Contractor provided / Quantities Site Specific

Patch Panel Components / Hardware - Contractor Provided / Installed

Rack units 1 - 10 to remain empty (free of patch panels / LIU (Bottom up))

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Chatsworth Horizontal Cable Manager P/N 30330-719 - Contractor provided / Quantities Site Specific

Voice Patch Panel - Contractor Provided / Installed

Network Components - Owner Provided / Installed

APC 5K UPS / APC 192V Battery pack - Owner Provided / Installed

TCU Headend Equipment - Provided / Installed Rauland Borg 14 U above UPS U.O.N.

NEMA L6 - 30R receptacle located behind rack at 80" A.F.F.U.O.N. - Contractor Provided / Installed

Rack units 1 - 10 to remain empty (free of patch panels / LIU (Bottom up))

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Chatsworth Horizontal Cable Manager P/N 30330-719 - Contractor provided / Quantities Site Specific

Spectrum Components - Vendor Provided / Installed

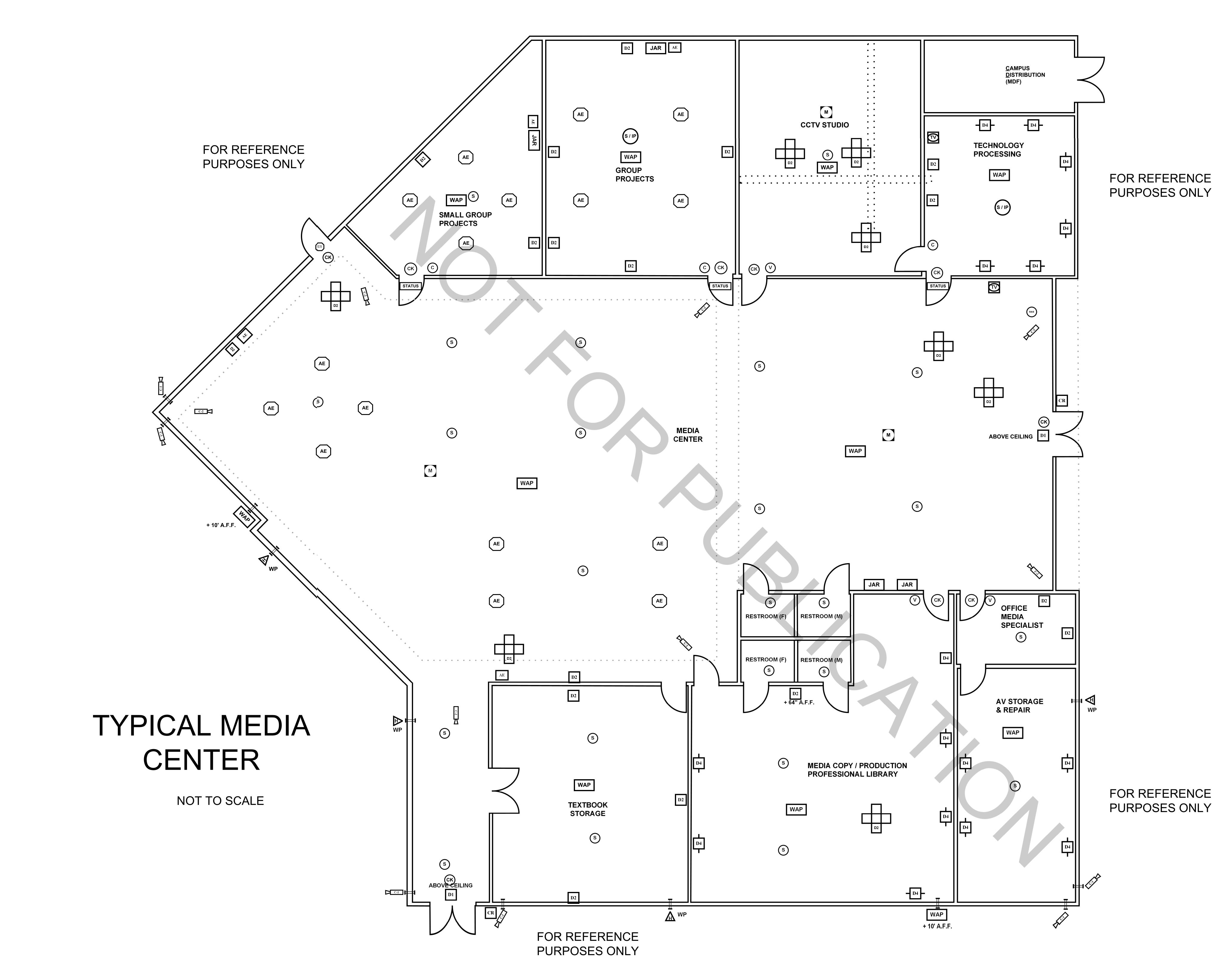
Fiber Optic Campus Box (LIU) - Contractor Provided / Installed

APC 2200 UPS / APC 72V Battery pack - Owner Provided / Installed

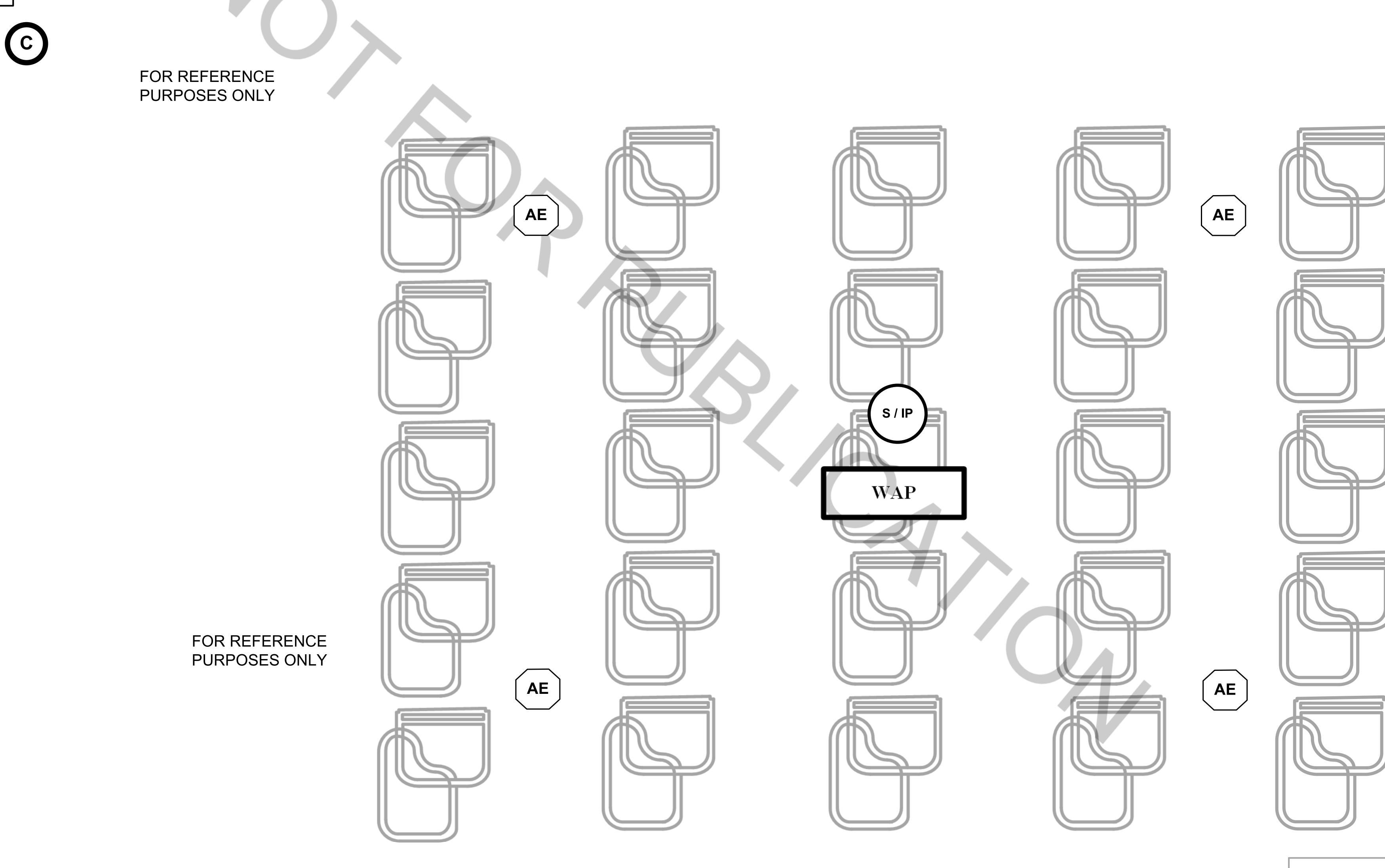
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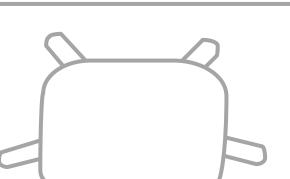


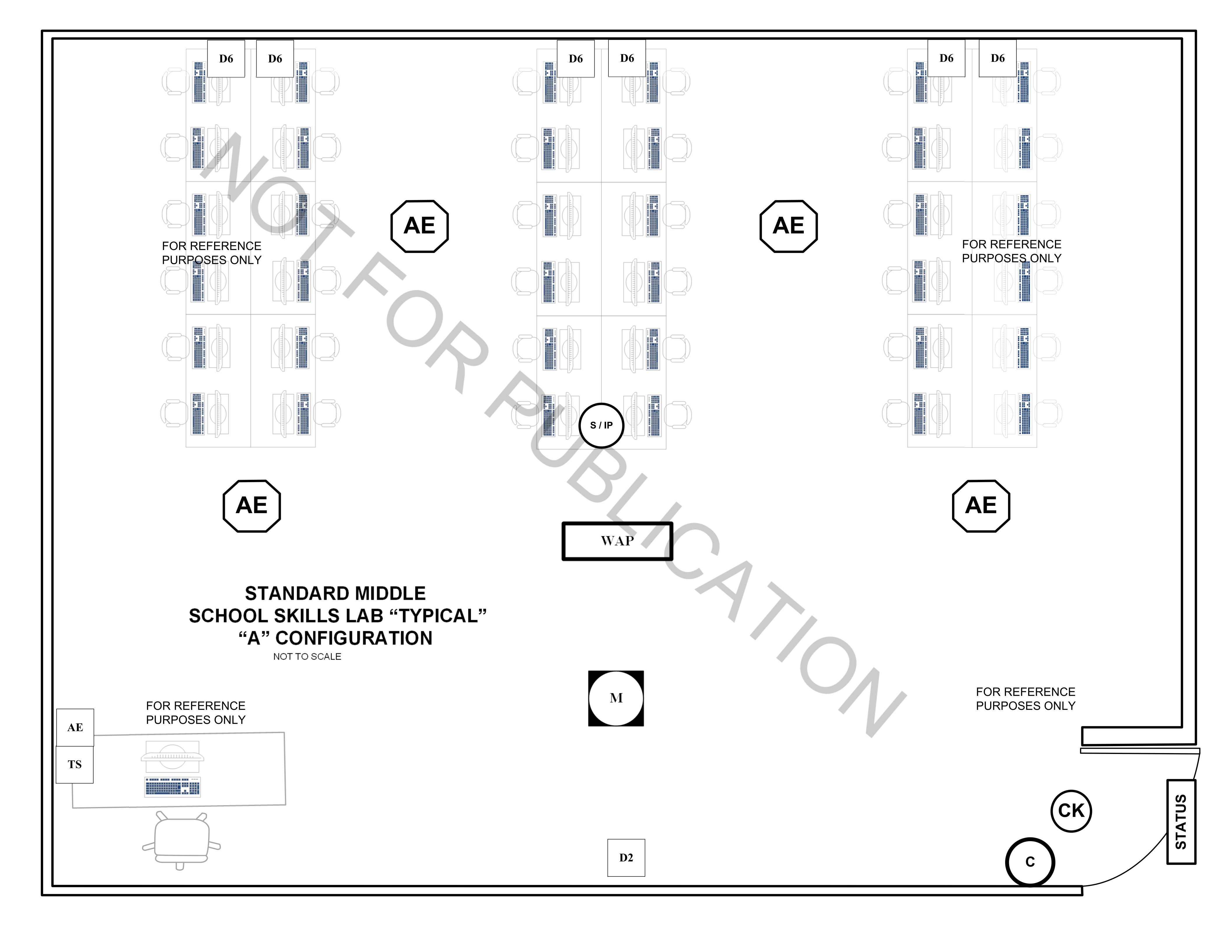
NOT TO SCALE

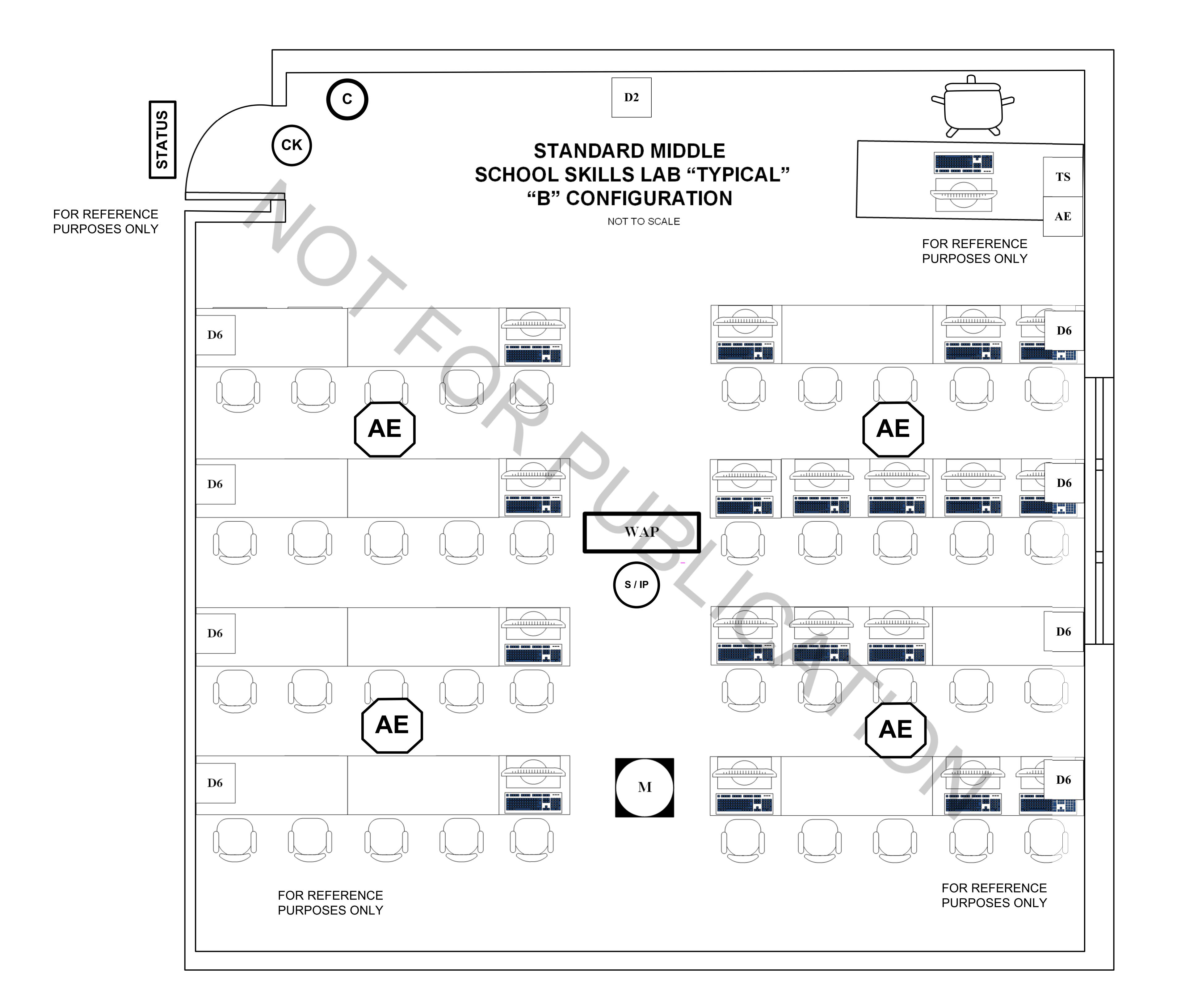


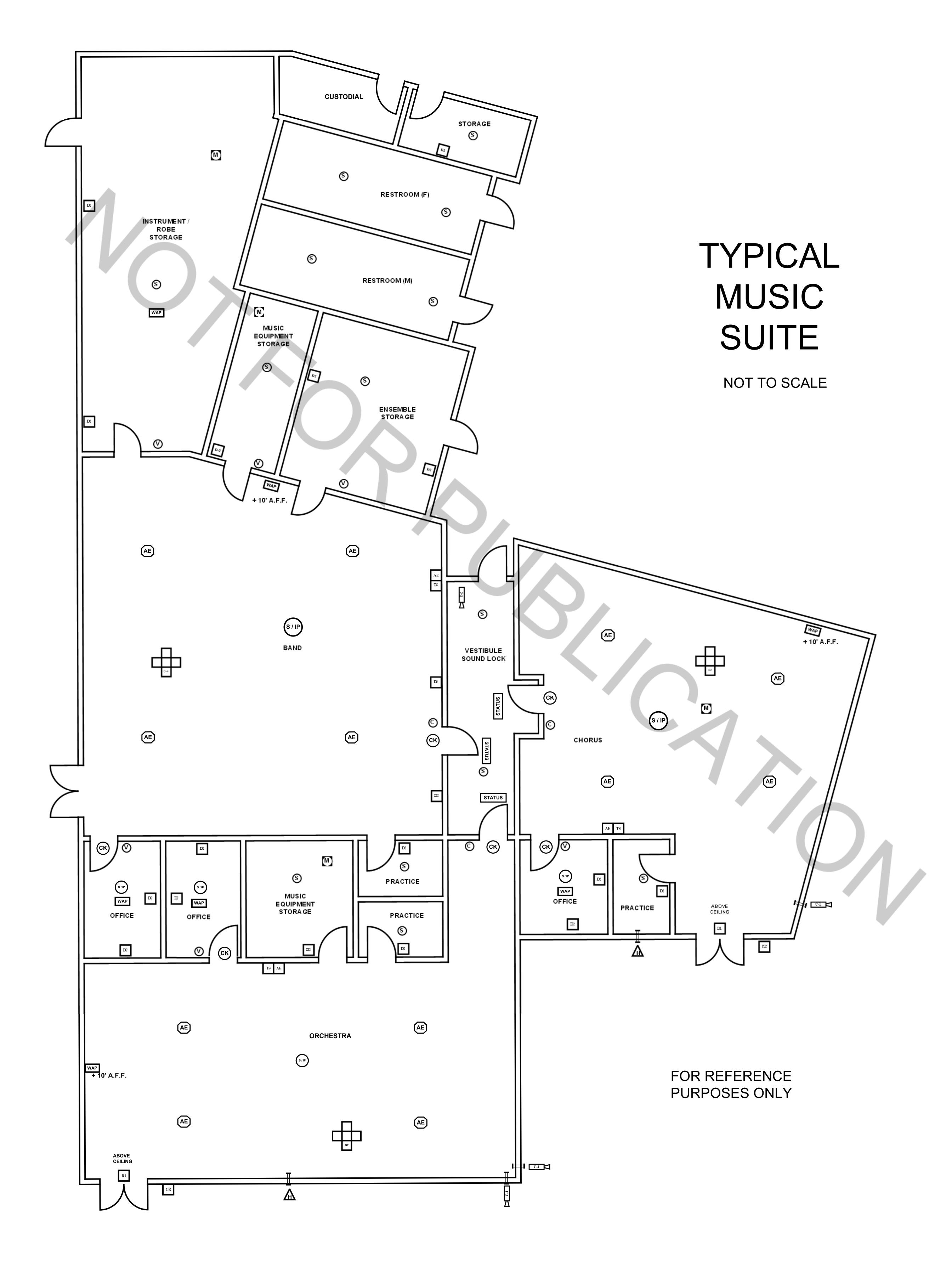
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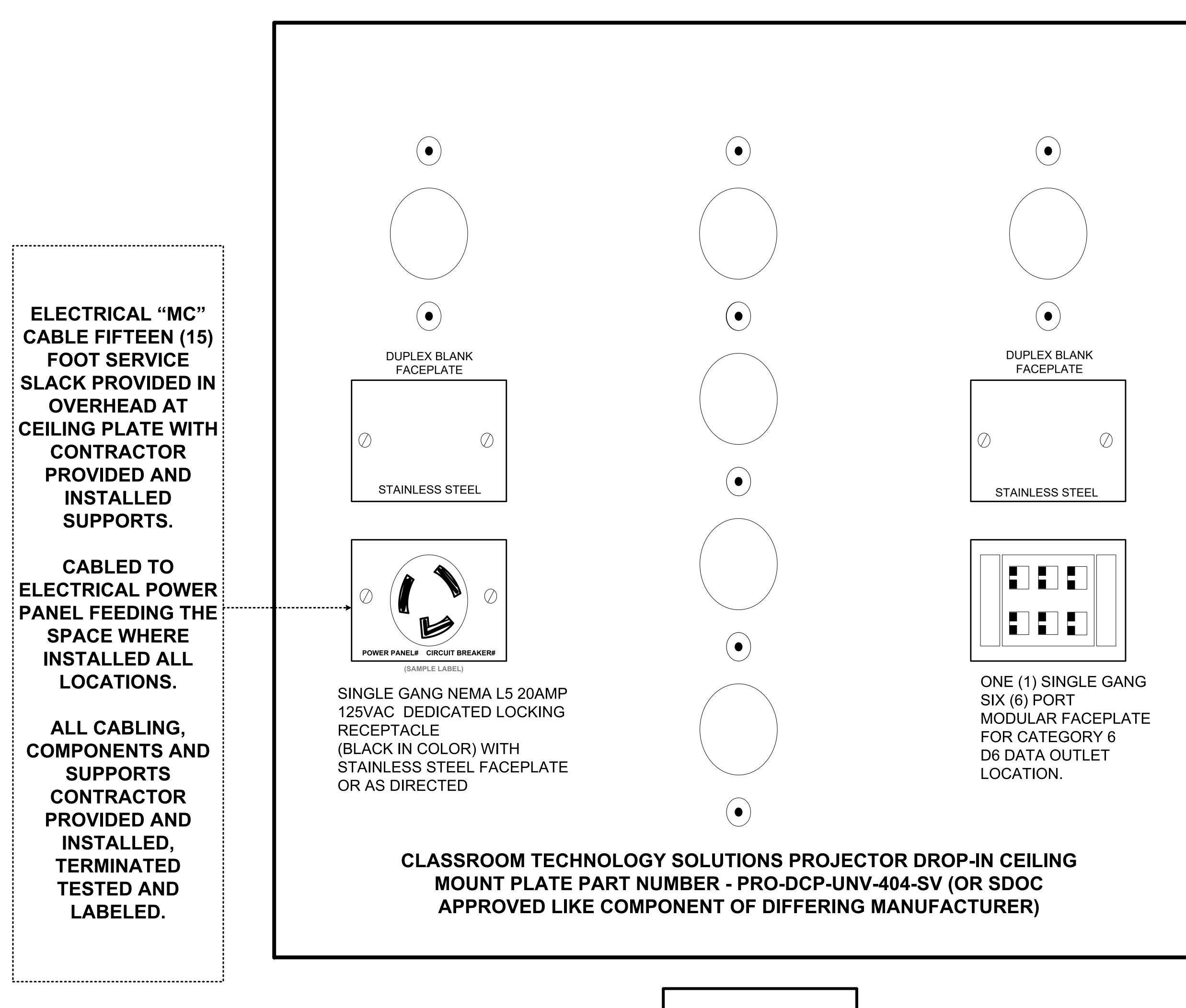




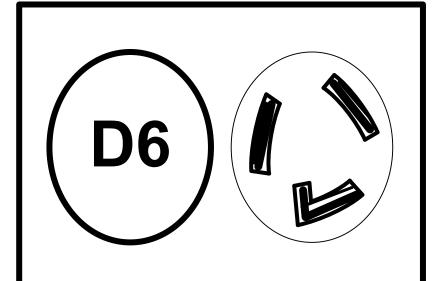




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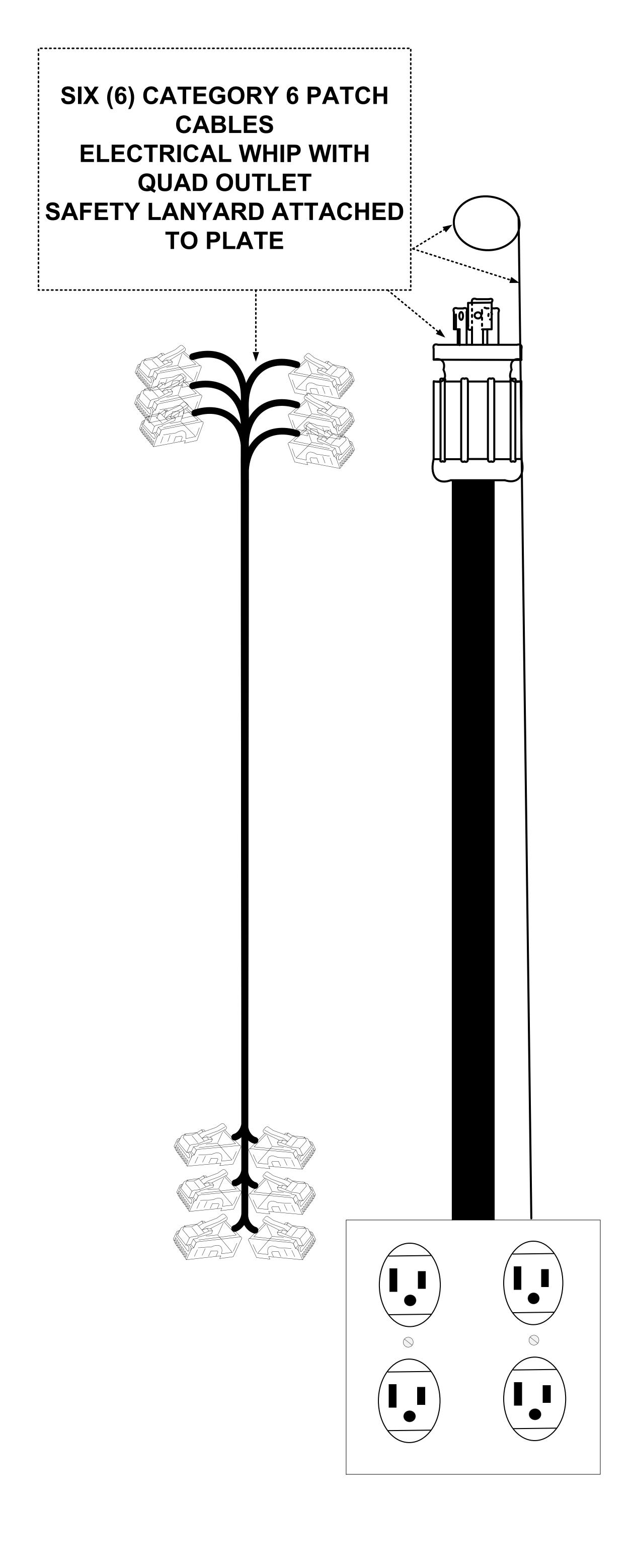


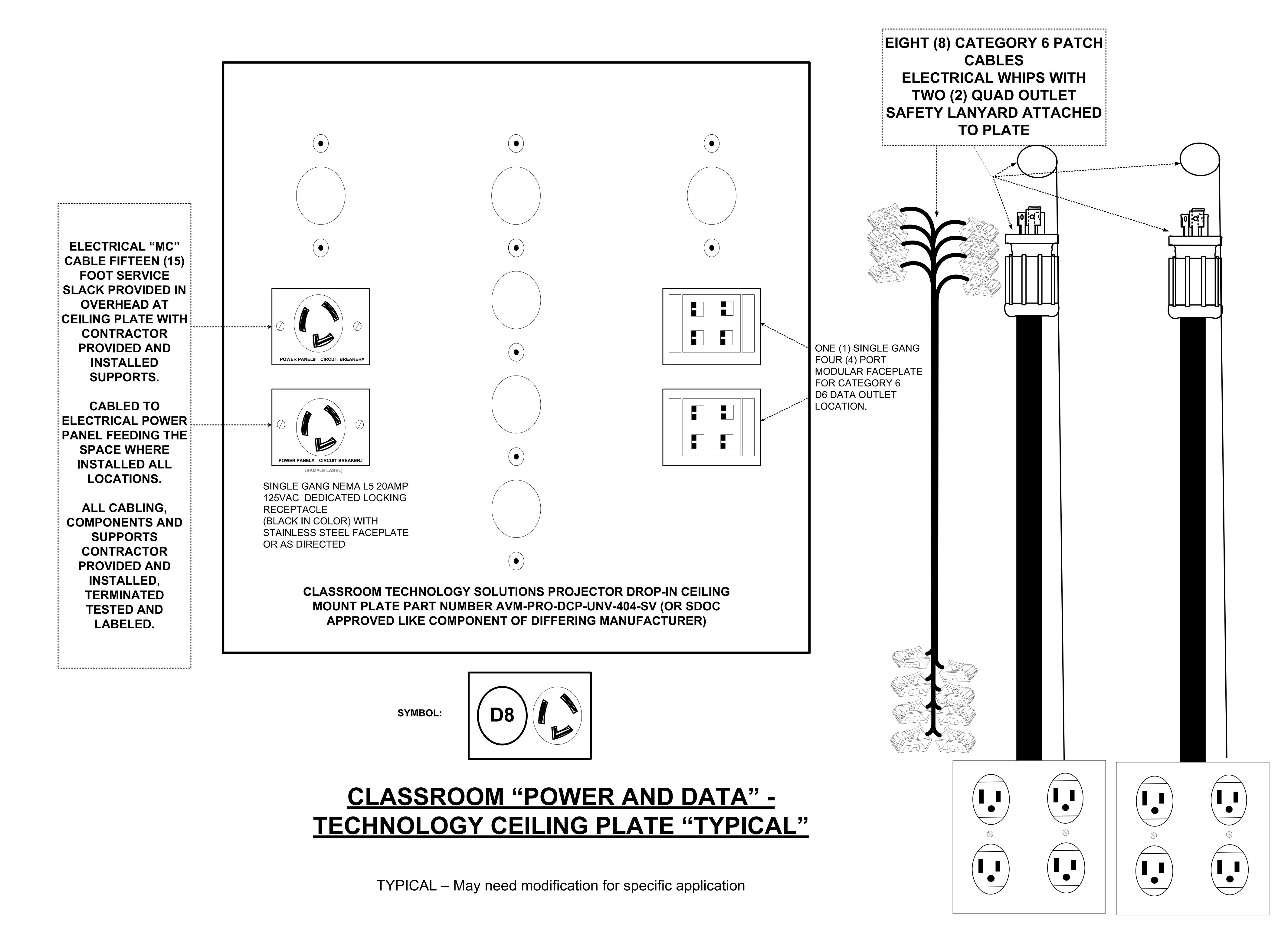
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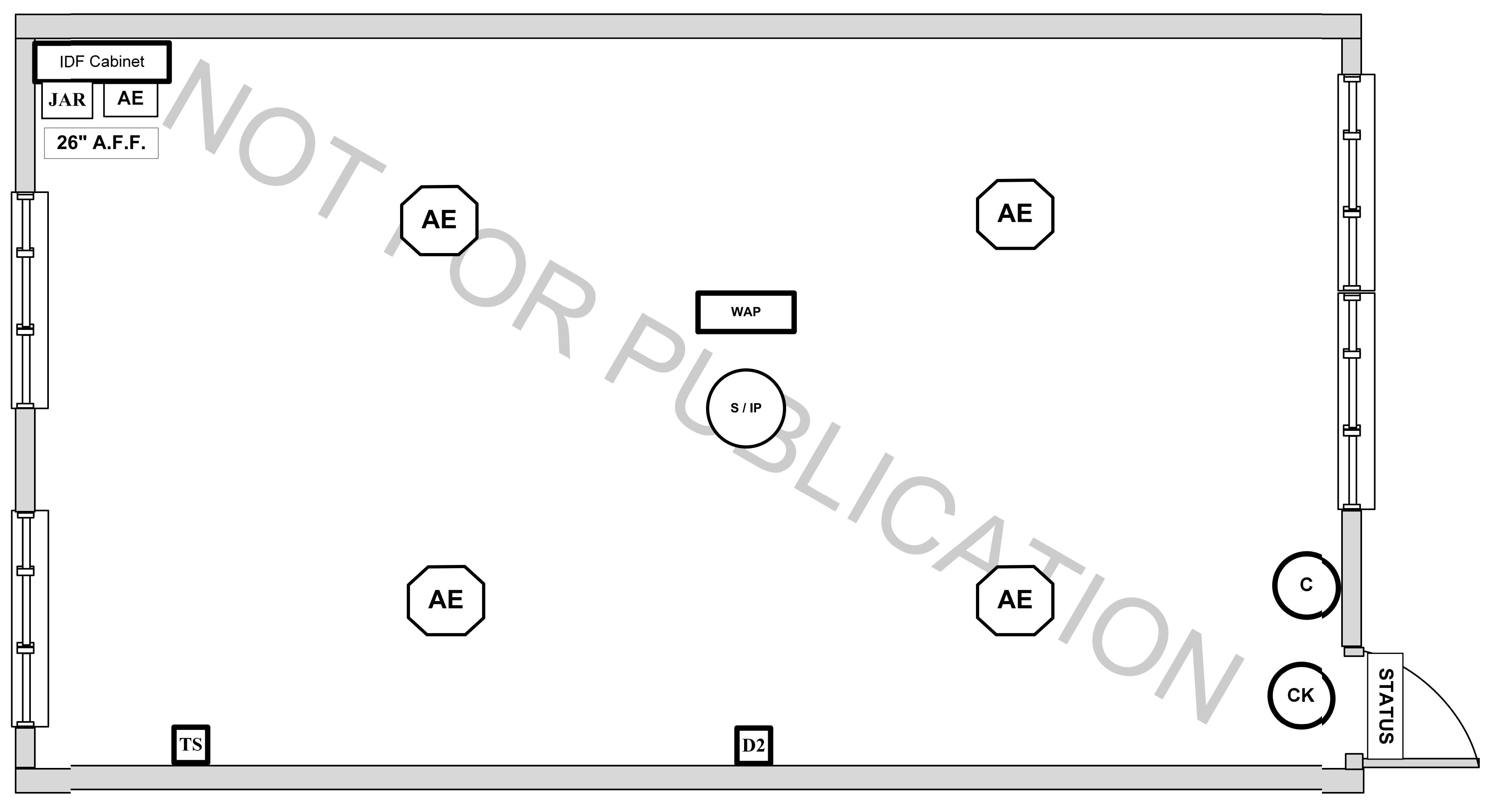


# CLASSROOM "POWER AND DATA" TECHNOLOGY CEILING PLATE "TYPICAL"

TYPICAL – May need modification for specific application





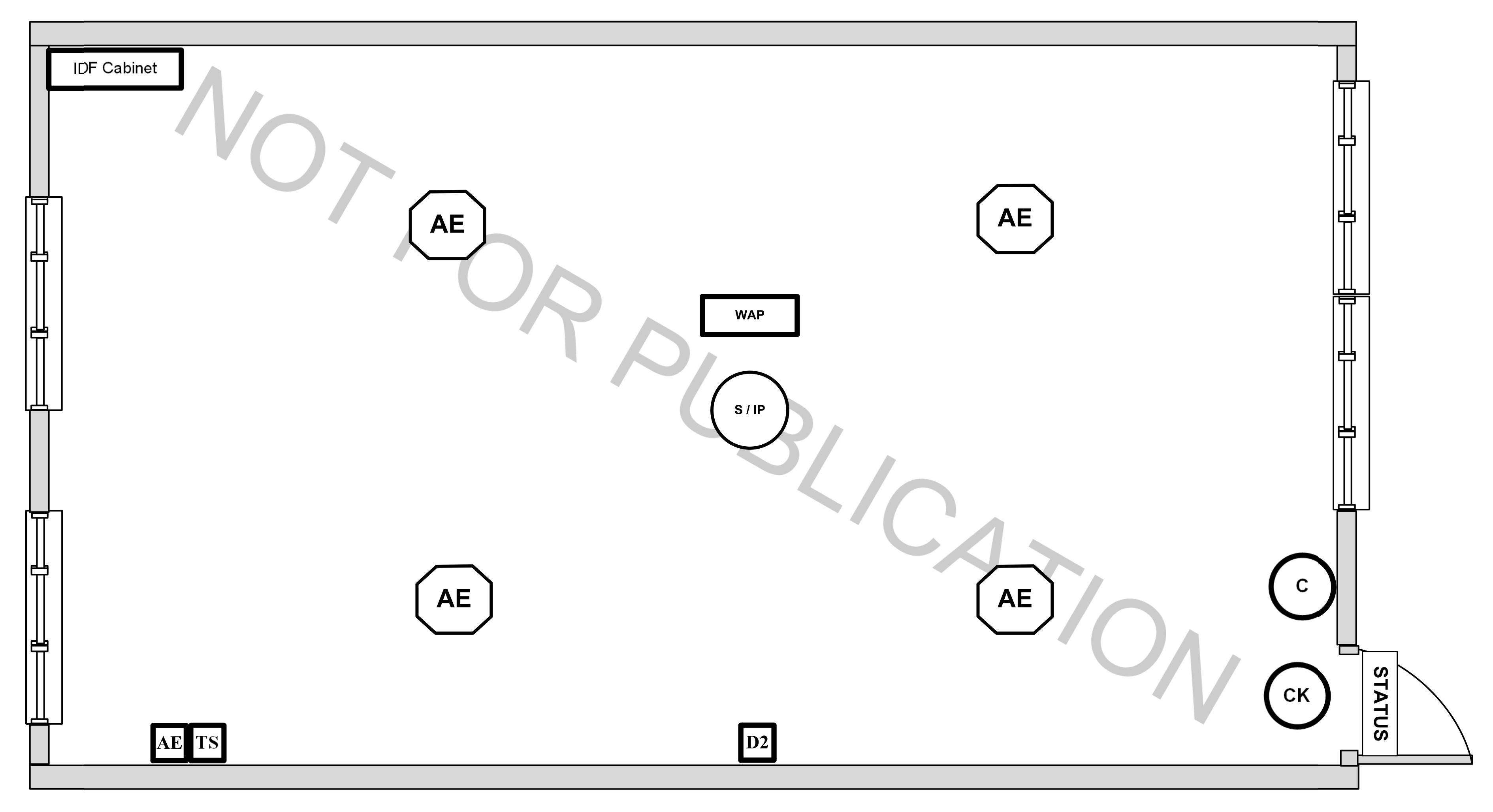


FOR REFERENCE PURPOSES ONLY

Portable
Interior Layout
Typical w/o Teaching Wall

Not to Scale
All locations are approximations

FOR REFERENCE PURPOSES ONLY

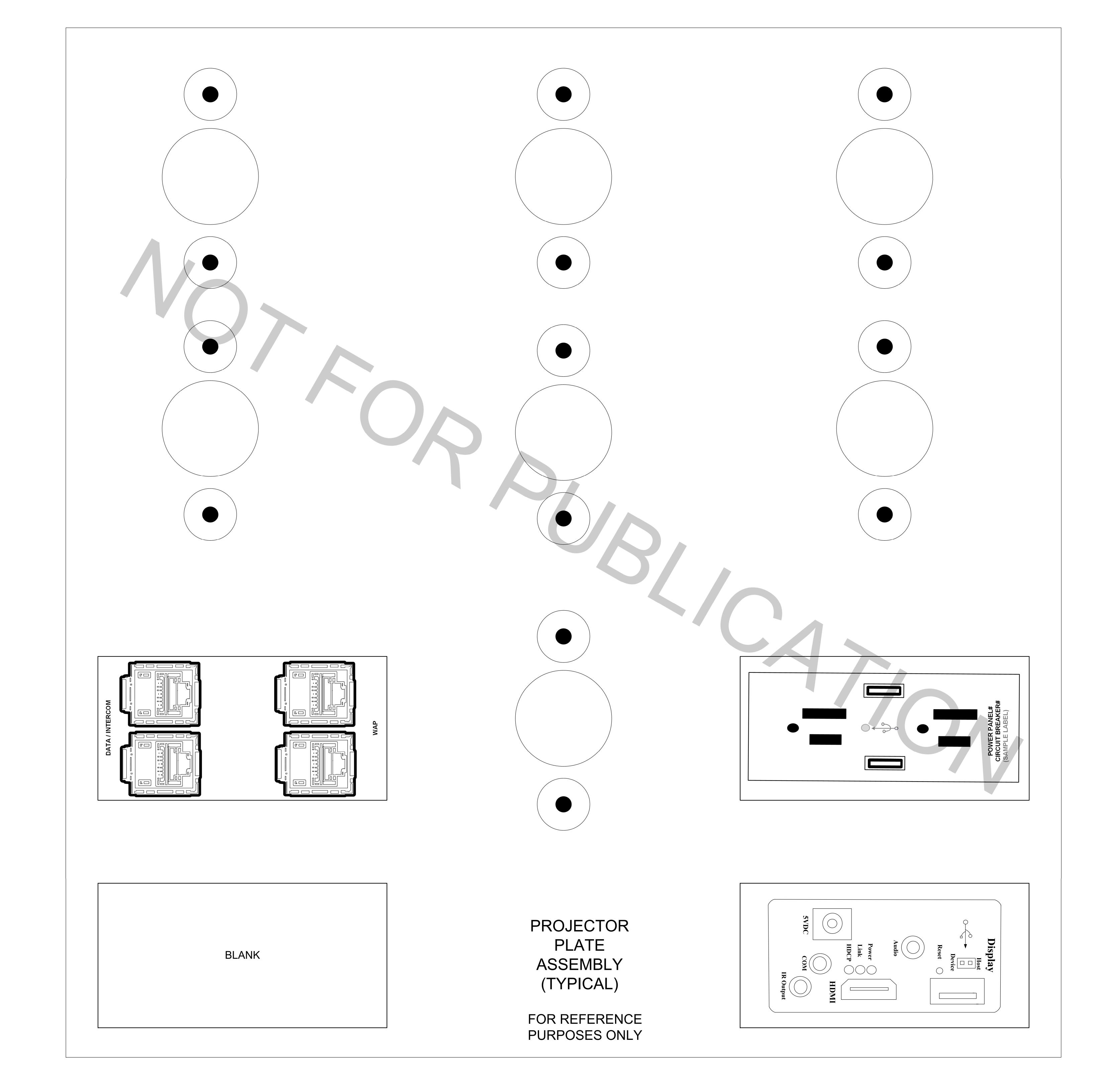


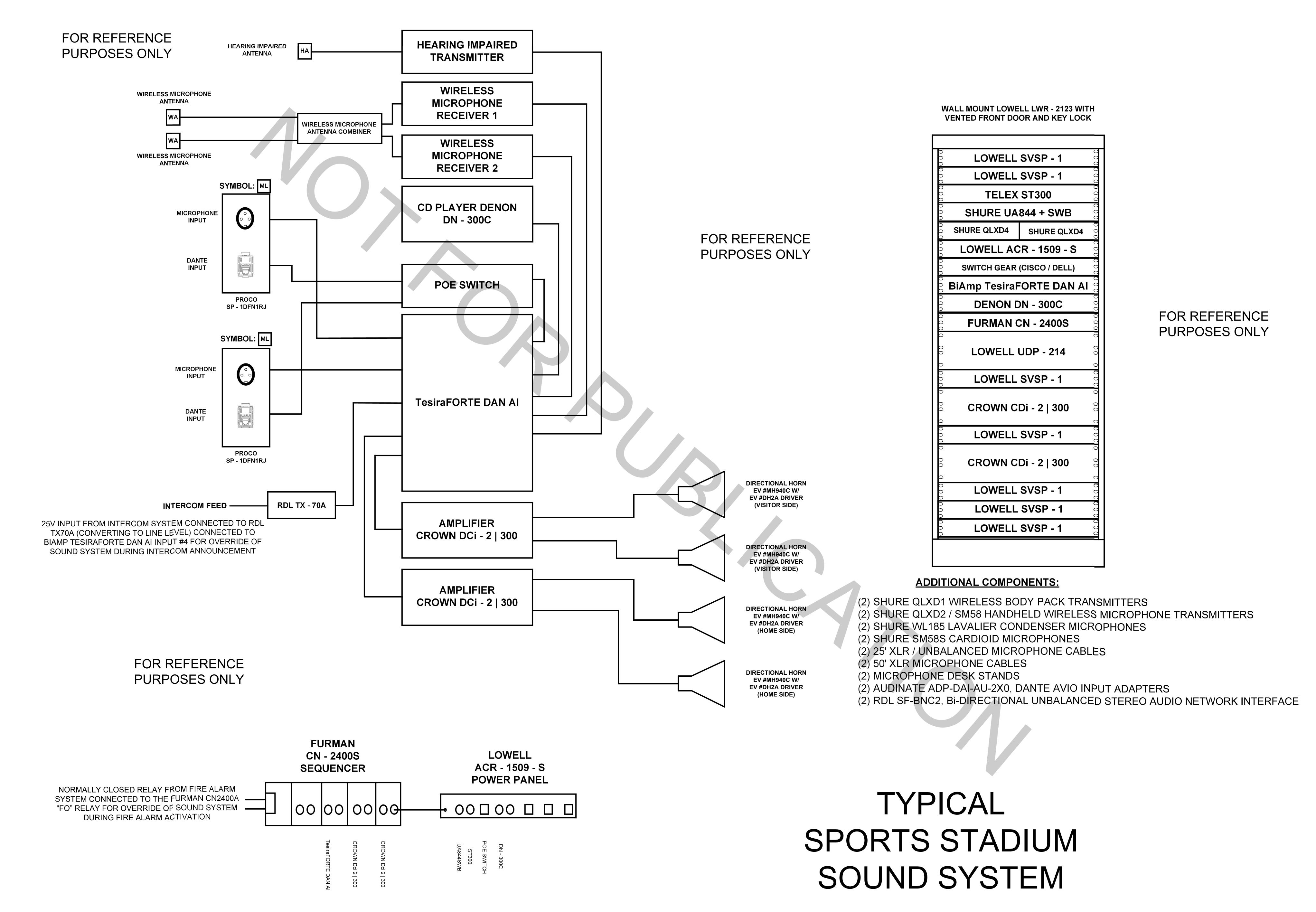
FOR REFERENCE PURPOSES ONLY

Portable
Interior Layout
Typical

Not to Scale
All locations are approximations

FOR REFERENCE PURPOSES ONLY





NOT TO SCALE

# FOR REFERENCE PURPOSES ONLY

ONE (1 1/4) INCH EMT CONDUIT OR OTHER SDOC APPROVED PATHWAY **VERTICAL TO SIX (6) INCHES ABOVE** FINISHED CEILING REAMED AND **BUSHED ALL LOCATIONS** (1) TECHNOLOGY ASSEMBLIES SHOWN SHALL BE MOUNTED ON CONTRACTOR PROVIDED AND INSTALLED: DOUBLE GANG EMT WALL BOX 4"H X 4"D CONSISTING OF HUBBELL GANGABLE HBL985 WALLBOX (\*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) INSTALLED WITH ONE (1) BARRIER (HUBBELL P/N# HBL989 \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) AS MANUFACTURER SPECIFIED LOW VOLTAGE PARTITION AT POWER RECEPTACLE LOCATION. COUPLED TO EMT WALL BOX SHALL BE 1 1/4 INCH EMT CONDUIT (\*OR SDOC APPROVED EQUIVALENT PATHWAY) INSTALLED VERTICALLY AND STUBBED OUT ABOVE CEILING REAMED AND BUSHED FOR CATEGORY 6A DATA OUTLET CABLING. (2) HUBBELL ISTATION MODULAR FACEPLATE FRAME - 1-GANG DECORATOR 1-GANG ISTATION MODULAR FACEPLATE (HUBBELL CD (MDF) / FD (IDF) P/N# IMFP1D10W - \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) A1 (SAMPLE LABEL) A2 (3) TWO INSTALLED KEYSTONE MODULE FLAT, 2-PORT (HUBBELL P/N# IM2K1OW -\*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) INSTALLED IN EACH KEYSTONE MODULE SHALL BE TWO (2): NEXTSPEED CATEGORY 6A JACKS (HUBBELL P/N# HXJ6OW - \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) FOR A TOTAL OF TWO (2) CATEGORY 6A JACKS WHEN COMPLETE. (4) BLANK MODULE (HUBBELL P/N# IMB05OW - \*OR SDOC APPROVED SAME COMPONENT OF DIFFERING MANUFACTURER) (5) DUPLEX GENERAL POWER RECEPTACLE 20A 125VAC (HUBBELL P/N# AVPS20BK \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) (EACH POWER RECEPTACLE SHALL BE TERMINATED AT LOCAL POWER PANEL AND SHALL BE LABELED ON THE RECEPTACLE WITH THE POWER PANEL NUMBER AND CIRCUIT BREAKER NUMBER AT POWER PANEL# POWER PANEL# **CIRCUIT BREAKER#** ALL LOCATIONS.) **CIRCUIT BREAKER#** (ALL CABLING AND COMPONENTS CONTRACTOR PROVIDED AND (SAMPLE INSTALLED, TERMINATED, TESTED, LABELED ALL LOCATIONS) Audio Enhancement Amplification Equipment CD (MDF) / FD (IDF) (6) OPEN SPACE A1 (SAMPLE LABEL) A2 AREA LEFT OPEN FOR AUDIO ENHANCEMENT CABLING TO BE COVERED BY AUDIO ENHANCEMENT AMPLIFICATION TS / AE **EQUIPMENT.** 

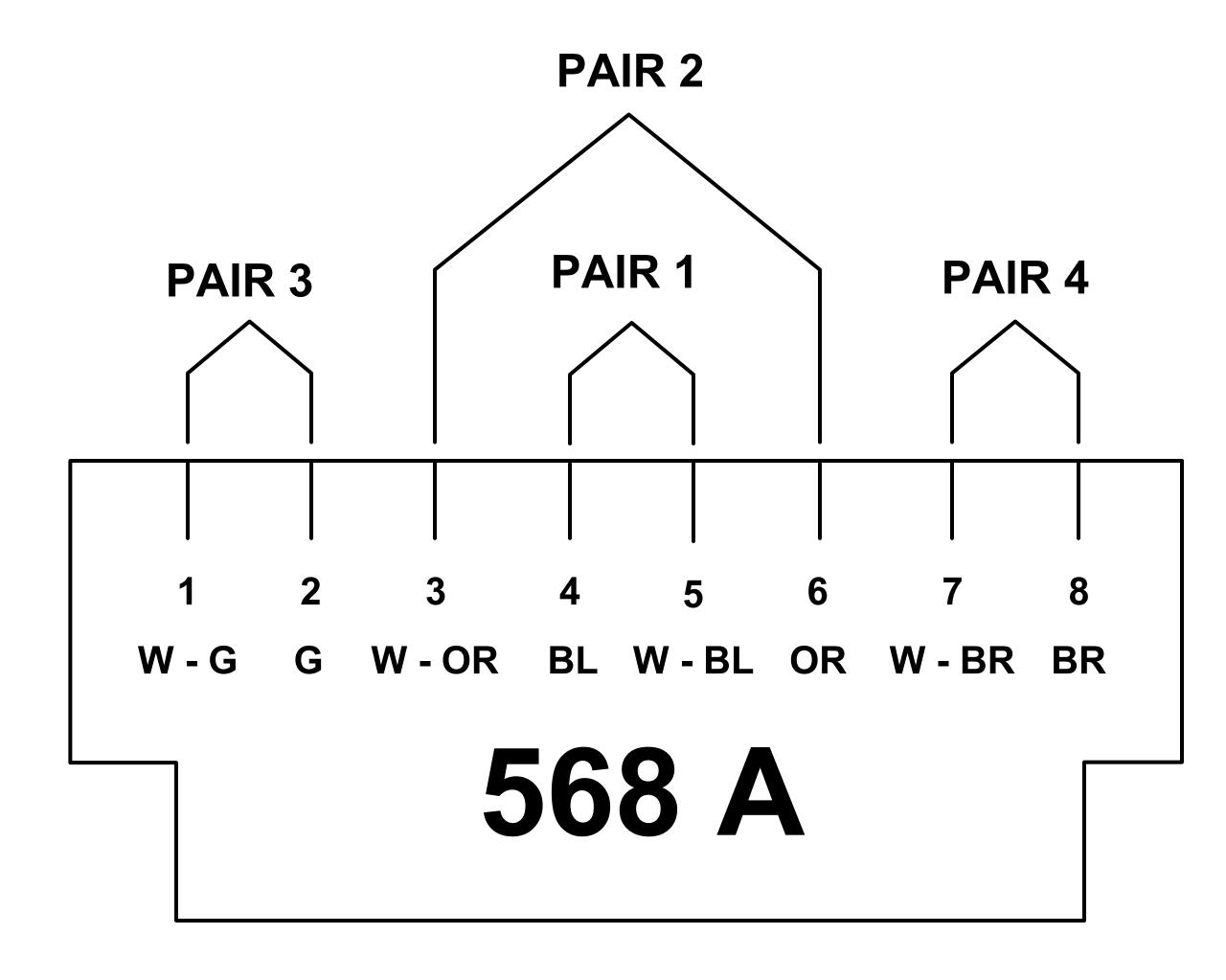
TEACHER STATION / AUDIO ENHANCEMENT AMPLIFICATION EQUIPMENT INSTALLED AT ALL DESIGNATED DATA OUTLET WALL LOCATIONS AT EIGHTEEN (18) INCHES TO THE CENTER OF EACH BOX ABOVE FINISHED FLOOR.

(DETAIL NOT TO SCALE)

ELECTRICAL "MC" OR EMT CONDUIT VERTICAL TO ABOVE CEILING TO ELECTRICAL PANEL ALL LOCATIONS

## (NOT TO SCALE)

# SDOC RJ45 MODULAR JACK AND PATCH PANEL PORT TERMINATION METHOD 568 "A" ONLY CONFIGURATIONS U.O.N.



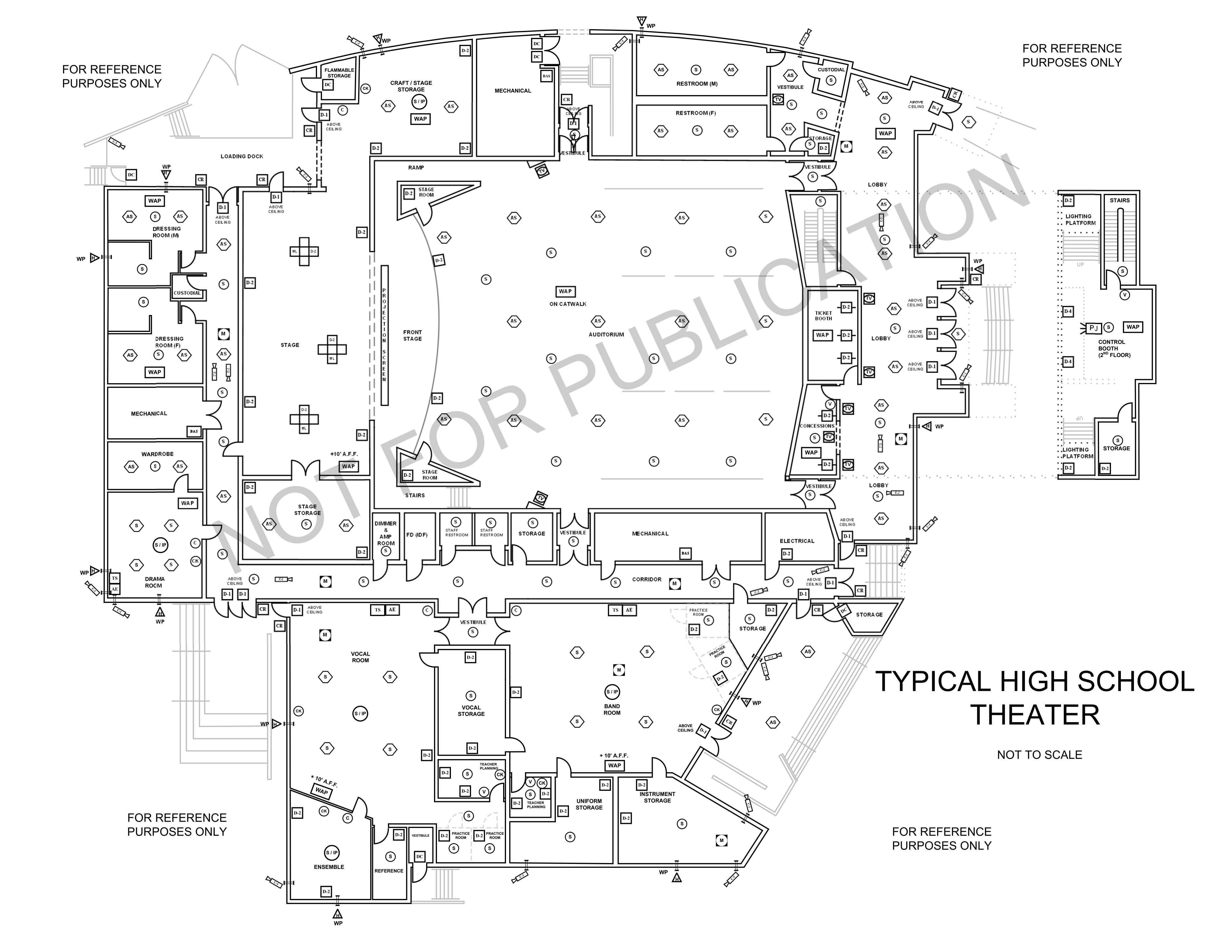
## NOTE:

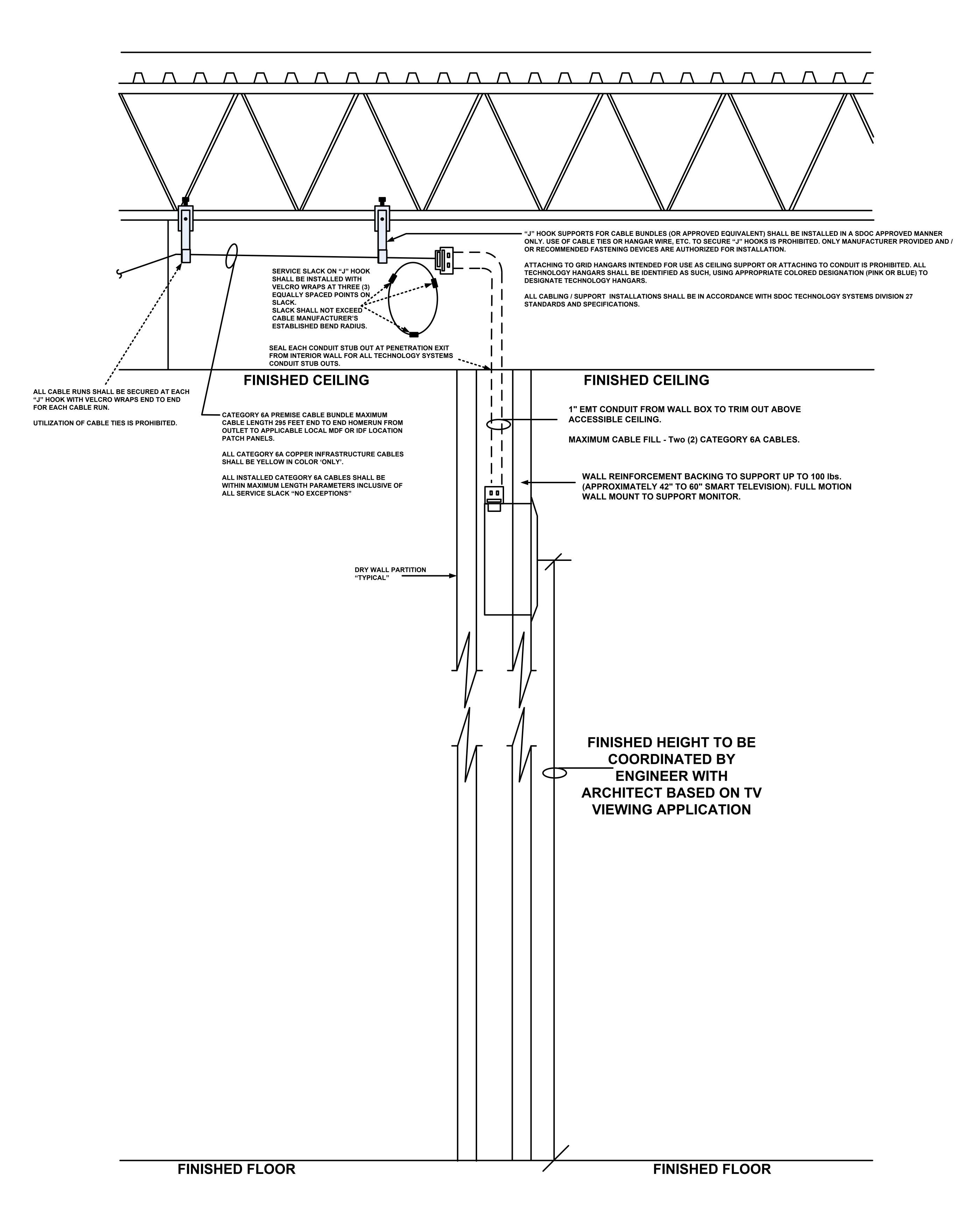
EIGHT (8) - POSITION JACK PIN / PAIR ASSIGNMENTS EIA / TIA - 568A.

(ALL FOUR (4) PAIR CATEGORY 6A COPPER DATA CABLES SHALL BE TERMINATED IN THIS CONFIGURATION "ONLY" FOR ALL SCHOOL DISTRICT OF OSCEOLA COUNTY, FLORIDA CONFIGURATIONS.

# SDOC CATEGORY 6A MODULAR JACK WIRING CONFIGURATION DETAIL "TYPICAL"

(NOT TO SCALE)





# TYPICAL WALL MOUNTED TECHNOLOGY COMMUNICATIONS TV DATA OUTLET

(1) TECHNOLOGY ASSEMBLIES SHOWN SHALL BE MOUNTED ON CONTRACTOR PROVIDED AND INSTALLED:

DOUBLE GANG EMT AV WALL BOX 4"H X 4"D CONSISTING OF HUBBELL GANGABLE HBL985 WALLBOX (\*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) INSTALLED WITH ONE (1) BARRIER (HUBBELL P/N# HBL989 \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) AS MANUFACTURER SPECIFIED LOW VOLTAGE PARTITION AT POWER RECEPTACLE LOCATION.

COUPLED TO EMT AV WALL BOX SHALL BE ONE X ONE (1) INCH EMT CONDUIT (\*OR SDOC APPROVED EQUIVALENT PATHWAY) INSTALLED VERTICALLY AND STUBBED OUT ABOVE CEILING REAMED AND BUSHED FOR CATEGORY 6A DATA OUTLET CABLING.

(2) HUBBELL ISTATION MODULAR FACEPLATE FRAME - 1-GANG DECORATOR 1-GANG ISTATION MODULAR FACEPLATE (HUBBELL

P/N# IMFP1D10W

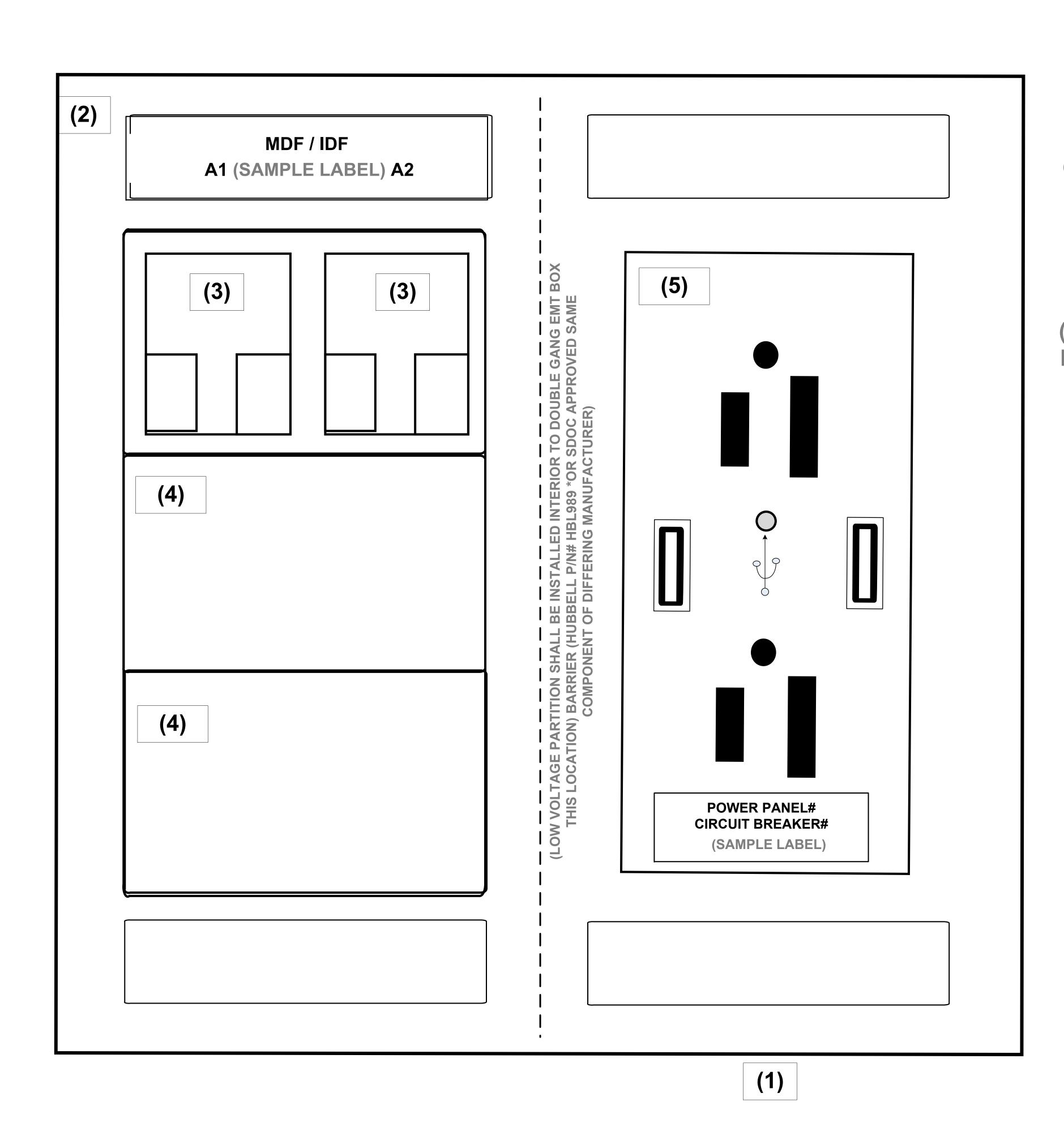
- \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER)

(3) TWO INSTALLED KEYSTONE MODULE FLAT, 2-PORT (HUBBELL P/N# IM2K1OW – \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER) INSTALLED IN EACH KEYSTONE MODULE SHALL BE TWO (2):

NEXTSPEED CATEGORY 6 JACKS
(HUBBELL P/N# HXJ6OW – \*OR SDOC APPROVED LIKE COMPONENT OF DIFFERING MANUFACTURER)
FOR A TOTAL OF TWO (2) CATEGORY 6 JACKS WHEN COMPLETE.

(4) BLANK MODULE (HUBBELL P/N# IMB05OW - \*OR SDOC APPROVED SAME COMPONENT OF DIFFERING MANUFACTURER)

(5) DUPLEX GENERAL POWER RECEPTACLE
20A 125VAC
(HUBBELL P/N# AVPS20BK \*OR SDOC APPROVED LIKE
COMPONENT OF DIFFERING MANUFACTURER)
(EACH POWER RECEPTACLE SHALL BE TERMINATED AT
LOCAL POWER PANEL FEEDING THE PORTABLE AND
SHALL BE LABELED ON THE RECEPTACLE WITH THE
POWER PANEL NUMBER AND CIRCUIT BREAKER
NUMBER AT ALL LOCATIONS.)
(ALL CABLING AND COMPONENTS CONTRACTOR
PROVIDED AND INSTALLED, TERMINATED, TESTED,
LABELED ALL LOCATIONS)



**ELECTRICAL "MC"** OR EMT CONDUIT **VERTICAL TO ABOVE CEILING TO ELECTRICAL PANEL ALL LOCATIONS** ONE (1) INCH EMT CONDUIT OR OTHER SDOC **APPROVED PATHWAY VERTICAL TO SIX** (6) INCHES ABOVE FINISHED CEILING REAMED AND **BUSHED ALL** LOCATIONS TV

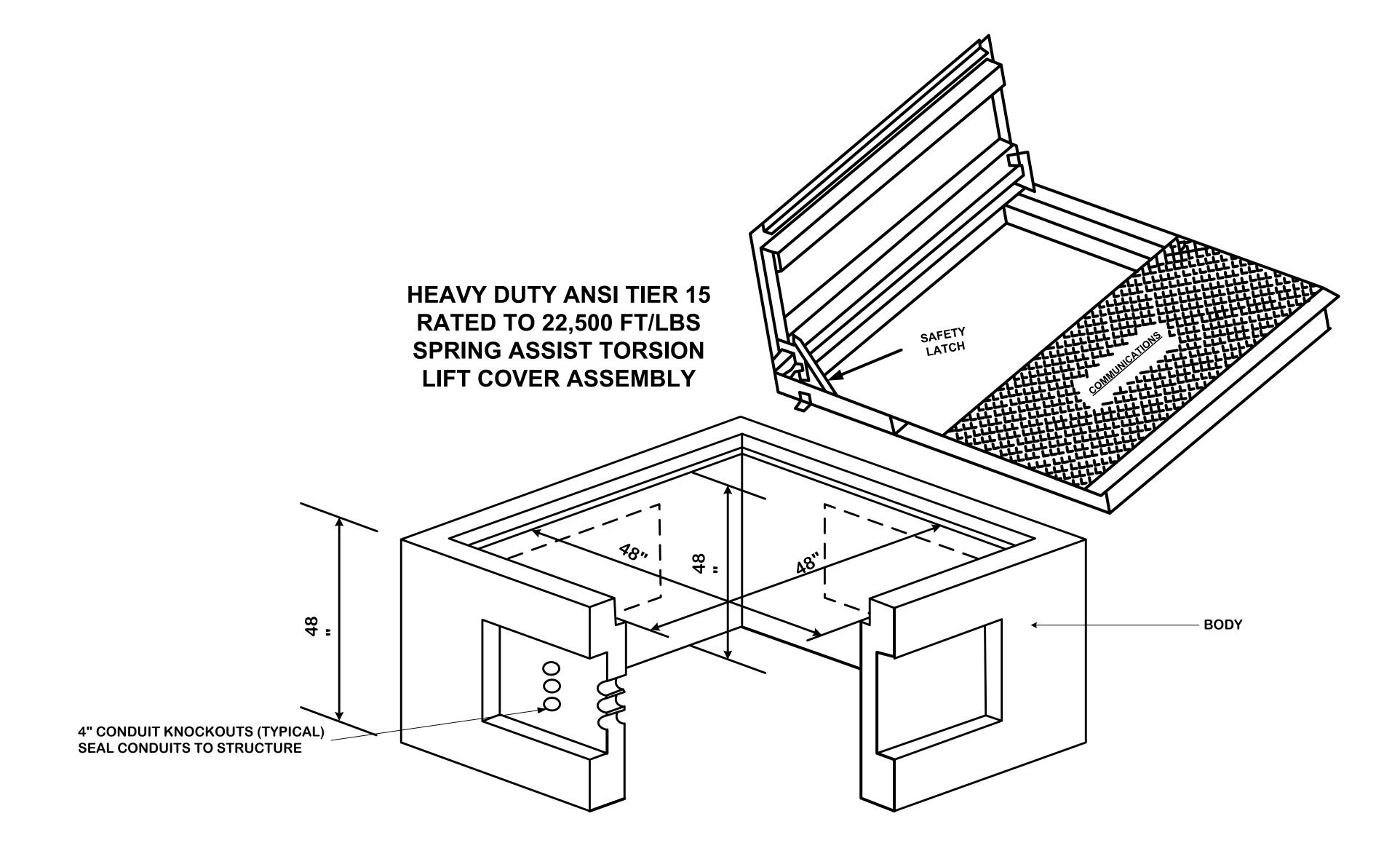
TYPICAL TV DATA OUTLET DETAIL
INSTALLED AT ALL DESIGNATED TV OUTLET WALL LOCATIONS
ENGINEER TO COORIDINATE HEIGHT WITH ARCHITECT BASED ON TV
APPLICATION.

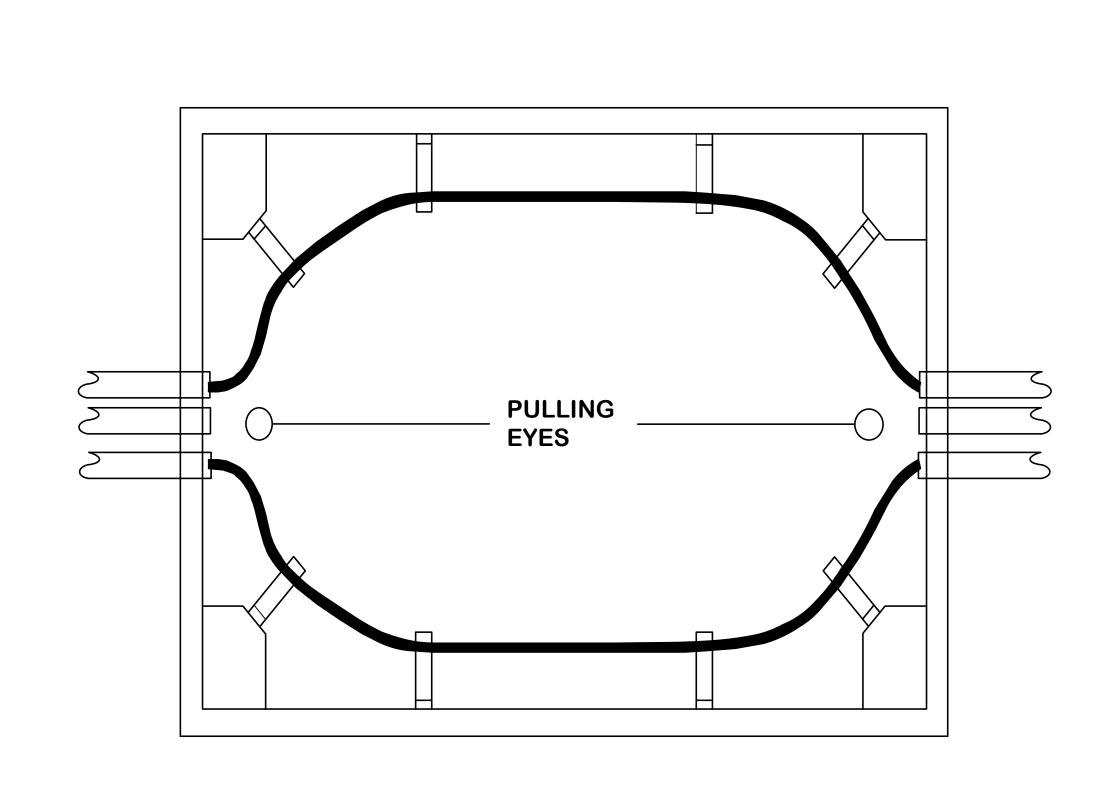
(DETAIL NOT TO SCALE)

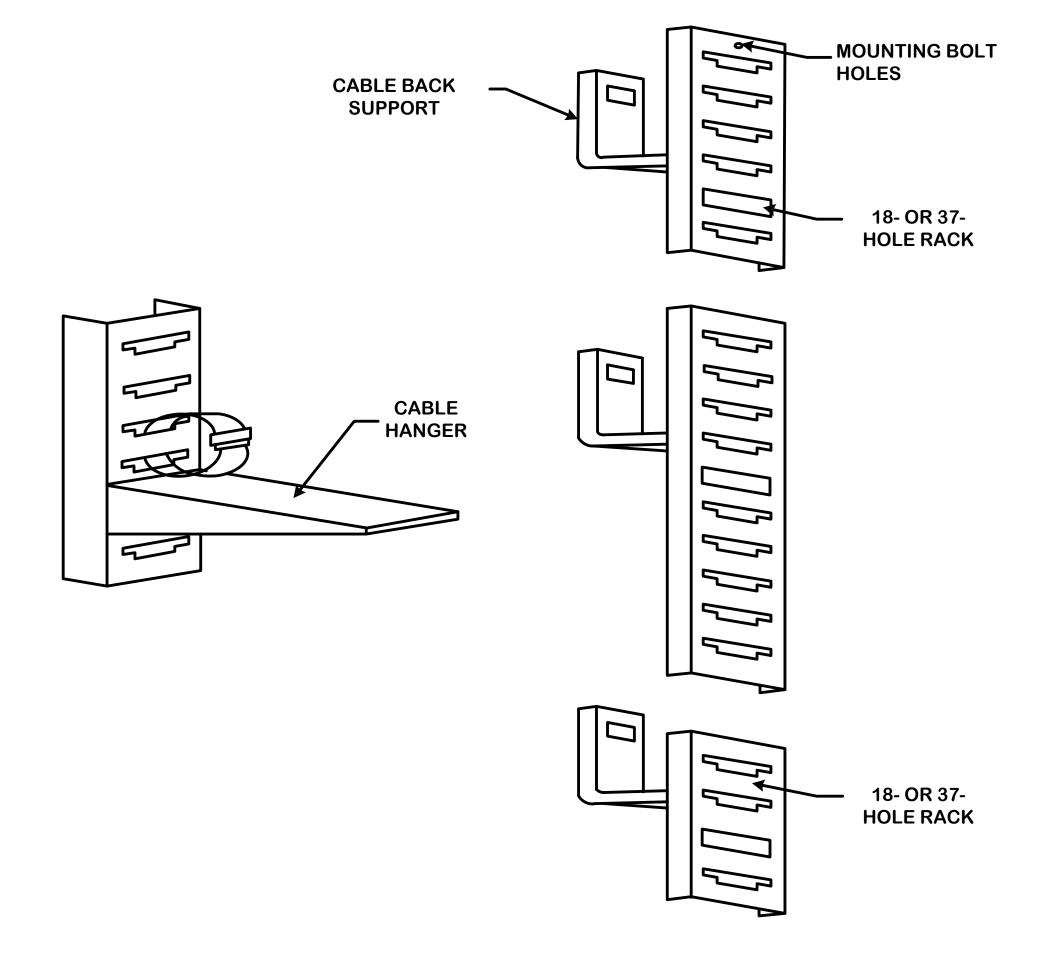
### **UTILITY VAULT NOTES:**

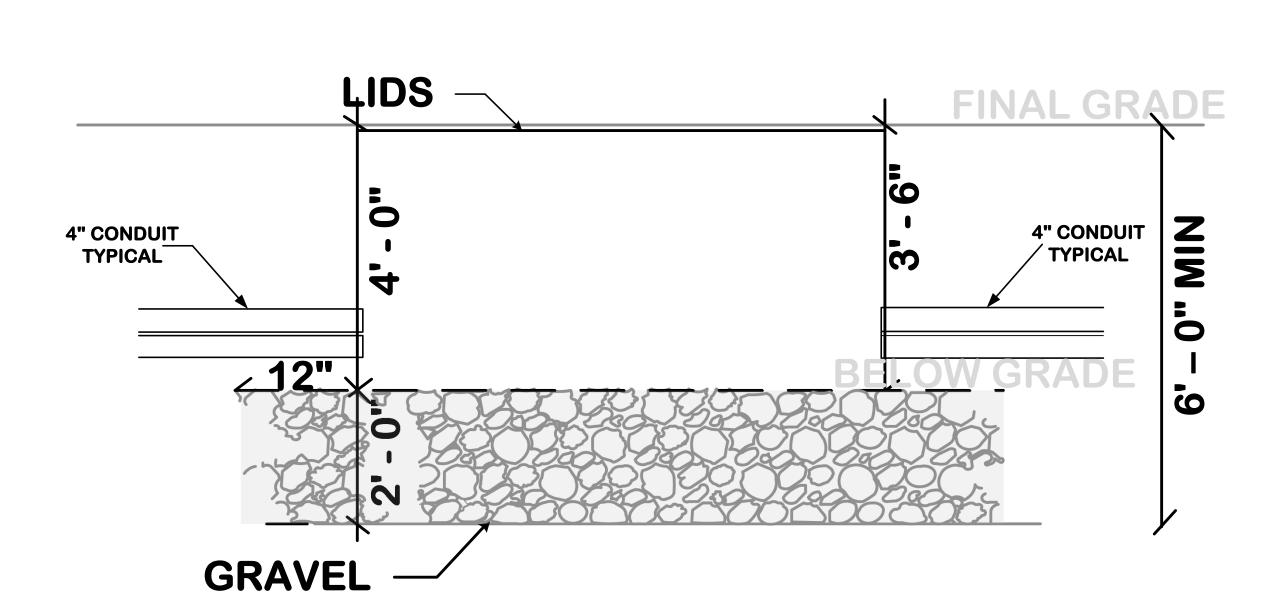
BOTTONS.

- 1. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS AND THESE REQUIREMENTS.
- 2. ANSI / SCTE 77 TIER RATED FOR ENVIRONMENT AS DETERMINED APPLICABLE BY PROJECT ENGINEER.
- DESIGN CONCRETE STRUCTURE AND STEEL COVER FOR HS-20-44 LOADING LIDS ARE TO HAVE OPEN
- 4. USE ASTM A-615 REINFORCING STEEL WITH 60,000 psi YIELD.
- 5. ONE (1) LID MUST HAVE "COMMUNICATIONS" LOGO PERMANENTLY STAMPED.
- 6. 24" GRAVEL BASE EXTEND 12" BEYOND EXTERIOR OF VAULT ON ALL SIDES.
- 7. PROVIDE INSERTS FOR TWO CABLE RACKS ON EACH WALL. LOCATE INSERTS TO CLEAR DUCT ENTRIES.
- 8. ALL CABLES SHALL BE PROPERLY ROUTED AND SECURED AGAINST THE SIDES OF ALL COMMUNICATION VAULTS USING PROPER SUPPORTS AS REQUIRED.
  - CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PRODUCT AND CODE SPECIFIC
- REQUIREMENTS FOR INSTALLATION, REGARDLESS OF ERROR OR OMISSION IN THIS INFORMATIONAL DETAIL.
- 10. MAXIMUM DISTANCE BETWEEN VAULTS SHALL NOT EXCEED 500 FEET NO EXCEPTIONS



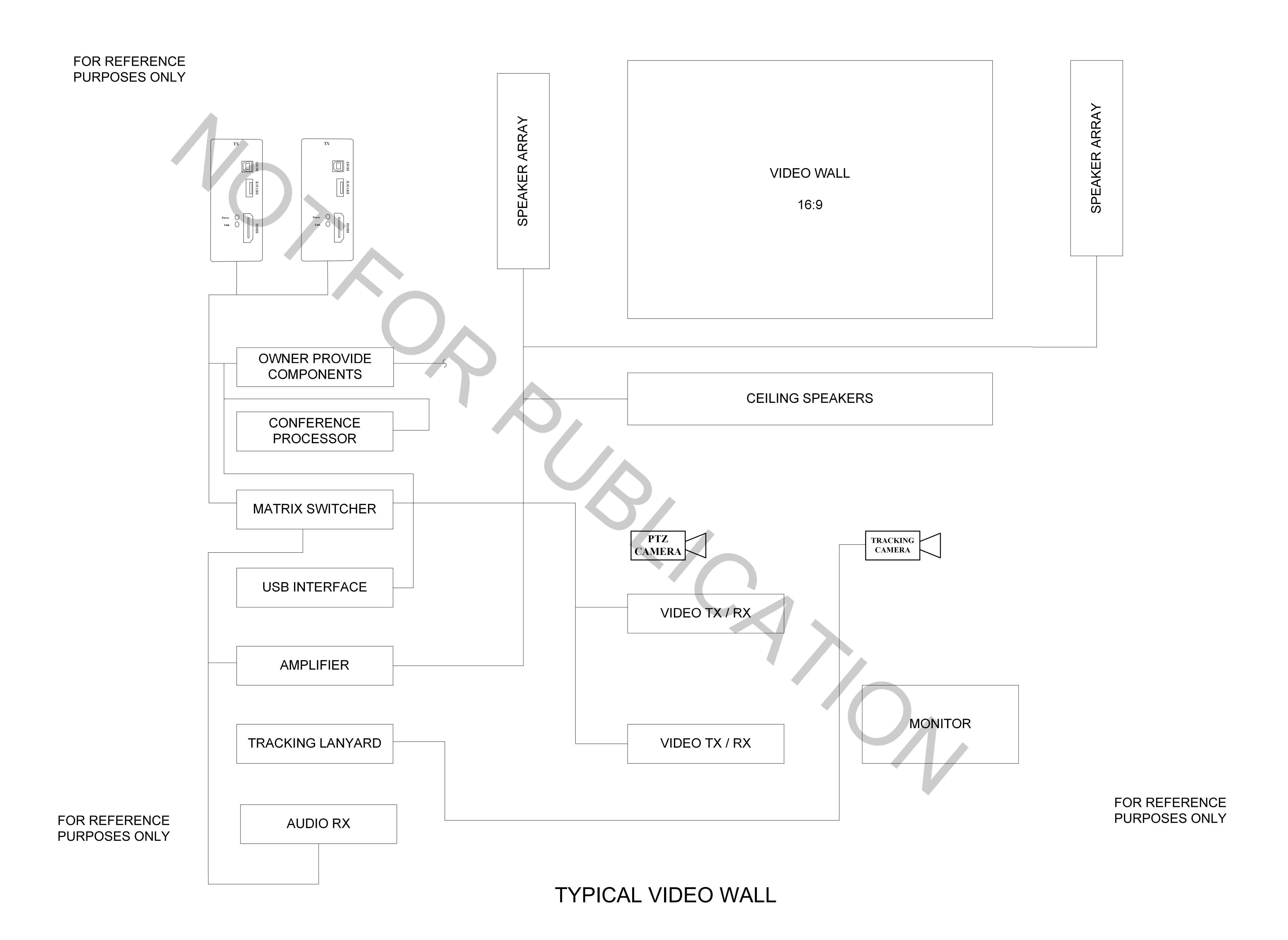






## **COMMUNICATION VAULTS**

(NOT TO SCALE)



#### SECURITY SYSTEMS ADDENDUM 1

#### PART 1 GENERAL

#### 1.1 INTRODUCTION

A. Electronic safety and security systems are crucial in the protection of life and property at any school campus or ancillary facility. This section is developed to ensure all safety and security systems are installed to provide maximum coverage and peak operability. With the convergence of information technology and traditional building systems, it is imperative that these systems integrate seamlessly with the School District of Osceola County's (SDOC) data network, structured cabling and telecommunications spaces to function properly and reliably. Therefore, electronic safety and security system device symbols and details for access control, video surveillance and intrusion detection shall be shown on the technology drawings (T-sheets) and the following requirements shall be followed in addition to relevant Division 28 specifications.

#### PART 2 ACCESS CONTROL (Section 28 10 00)

#### 2.1 CONTRACTOR'S QUALIFICATIONS

- A. The Contractor(s) must hold a Certified Electrical Contractor (EC), Certified Alarm Contractor I (EF), or Certified Alarm Contractor II (EG) license as issued by the State of Florida Construction Industry Licensing Board according to Florida State Statutes, Chapter 489.
- B. The Access Control Detection Contractor must have successfully completed within the past three (3) years a minimum of ten (10) commercial Intrusion Detection jobs where the contract amount was \$5,000.00 or more.
- C. Must be a factory certified dealer of DORMAKABA Aurora and Keyscan product lines with full warranty privileges.
- All technicians dispatched to troubleshoot or program access control panels must be factory certified with DORMAKABA.

#### 2.2 INSTALLATION

- A. Standard Requirements for installation of complete Access Control system including servers, locks, strikes, card readers, and associated hardware:
  - 1. Access Control shall be installed at the following locations:
    - a) Campus primary entrance exterior doors (main entrance, administration lobby, staff entrance, and kitchen entrance)
    - b) All doors exiting the secure lobby
    - c) Critical kitchen area doors (dry storage and manager's office)
- B. All access control network cabling shall terminate to dedicated security patch panels in the local CD (MDF) / FD (IDF) location. Patch panel installation location in racks to be coordinated with SDOC Technology Services Department Network Communications Analyst (Kevin McKenzie) or designee.
- C. The structured cabling contractor shall be responsible for all network structured cabling including patch panels, pathways, supports, terminations, and associated hardware to support installation of access control system.
- D. Security Contractor shall be responsible for all access control hardware installation to manufacturer's specifications.
- E. Security contractor shall be responsible for all low voltage cabling between controllers and devices.
- F. Security contractor shall provide all certified category 6 patch cords, orange in color, required at each end.
- G. All cabling shall be labeled at both ends to indicate device number, patch panel number and port number. All labels shall be printed in accordance with UL 969, not handwritten.
- H. All cabling work must be completed in accordance with, but not limited to:
  - 1. The National Electrical Code Latest Edition
  - 2 BICSI Telecommunications Distribution Methods Manual Latest Edition
  - 3. BICSI Information Technology Systems Installation Methods Manual Latest Edition
  - 4. School District of Osceola County Division 27 Standards and Specifications.

- I. The School District of Osceola County shall be responsible to provide DORMAKABA Aurora server, server configuration, network switches, server cabinet, UPS, switch port configuration, user credentials, user configuration, and scheduleconfiguration.
- J. Security Contractor shall provide and install all other equipment and perform all other system configuration as required for a complete and operational access control system.

#### PART 3 VIDEO SURVEILLANCE (Section 28 20 00)

#### 3.1 CONTRACTOR QUALIFICATIONS:

- A. The Contractor(s) must hold a Certified Electrical Contractor (EC), Certified Alarm Contractor I (EF), Certified Alarm Contractor II (EG), or Certified Specialty Contractor (ES) license as issued by the State of Florida Construction Industry Licensing Board according to Florida State Statues, Chapter 489. The licenses must be valid at the time of the Bid opening.
- B. The Video Surveillance Contractor must have successfully completed, within the past three (3) years, a minimum of ten (10) commercial Video Surveillance projects where the contract amount exceeded \$10K.
- C. Must be an authorized dealer of the Salient Systems Corporation with full warranty privileges.
- D. All technicians dispatched to install, troubleshoot or program Completeview VMS Systems must be factory certified with the Salient System Corporation.

#### 3.2 INSTALLATION

- A. Standard Requirements for installation of complete Video Surveillance system including servers, mounts, supports, cameras, and associated hardware:
  - 1. Group or common areas (interior and exterior) shall have adequate video surveillance coverage. EXCEPTIONS: Teacher/staff lounges, classrooms, restrooms, dressing rooms, and locker rooms.
  - All Video Surveillance network cabling shall terminate to dedicated security patch panels in the local CD (MDF) / FD (IDF) location. Patch panel installation location in racks to be coordinated with SDOC Technology Services Department Network Communications Analyst (Kevin McKenzie) or designee.
- B. The structured cabling contractor shall be responsible for all network structured cabling including patch panels, pathways, supports, terminations, and associated hardware to support installation of Video Surveillance system.
- C. Security Contractor shall be responsible for all camera installation to manufacturer's specifications.
- D. Security contractor shall provide all certified category 6 patch cords, orange in color, required at each end.
- E. All cabling shall be labeled at both ends to indicate camera location, patch panel number and port number. All labels shall be printed in accordance with UL 969, not handwritten.
- F. All structured cabling work must be completed in accordance with, but not limited to:
  - 1. The National Electrical Code, Latest Edition
  - 2. BICSI Telecommunications Distribution Methods Manual Latest Edition
  - 3. BICSI Information Technology Systems Installation Methods Manual Latest Edition
  - 4. School District of Osceola County Division 27 Standards and Specifications.
- G. The School District of Osceola County shall be responsible to provide Salient NVR servers, server configuration, network switches, server cabinet, UPS, switch port configuration, user configuration, camera configuration, camera ceiling tile mount (24"x24"), HTH-273ZJ-130B-TRL box arm, Hikvision cameras, and Salient camera licenses.
- H. All cameras shall be labeled for identification for specific physical location and numeric identification. Example: If camera #32 is located in building two (2), second floor corridor, this camera will be programmed internally and viewed in the system as C32 - BLDG2 / FL 2Corridor.
- After the installation is deemed substantially complete, a final pass for focus, positioning and view of all cameras shall be coordinated with the Safety, Security, and Emergency Management (SSEM) Coordinator (Russell Gould) or designee.

#### PART 4 INTRUSION DETECTION (Section 28 30 00)

#### 4.1 CONTRACTOR'S QUALIFICATIONS

A. The Contractor(s) must hold a Certified Electrical Contractor (EC), Certified Alarm Contractor I (EF), Certified Alarm Contractor II (EG), or Certified Specialty Contractor (ES) license as issued by the State of Florida Construction Industry Licensing Board according to Florida State Statutes, Chapter 489.

- B. The Intrusion Detection Contractor must have successfully completed within the past three (3) years a minimum of ten (10) commercial Intrusion Detection jobs where the contract amount exceeded \$5K.
- C. Must be an authorized dealer of Digital Monitoring Products (DMP) with full warranty privileges.
- All technicians dispatched to troubleshoot or program intrusion panels must be factory certified with DMP.

#### 4.2 INSTALLATION

- A. Standard Requirements for installation of complete Intrusion Detection (alarm) system including control panels, sensors, keypads, and associated hardware;
  - All administrative, corridor, computer lab, band/music, media center, and high-density technology spaces shall have adequate motion activated Intrusion Detection coverage.
  - Keypads shall be located at each building primary entrance, staff parking entrance, and kitchen entrance.
  - The system siren/strobe shall be located at the campus administrative entrance on the exterior of the building.
- B. All Intrusion Detection (alarm) network cabling shall terminate to dedicated security patch panels in the local CD (MDF) / FD (IDF) location. Patch panel installation location in racks to be coordinated with SDOC Technology Services Department Network Communications Analyst (Kevin McKenzie) or designee.
- C. The structured cabling Contractor shall be responsible for all network structured cabling including patch panels, pathways, supports, terminations, and associated hardware to support installation of Intrusion Detection system.
- D. Security Contractor shall be responsible for all Intrusion Detection (alarm) device installation to manufacturer's specifications
- E. Security Contractor shall be responsible for all low voltage cabling between main control panel, expansion panels and devices.
- F. Security Contractor shall provide all certified category 6 patch cords, orange in color, required at each
- G. All cabling shall be labeled at both ends to indicate device number, expansion panel number and expansion panel port number. All labels shall be printed in accordance with UL 969, not handwritten.
- H. All structured cabling work must be completed in accordance with, but not limited to: The National Electrical Code, BICSI Telecommunications Distribution Methods Manual 14th Edition, BICSI Information Technology Systems Installation Methods Manual 7th Edition, School District of Osceola County - Division 27 Standards and Specifications.
- I. The School District of Osceola County shall be responsible to provide user and schedule configuration, network switches, and switch port configuration.
- J. Security Contractor shall provide and install all other equipment and perform all other system configuration as required for a complete and operational Digital Monitoring Products (DMP) Intrusion Detection (alarm) system.

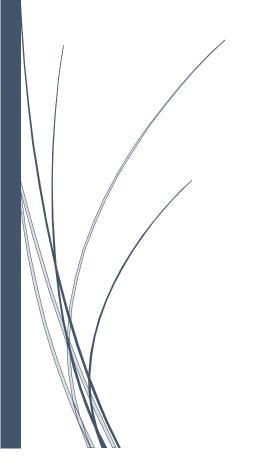
END OF SECURITY SYSTEMS ADDENDUM 1

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## School District of Osceola County

# PRE – APPROVED PRODUCTS LIST

**Technology Services Department** 



David Hiers – Network Analyst / Kenny Shocklee – TIS Revised April 17, 2024

#### **Pre-Approved Product List**

#### 1.1 Structured Premise Cabling:

- A. Hubbell
  - 1. Category 6A Yellow
    - a) C6ASRDSY Riser Rated cable
    - b) C6ASPDSY Plenum Rated cable

#### 1.2 Fiber Optic Cabling:

- A. Corning
  - 1. Single Mode OS2 Indoor / Outdoor Loose Tube
    - a) 012EUF-T4101D20 FREEDM Non-Plenum Rated cable 12 strand
    - b) 012ESP-T4101D20 FREEDM Plenum Rated cable 12 strand
    - c) 024EUF-T4101D20 FREEDM Non-Plenum Rated cable 24 strand
    - d) 024EWP-T4101D20 FREEDM Plenum Rated cable 24 strand
    - e) 048EUF-T4101D20 FREEDM Non-Plenum Rated cable 48 strand
    - f) 048EWP-T4101D20 FREEDM Plenum Rated cable 48 strand
  - 2. Single Mode OS2 Outdoor Loose Tube
    - a) 024ZU4-T4F22D20 ALTOS Non-Armor cable 24 strand
    - b) 024ZUC-T4F22D20 ALTOS Single Armor cable 24 strand
    - c) 024EUD-T4101D20 ALTOS Double Armor cable 24 strand
    - d) 048ZU4-T4F22D20 ALTOS Non-Armor cable 48 strand
    - e) 048ZUC-T4F22D20 ALTOS Single Armor cable 48 strand
    - f) 048EUD-T4101D20 ALTOS Double Armor cable 48 strand
  - 3. Multi-Mode OM3
    - a) 006TUF-T4180D20 FREEDM Non-Plenum Rated cable 6 strand
    - b) 006TSP-T4180D20 FREEDM Plenum Rated cable 6 strand
    - c) 012TUF-T4180D20 FREEDM Non-Plenum Rated cable 12 strand
    - d) 012TSP-T4180D20 FREEDM Plenum Rated cable 12 strand
    - e) 024TUF-T4180D20 FREEDM Non-Plenum Rated cable 24 strand
    - f) 024TSP-T4180D20 FREEDM Plenum Rated cable 24 strand

#### B. Hubbell

- 1. Single Mode OS2 Indoor / Outdoor Loose Tube
  - a) HFCH2012RBKS Non-Plenum Rated cable 12 strand
  - b) HFCH2012PBKS Plenum Rated cable 12 strand
  - c) HFCH2024RBKS Non-Plenum Rated cable 24 strand
  - d) HFCH2024PBKS Plenum Rated cable 24 strand
  - e) HFCH2048RBKS Non-Plenum Rated cable 48 strand
  - f) HFCH2048PBKS Plenum Rated cable 48 strand

- 2. Single Mode OS2 Outdoor Loose Tube
  - a) HFCH3024BKS Non-Armor cable 24 strand
  - b) HFCH4024BKS Armor cable 24 strand
  - c) HFCH5024BKS Double Armor cable 24 strand
  - d) HFCH3048BKS Non-Armor cable 48 strand
  - e) HFCH4048BKS Armor cable 48 strand
  - f) HFCH5048BKS Double Armor cable 48 strand
- 3. Multi-Mode OM3
  - a) HFCH2006RBK3 Non-Plenum Rated cable 6 strand
  - b) HFCH2006PBK3 Plenum Rated cable 6 strand
  - c) HFCH2012RBK3 Non-Plenum Rated cable 12 strand
  - d) HFCH2012PBK3 Plenum Rated cable 12 strand
  - e) HFCH2024RBK3 Non-Plenum Rated cable 24 strand
  - f) HFCH2024PBK3 Plenum Rated cable 24 strand

#### 1.3 Anchors:

#### A. Concrete

- 1. Red Head Concrete Anchoring System
  - a) Expansion Anchors
  - b) Dynabolt Sleeve
  - c) Trubolt
  - d) Screw Anchors
  - e) Tapcon
  - f) Tapcon Maxi-set
  - g) Tapcon Scots
  - h) Tapcon XL Screw
  - i) Tapcon SG ancors
- 2. Drywall
  - a) Toggler Anchoring System
  - b) Snaptoggle
  - c) Heavy duty hollow-wall anchors
  - d) SnapSkru

#### 1.4 Back Boards:

- A. Ready Spec
  - 1. Single Panel Kits
    - a) RB-A4848NPW (48" x 48")
  - 2. Modular Wall Kits
    - a) RB-AD4896W (4' x 8')

#### 1.5 Cable Supports:

- A. Strap
  - 1. Erico
    - a) Caddy
      - 1) CAT12 181100
      - 2) CAT21 181110
      - 3) CAT32 181120
      - 4) CAT425 181130
- B. Wire Basket Tray
  - 1. Hubbell
    - a) HBT0204BK 2" x 4" x 118" overhead tray Black
    - b) HBT0212BK 2" x 12" x 118" overhead tray Black
    - c) HBT0622BK 6" x 22" x 118" overhead tray Black

#### 1.6 Cable Trays:

- A. Hubbell
  - 1. 4" x 24" x 118"
    - a) HPWW0424

#### 1.7 Cable Wraps:

- A. Hook and loop fasteners
  - 1. Velcro
    - a) White
    - b) Black

#### 1.8 Charging Station:

- A. JAR Systems
  - 1. CS-1610 Charging Station
  - 2. ADAPT4-ACTIV Charging Station

#### 1.9 Classroom Amplification:

A. Audio Enhancement - Sole Source

#### 1.10 Clocks:

- A. Rauland Borg
  - 1. 16 inch synchronized analog clock
    - a) TCCKAN16
  - 2. Atomic to Master clock synchronizer module
    - a) TCAMCS
  - 3. Master Clock
    - a) 2524

#### 1.11 Data Hardware / Components / Devices:

- A. Hubbell
  - 1. Audio Visual Component
    - a) 4K / USB Extender (pair) new construction

- 1) ISFHD4BK
- b) 4K / VGA / HDMI / USB Extender (three) Renovation
  - 1) ISFHDT421KB
- 2. Power Component
  - a) 125V 20A power receptacle with 5vdc pigtail (USB 2.0)
    - 1) AVPS20BK
    - 2) AVPS20W
- 3. Data Component
  - a) Patch Panel
    - 1) 1U Keystone unloaded
      - a. HPJ24
    - 2) 2U Keystone unloaded
      - a. HPJ48
- 4. Copper Jack
  - a) Nextspeed CAT 6A
    - 1) HJU6AOW
    - 2) HJU6ABK
    - 3) HJ6Axx
  - b) XCELERATOR CAT 6
    - 1) HXJ60W
    - 2) HXJ6BK
    - 3) HJ6xx
    - 4) HJU6xx
- 5. Faceplates
  - a) Multimedia Face Plates
    - 1) NSP11LA Single gang, single port
    - 2) NSP12LA Single gang, dual port
    - 3) NSP14LA single gang, four port
  - b) IFP Face Plates w/label fields
    - 1) IFP110W Single gang, single port
    - 2) IFP120W Single gang, dual port
    - 3) IFP140W Single gang, four port
    - 4) IFP260W double gang, six port
  - c) iStation multi-service face plates
    - 1) NP260W Single gang, decorator wall plate
    - 2) NP2620W double gang, decorator wall plate
    - 3) IMFP1D10W double gang decora / istation frame
      - a. NS6120W double port istation insert
    - 4) NP2630W triple gang, decorator wall plate

#### 5) NP2640W - four gang, decorator wall plate

#### 6. Blanks

- a) IMB050W 0.5-unit blank module
- b) IMB10W 1-unit blank module
- c) IMB150W 1.5-unit blank module
- d) SFB10 single blank unit

#### 7. Boxes

- a) Wall Boxes / enclosures
  - 1) HBL989 double gang
  - 2) HBL986 triple gang
  - 3) NSAV62M double gang in wall enclosure
  - 4) NSAV124M four gang in wall enclosure
- b) Ceiling AV enclosure
  - 1) AVCE1 Non-plenum white ceiling mount
  - 2) AVCE1P Plenum white ceiling mount
- c) Recessed Floor Boxes
  - 1) CFB2G30 double gang rectangular standard
  - 2) CFB2G30CR double gang rectangular on-grade
  - 3) CFB4G30 four gang rectangular standard
  - 4) CFB4G30CR four gang rectangular on-grade
  - 5) CFB6G30 six gang rectangular standard
  - 6) CFB6G30cR six gang rectangular on-grade

#### d) Covers

- 1) 24GCCVRBK Surface Rectangular cover for two / four gang floor boxes
- 2) 24GCCVRBKC Surface rectangular cover for two / four gang floor boxes with inserts
- 3) 24GTCVRBK Flush rectangular cover for two / four gang floor boxes
- 4) 24GTCVRBKC Flush rectangular cover for two / four gang floor boxes with inserts
- 5) 610GCCVRBK Surface rectangular cover for six / ten gang floor boxes
- 6) 610GCCVRBKC Surface rectangular cover for six / ten gang floor boxes with inserts
- 7) 610GTCVRBK Flush rectangular cover for six / ten gang floor boxes
- 610GTCVRBKC Flush rectangular cover for six / ten gang floor boxes with inserts

#### 8. Inserts

- a) FBMPREC Decorator plate
- b) FBMP6KS ISF6 keystone jack plate
- c) FB10MPREC Decorator plate (6 / 10 gang)
- d) FB10MPKEY Decorator plate (including ISF6GY insert)

#### 9. Brackets

a) CP-2 – grid hanger bracket (for WAP)

#### 1.12 Enclosures:

- A. Server
  - 1. APC
    - a) NetShelter SX 42U (1) AR3100
- B. Free Standing
  - 1. Chatsworth
    - a) Mega-Frame Series
      - 1) M1040-722
- C. Wall Mount
  - 1. Tripp-Lite
    - a) Smart Rack
      - 1) SRW18UHD

#### 1.13 Fiber Optic Connectors / Appliances:

- A. Fiber LIU
  - 1. Corning
    - a) CCH-01U Closet Connector Housing 1 RMU 2 cassettes / modules panels
    - b) CCH-02U Closet Connector Housing 2 RMU 4 cassettes / modules panels
    - c) CCH-03U Closet Connector Housing 3 RMU 6 cassettes / modules panels
    - d) CCH-04U Closet Connector Housing 4 RMU 12 cassettes / modules panels
    - e) PWH-12P Pretium Wall-Mountable Housing 12 CCH connector panels
  - 2. Hubbell
    - a) FCR1U3SP FCR Series, 1 RMU 3 Adapter Packs
    - b) FCR2U6SP FCR Series, 2 RMU 6 Adapter Packs
    - c) FCR3U12SP FCR Series, 3 RMU 12 Adapter Packs
    - d) FCR4U15SP FCR Series, 4 RMU 15 Adapter Packs
    - e) FCW12SP wall mount, 12 adapter panel, 4 splice tray capacity
- B. Fiber Adapters
  - 1. Corning
    - a) CCH-CP12-E4 Closet Connector Housing panel 12 port LC Duplex 50µm multi-mode OM3 / OM4
    - b) CCH-CP12-E7 Closet Connector Housing panel 12 port SC Duplex 50µm multi-mode 0M3 / 0M4
    - c) CCH-CP12-xx Closet Connector Housing panel 12 port SC Duplex blank
    - d) WLL-KS-E4 Wall-Plate Outlet Keystone adapter agua LC non-keyed to non-keyed
    - e) ADPO-DLCO-CCARF-CLS Secure LC adapter aqua non-keyed to non-keyed (OM1, 2, 3, 4 / OS2 reduced-flange mount, ceramic sleeve)
    - f) WLL-KS-E6 Wall-Plate Outlet Keystone adapter aqua SC non-keyed to non-keyed
  - 2. Hubbell
    - a) FSPKLCDS6AQ 12 port, loaded, LC (Aqua)

- b) FSPSCDS6AQ 12 port, loaded, SC (Aqua)
- c) FSPSC12BK 12 port, Unloaded (Black)
- d) SFFLCSAQBK LC Duplex Flush Mount Keystone (25 pack, Aqua / Black)
- e) SFLCSAQBK LC Duplex Keystone (25 pack, Aqua / Black)
- f) SFFSCSAQBK SC Simplex Flush Mount Keystone (25 pack, Aqua / Black)
- g) SFFSCSRBK SC Simplex Flush Mount Keystone (25 pack, RED / Black (Fire Alarm ONLY))
- h) SFFSCSBEBK SC Simplex Flush Mount Keystone (25 pack, BEIGE / Black (HVAC ONLY))
- i) SFSCSAQBK SC Simplex Keystone (25 pack, Aqua / Black)
- j) SFSCSRBK SC Simplex Keystone (25 pack, RED / Black (Fire Alarm ONLY))
- k) SFSCSBEBK SC Simplex Keystone (25 pack, BEIGE / Black (HVAC ONLY))
- I) FCLCF900SM6PK LC single mode OS2 Fusion Splice-on connector (6 pack)
- m) FCSCF900SM6PK SC single mode OS2 Fusion Splice-on connector (6 pack)
- n) FCSCF900SMA6PK SC single mode OS2 Fusion Splice-on connector (6 pack)
- o) FCLCF900M50G6PK LC Multi-mode OM3 Fusion Splice-on connector (6 pack)
- p) FCSCF900M50G6PK SC Multi-mode 0M3 Fusion Splice-on connector (6 pack)
- q) Keystone adapter
  - 1) SFLCSAQBK LC Single / Multi-mode duplex keystone adapter
  - 2) SFSCSAQBK SC Single / Multi-mode simplex keystone adapter

#### C. Fiber Cassettes:

#### 1. Corning

- a) CCH-CS12-E4-P00TE Closet Connector Housing pigtail cassette, loaded with CCH panel and factory-terminated pigtails, 12 strand, LC Simplex, OM3 single fiber splicing
- b) CCH-CS12-E6-P00TE Closet Connector Housing pigtail cassette, loaded with CCH panel and factory-terminated pigtails, 12 strand, SC simplex, OM3 single fiber splicing
- c) CCH-CS12-A9-POORE Closet Connector Housing pigtail cassette, loaded with CCH panel and factory-terminated pigtails, 12 strand, LC Duplex, SM/UPC single fiber splicing
- d) CCH-CS12-3C-POORE Closet Connector Housing pigtail cassette, loaded with CCH panel and factory-terminated pigtails, 12 strand, SC simplex, SM/UPC single fiber splicing

#### 2. Hubbell

- a) OCSPLCD12S2 Fusion Spliced LC cassette 12 strand capacity
- b) OCSPSCD12S2 Fusion Spliced SC cassette 12 strand capacity

#### D. Fiber Splice Enclosure:

#### 1. Corning

- a) CSH-03U Closet Splice Housing 3 RMU holds 12 0.2in splice trays
- b) M67-076 Splice trays, heat-shrink Fusion Splices, 0.2in 12 strand
- c) M67-112 Splice trays, heat-shrink Fusion Splices, 0.2 in 24 strand

#### 2. Hubbell

- a) FCR350SE FCR Series, 2 RMU 6 tray capacity
- b) STRAY12F 12 strand Fusion Splice tray
- c) STRAY24F 24 strand Fusion Splice tray

#### E. Fiber Optic Connectors:

#### 1. Corning

- a) FuseLite
  - 1) SOC-LCU-900-SM FuseLite LC single mode OS2 Tight Buffered Fusion Splice connector
  - 2) SOC-SCU-900SM FuseLite SC single mode OS2 Tight Buffered Fusion Splice connector
  - 3) SOC-SCA-900SM FuseLite SC single mode OS2 Tight Buffered Fusion Splice connector
  - 4) SOC-LC-900-OM4 FuseLite LC 50 μm multi-mode OM2/3/4 Tight Buffered Fusion Splice connector
  - SOC-SC-900-OM4 FuseLite SC 50 μm multi-mode OM2/3/4 Tight Buffered Fusion Splice connector

#### 2. Hubbell

- a) OptiChannel
  - 1) FCLCF900SM6PK LC single mode OS2 Fusion Splice-on connector (6 pack)
  - 2) FCSCF900SM6PK SC single mode OS2 Fusion Splice-on connector (6 pack)
  - 3) FCSCF900SMA6PK SC single mode OS2 Fusion Splice-on connector (6 pack)
  - 4) FCLCF900M506PK LC Multi-mode OM2 Fusion Splice-on connector (6 pack)
  - 5) FCSCF900M605PK SC Multi-mode OM2 Fusion Splice-on connector (6 pack)
  - 6) FCLCF900M50G6PK LC Multi-mode OM3 Fusion Splice-on connector (6 pack)
  - 7) FCSCF900M50G6PK SC Multi-mode 0M3 Fusion Splice-on connector (6 pack)

#### 1.14 Fire Rated Appliances:

- A. EZ Path
  - 1. EZDP144RS2 Split wall Full Kit (existing cabling)
  - 2. EZDP44S2 Single Pathway Full Kit

#### 1.15 Free Standing Racks:

- A. Chatsworth
  - 1. 55053-703 Black two post
  - 2. 10600-019 Rack Base Insulator Kit
  - 3. 10250-712 Universal Runway
  - 4. 11421-712 Angle support Kit
  - 5. 10595-712 Rack to Runway Plate Kit
  - 6. 10642-001 End Caps (pair)
- B. Hubbell
  - 1. HPW84RR19 Black two post
  - 2. HRRP Insulation Kit
  - 3. HLRF Foot kit
  - 4. HLJB j-volt kit
  - 5. HLWRK Nextframe ladder rack, wall / rack mounting kit
  - 6. HLECPK2 End Caps (pair)

- 7. HLS1012B 12" Ladder rack 10 foot section black
- 8. HLBSK Butt splice kit
- 9. HLTK T junction splice kit
- 10. TLTSB12B Triangle wall support
- 11. TLX0612 Wall angle support
- 12. HLVWBK Vertical wall bracket
- 13. HLEK23 Elevation kit 2-3"
- 14. HLEK46 Elevation kit 4-6"

#### 1.16 Ground Bus Bar:

#### A. Hubbell

- 1. HBBB14416H 4 inch x 16 inch copper bus bar
- 2. HGRKTD9D 9 inch ladder bonding strap
- 3. HGBTEBCBRKL10 ladder bonding bracket (10 pack)
- 4. HBBB14212 12 inch wall mount bonding bus bar with isolators
- 5. HBBHR19KT Horizontal rack mount bonding bar 19 inch
- 6. HBBBVR36KT Vertical rack mount bonding bar 36 inch
- 7. HGVVL06D #6 AWG double hole compression lug

#### 1.17 Grounding Lugs:

#### A. Hubbell

1.	HGBL06D (SBB)	# 6 AWG	Blue
2.	HGBL06DA (PBB)	# 6 AWG	Blue
3.	HGBL04DA	#4 AWG	Gray
4.	HGBL02DA	#2 AWG	Brown
5.	HGBL01DA	#1 AWG	Green
6.	HGBL10DA	1/0	Pink
7.	HGBL20DA	2/0	Black
8.	HGBL30DA	3/0	Orange
9.	HGBL40DB	4/0	Purple
10.	HGBL250DB	250 kcmil	Yellow
11.	HGBL300DB	300 kcmil	White
12.	HGBL350DB	350 kcmil	Red
13.	HGBL500DB	500 kcmil	Brown
14.	HGBL600DB	600 kcmil	Green
15.	HGBL750DB	750 kcmil	Black

#### 1.18 Innerduct:

#### A. MaxCell

1. MXED86383 - Fabric Edge detectable 3 cell innerduct

#### 1.19 Interactive Flat Panels:

A. SMART

#### 1. MX275 - Interactive Flat Monitor

#### 1.20 Intercom:

A. Rauland Borg - Sole Source

#### 1.21 Message Boards:

- A. Rauland Borg Sole Source
  - 1. TCC3012L Large Message Board
  - 2. ACC3011LBB Surface mount Backbox
  - 3. ACC3011L Large Message Board Baffle assembly

#### 1.22 Monitor:

- A. LG
  - 1. LJ5100 Series LED 1080p flat monitor
- B. Vizio
  - 1. D40F-E1 40 inch LED Smart HDTV
  - 2. D43-D2 43 inch LED flat monitor
  - 3. D55-D2 55 inch LED flat monitor
  - 4. D65-D2 65 inch LED flat monitor

#### 1.23 Mounts - Visual:

- A. Balance Box
  - 1. 480A02 BB400-70 rated capacity 83.6 142.2 lbs. (38-66 kg) typical MX275
  - 2. 481A21 VESA interface
  - 3. 480A04 BB400-90 rated capacity 145.2 198.0 lbs. (66-90 kg) typical SMART 6065
  - 4. 481A21 VESA interface
  - 5. 480A08 BB650-130 rated capacity 137.3 269.3 lbs. (62-122 kg) typical SMART 7075
  - 6. 481A19 VESA interface
- B. Chief Manufacturing
  - 1. LSM-LTM series 70 inch application rated capacity 200 lbs. Typical SMART 6065 / MX275
  - 2. WBM2U series 50 inch application rated capacity 125 lbs. Typical flat monitors over markerboard applications
  - 3. WBM4E series 70 inch application rated capacity 300 lbs. Typical interactive flat panel over markerboard applications
  - 4. VCMU Heavy duty universal projector mount
- C. Copernicus
  - 1. IFP500 iRover2 Interactive cart rated capacity 200 lbs. Typical MX275
- D. Peerless
  - 1. SF680 series 65-70 inch application rated capacity 350 lbs. Typical interactive flat panel
  - Premier IWB600-2SB 77 inch application rated capacity 70.5 lbs. Typical SMART Board 680 over markerboard applications
  - 3. P5080T 50-80 inch application rated capacity 300 lbs. Typical interactive flat panel

#### 1.24 Mounts - Access Points:

#### A. TerraWave

- 1. TW-HWM-C-CVR-521473 horizontal wall mount Wi-Fi enclosure with cover
- 2. V-HWM-12124-W horizontal wall mount Wi-Fi enclosure with bubble cover

#### 1.25 Patch/Equipment Cords:

#### A. Corning

#### 1. Single Mode

- a) 727200G5120001M SC Duplex to SC Duplex Yellow 1 meter
- b) 727200G5120003M SC Duplex to SC Duplex Yellow 3 meter
- c) 727200G5120005M SC Duplex to SC Duplex Yellow 5 meter
- d) 040402G5120001M LC Duplex to LC Duplex Yellow 1 meter
- e) 040402G5120003M LC Duplex to LC Duplex Yellow 3 meter
- f) 040402G5120005M LC Duplex to LC Duplex Yellow 5 meter
- g) 047202G5120001M SC Duplex to LC Duplex Yellow 1 meter
- h) 047202G5120003M SC Duplex to LC Duplex Yellow 1 meter
- i) 047202G5120005M SC Duplex to LC Duplex Yellow 1 meter

#### Multi-Mode

- a) 575702T5120001M SC Duplex to SC Duplex Aqua 1 meter
- b) 575702T5120003M SC Duplex to SC Duplex Agua 3 meter
- c) 575702T5120005M SC Duplex to SC Duplex Aqua 5 meter
- d) 050502T5120001M LC Duplex to LC Duplex Agua 1 meter
- e) 050502T5120003M LC Duplex to LC Duplex Aqua 3 meter
- f) 050502T5120005M LC Duplex to LC Duplex Aqua 5 meter
- g) 055702T5120001M SC Duplex to LC Duplex Aqua 1 meter
- h) 055702T5120003M SC Duplex to LC Duplex Aqua 3 meter
- i) 055702T5120005M SC Duplex to LC Duplex Aqua 5 meter

#### B. Hubbell

#### 1. OptiChannel

- a) Single Mode
  - 1) DFPCSCSCS01SM SC to SC 0S2 1 meter (Yellow)
  - 2) DFPCSCSCS03SM SC to SC 0S2 3 meter (Yellow)
  - 3) DFPCSCSCS05SM SC to SC 0S2 5 meter (Yellow)
  - 4) DFPCLCLCS01SM LC to LC OS2 1 meter (Yellow)
  - 5) DFPCLCLCS03SM LC to LC 0S2 3 meter (Yellow)
  - 6) DFPCLCLCS05SM LC to LC OS2 5 meter (Yellow)
  - 7) DFPCLCSCS01SM LC to SC OS2 1 meter (Yellow)
  - 8) DFPCLCSCS03SM LC to SC 0S2 3 meter (Yellow)
  - 9) DFPCLCSCS05SM LC to SC OS2 5 meter (Yellow)
- b) Multi-Mode
  - 1) DFPCSCSCE01MM SC to SC 0M3 1 meter (Aqua)

- 2) DFPCSCSCE03MM SC to SC 0M3 3 meter (Agua)
- DFPCSCSCE05MM SC to SC 0M3 5 meter (Aqua)
- 4) DFPCLCLCE01MM LC to LC 0M3 1 meter (Aqua)
- 5) DFPCLCLCE03MM LC to LC 0M3 3 meter (Aqua)
- 6) DFPCLCLCE05MM LC to LC 0M3 5 meter (Aqua)
- 7) DFPCLCSCE01MM LC to SC 0M3 1 meter (Aqua)
- 8) DFPCLCSCE03MM LC to SC 0M3 3 meter (Aqua)
- 9) DFPCLCSCE05MM LC to SC OM3 5 meter (Aqua)

#### c) Bundles

- 1) Single Mode
  - a. FPBKR06SC6S SC, 6 strand 3 meter
  - b. FPBKR12SC6S SC, 12 strand 3 meter
  - c. FPBKR06LC6S LC, 6 strand 3 meter
  - d. FPBKR12LC6S LC, 12 strand 3 meter
- 2) Multi-Mode
  - a. FPBKR12SC3M SC, 12 strand 3 meter
  - b. FPBKR12LC3M LC, 12 strand 3 meter

#### 2. Nextspeed

- a) Category 6 3 foot
  - 1) HC6Y03 Standard OD yellow 3 foot (Station / Closet computer / printer)
  - 2) HC6BK03 Standard OD black 3 foot (Station / Closet phone)
  - 3) HC60R03 Standard OD orange 3 foot (Station / Closet security)
  - 4) HC6P03 Standard OD purple 3 foot (Closet server)
  - 5) HC6GN03 Standard OD green 3 foot (Station / Closet intercom / AV monitor)
  - 6) HC6GY03 Standard OD gray 3 foot (Station / Closet POS / Kronos)
  - 7) HC6R03 Standard OD red 3 foot (Closet Fire Alarm)
  - 8) HC6W03 Standard OD white 3 foot (Closet HVAC / Facility)
  - 9) HC6B03 Standard OD blue 3 foot (Closet UPS)
- b) Category 6 5 foot
  - 1) HC6Y05 Standard OD yellow 5 foot (Station / Closet computer / printer)
  - 2) HC6BK05 Standard OD black 5 foot (Station / Closet phone)
  - HC60R05 Standard OD orange 5 foot (Station / Closet security)
  - 4) HC6P05 Standard OD purple 5 foot (Closet server)
  - 5) HC6GN05 Standard OD green 5 foot (Station / Closet intercom / AV monitor)
  - 6) HC6GY05 Standard OD gray 5 foot (Station / Closet POS / Kronos)
  - 7) HC6R05 Standard OD red 5 foot (Closet Fire Alarm)
  - 8) HC6W05 Standard OD white 5 foot (Closet HVAC / Facility)
  - 9) HC6B05 Standard OD blue 5 foot (Closet UPS)
- c) Category 6 7 foot

- 1) HC6Y07 Standard OD yellow 7 foot (Station / Closet computer / printer)
- 2) HC6BK07 Standard OD black 7 foot (Station / Closet phone)
- HC60R07 Standard OD orange 7 foot (Station / Closet security)
- 4) HC6P07 Standard OD purple 7 foot (Closet server)
- 5) HC6GN07 Standard OD green 7 foot (Station / Closet intercom / AV monitor)
- 6) HC6GY07 Standard OD gray 7 foot (Station / Closet POS / Kronos)
- 7) HC6R07 Standard OD red 7 foot (Closet Fire Alarm)
- 8) HC6W07 Standard OD white 7 foot (Closet HVAC / Facility)
- 9) HC6B07 Standard OD blue 7 foot (Closet UPS)
- d) Category 6 10 foot
  - 1) HC6Y10 Standard OD yellow 10 foot (Station / Closet computer / printer)
  - 2) HC6BK10 Standard OD black 10 foot (Station / Closet phone)
  - 3) HC60R10 Standard OD orange 10 foot (Station / Closet security)
  - 4) HC6P10 Standard OD purple 10 foot (Closet server)
  - 5) HC6GN10 Standard OD green 10 foot (Station / Closet intercom / AV monitor)
  - 6) HC6GY10 Standard OD gray 10 foot (Station / Closet POS / Kronos)
  - 7) HC6R10 Standard OD red 10 foot (Closet Fire Alarm)
  - 8) HC6W10 Standard OD white 10 foot (Closet HVAC / Facility)
  - 9) HC6B10 Standard OD blue 10 foot (Closet UPS)
- e) Category 6 15 foot
  - 1) HC6Y15 Standard OD yellow 15 foot (Station / Closet computer / printer)
  - 2) HC6BK15 Standard OD black 15 foot (Station / Closet phone)
  - 3) HC60R15 Standard OD orange 15 foot (Station / Closet security)
  - 4) HC6P15 Standard OD purple 15 foot (Closet server)
  - 5) HC6GN15 Standard OD green 15 foot (Station / Closet intercom / AV monitor)
  - 6) HC6GY15 Standard OD gray 15 foot (Station / Closet POS / Kronos)
  - 7) HC6R15 Standard OD red 15 foot (Closet Fire Alarm)
  - 8) HC6W15 Standard OD white 15 foot (Closet HVAC / Facility)
  - 9) HC6B15 Standard OD blue 15 foot (Closet UPS)
- f) Category 6 25 foot
  - 1) HC6Y25 Standard OD yellow 25 foot (Station / Closet computer / printer)
  - HC6BK25 Standard OD black 25 foot (Station / Closet phone)
  - 3) HC60R25 Standard OD orange 25 foot (Station / Closet security)
  - 4) HC6P25 Standard OD purple 25 foot (Closet server)
  - 5) HC6GN25 Standard OD green 25 foot (Station / Closet intercom / AV monitor)
  - 6) HC6GY25 Standard OD gray 25 foot (Station / Closet POS / Kronos)
  - 7) HC6R25 Standard OD red 25 foot (Closet Fire Alarm)
  - 8) HC6W25 Standard OD white 25 foot (Closet HVAC / Facility)
  - 9) HC6B25 Standard OD blue 25 foot (Closet UPS)

- g) Category 6A -
  - 1) HCL6APK03 Slim OD pink 3 foot (Station / Closet Access point)
  - 2) HCL6APK05 Slim OD pink 5 foot (Station / Closet Access point)
  - 3) HCL6APK07 Slim OD pink 7 foot (Station / Closet Access point)
  - 4) HCL6APK10 Slim OD pink 10 foot (Station / Closet Access point)
  - 5) HCL6APK15 Slim OD pink 15 foot (Station / Closet Access point)
  - 6) HCL6APK25 Slim OD pink 25 foot (Station / Closet Access point)

#### 1.26 Projector Plate:

- A. AMR
  - AMRDCP100KIT 2x2 ceiling tile insert with two (2) single gang knock-outs and projector mount knockout
- B. AVM
  - AVM-PRO-DCP-UNV-404-SV 2x2 ceiling tile insert with four (4) single gang knock- outs and projector mount knock-out
- C. Peerless
  - 1. PRGS-455 2x2 ceiling tile insert with three (3) single gang knock-outs and one (1) projector mount
- D. Chief
  - 1. CMS-445 2x2 ceiling tile insert with single and dual electrical outlet cutouts

#### 1.27 Projector Screens:

- A. Da-Lite
  - 1. TNSD 220D HD DM motorized screen
  - 2. DA37022L 16x9 (108x192) tension advantage electrol projector screen HDTV format
- B. Draper
  - 1. Access V Ceiling-recessed, tab-tensioned screen
    - a) Black Backed Matt White XT1000VB (Opti Flex)
    - b) 120V AC Standard Voltage Motor and Control options

#### 1.28 Projectors:

- A. EPSON
  - 1. G5950NL PowerLite multimedia projector
- B. NEC
  - 1. PA653UL-41ZL WUXGA conference room projector
  - 2. MP-PA703UL-41ZL 9000 lumen projector cafeteria installation (typical)

#### 1.29 Raceways:

- A. Panduit
  - 1. LD Surface raceway system
    - a) LD3 3/4 inch surface raceway locking cover
    - b) LD5 1 inch surface raceway locking cover
    - c) LD10 1  $\frac{1}{2}$  inch surface raceway locking cover
  - 2. T45 Surface raceway system
    - a) T45BIW10 T45 raceway base 10 foot section

- b) T45CIW10 T45 hinged raceway cover 10 foot section
- c) T45DW10 T45 divider wall, 10 foot section
- d) T45CEW T45 end cap
- 3. T70 Surface raceway system
  - a) T70BIW10 T70 raceway base 10 foot section
  - b) T70CIW10 T70 raceway cover 10 foot section
  - c) T70DW10 T70 raceway with divider 10 foot section
  - d) T70ECIW T70 end cap
- B. Hubbell
  - 1. WallTrak
    - a) PW1BC5 WallTrak low-profile, non-metallic raceway latching system

#### 1.30 Sound System - Components:

- A. Microphone
  - 1. Shure
    - a) BLX188/CVL-H9 Dual Channel lavalier wireless microphone system
    - b) BLX288/PG58H10 Dual handheld wireless microphone system
    - c) CVOBC Overhead condenser microphones
- B. CD Player
  - 1. Denon
    - a) DN-300Z Cd-SD-USB player w/BT and AM/FM tuner
- C. Amplifier
  - 1. Crown
    - a) XLi 800 Crown Audio power amplifier
- D. Mixer
  - 1. Yamaha
    - a) MG16 16 input 6-bus mixer
  - 2. Biamp (Tesira Forte)
    - a) DAN AI Fixed audio DSP
- E. Speaker
  - 1. JBL
    - a) SCS 8 Spatially cued surround loudspeaker 2-way coaxial
    - b) AC299 Two-way full range loudspeaker
      - 1) WMB100 Wall bracket
    - c) Pure Resonance Audio
      - 1) SD4 2x2 ceiling speaker array 8 ohm/70v

#### 1.31 Surge Protection:

- A. Circa Telecom
  - 1. Model 1880ENA1/NSC-25 (25 Pair Indoor 110/110 No Cover)
  - 2. SRA 5-pin module

- B. EDCO
  - 1. COHP Series
  - 2. H Series

#### 1.32 Wire Management - Rack:

- A. Chatsworth
  - 1. 30130-719 5 inch deep Horizontal Wire Manager
  - 2. 30330-719 7 inch deep Horizontal Wire Manager
  - 3. 30162-703 6 inch wide Vertical Wire Manager
  - 4. 30164-703 4 inch wide Vertical Wire Manager

#### 1.33 Wireless Access Points:

- A. Cisco
  - 1. AIR-AP28021-B-K9 Aironet Wireless Access Point 2.4 & 5 Ghz radios
  - 2. Air-Ap3802I-B-K9 Aironet Wireless Access point 2.4 & 5 Ghz radios

#### 1.34 Vaults:

- A. Hubbell
  - 1. Quazite Systems
    - a) Quazite FRP Systems

Request for product substitution shall be submitted to SDOC Technology Services Department Technology Representative or designate no later than ten (10) days prior to quote / bid due date Unless Otherwise Noted (U.O.N)

Requests received after this time may not be considered.

#### **END OF PRE-APPROVED PRODUCT LIST**

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	TECHNOLOGY RESPONSIBILTY MATIX				
	Design				
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
1	Site Configuration	Complete site conduit / riser / system / underground	Architect / Engineer	Construction Manager	CM / Electrical Contractor
2	Building Configuration	Complete building / floor / riser / system / underground	Architect / Engineer	Construction Manager	CM / Electrical Contractor
			Site Configuration		
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
3	Exterior Conduit Configuration	Conduit, Vaults, Manholes, etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
4	Property line to Campus CD	Technology Systems copper and fiber optic cable from Property line to CD (MDF) DMARC location	Architect / Engineer	Construction Manager	CM / Owner / Outside Service Providers - Applicable Engineering provide by Outside Providers (each discipline)
5		Technology Systems copper and fiber optic cable from CD (MDF) location to each individual FD (IDF) locations campus-wide	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
			Technology Systems Config	uration	
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
6	(FD) - (IDF) Buildout	Space dimensions / location / orientation - Door orientation / location - Backboard orientation / location - Backboard orientation / locations - HVAC requirements / orientation / location - Grounding requirements / orientation / location - Lighting requirement / orientation / location - Location - Access Control requirement / location - Rack orientation / location - Ladder rack orientation / location / location - Discipline orientation / location - Discipline orientation / location - Location - Discipline orientation / location - Discipline orientation / location	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
7	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor

8	Primary Cable Tray	Premise Distribution system cable trays	Architect / Engineer	Construction Manager	CM / Electrical Contractor
9	Miscellaneous Support	J-Hook / saddles / etc.	Architect / Engineer	Construction Manager	CM / Low Voltage Contractor
10	Exterior Cabling	Cabling between CD (MDF) / FD (IDF) each location	Architect / Engineer	Construction Manager	CM / Low Voltage Contractor
11	Exterior Cabling	Outside Services	Architect / Engineer	Construction Manager	CM / Owner / Outside Services (each discipline) - Installation provided by Outside Services Provider (Contractor)
12	Interior Premise Cabling	Premise Structured Cabling	Architect / Engineer	Construction Manager	CM / Low Voltage Contractor
13	Interior Intercom Cabling	Premise Structured Cabling	Architect / Engineer	Construction Manager	CM / Sole Source Contractor
14	Components (Outside Services)	Outside Services	Architect / Engineer	Construction Manager	CM / Owner / Outside Services (each discipline)
15	Components (SDOC Network)	Network requirements	Technology Services Department / Network Division (SDOC)	Owner	Owner / Technology Services Department (SDOC)
16	Components (SDOC Network)	Wireless Access	Technology Services Department / Network Division (SDOC)	Owner	CM / Low Voltage Contractor
17	Components (Intercom)	Intercom requirements	Architect / Engineer	Construction Manager	CM / Sole Source Contractor
18	Cross Connection	Technology Systems patching / cross connections of copper and fiber optic cabling / components / appliances / hardware (including all copper / fiber optic patch cords)	Technology Services Department / Network Division (SDOC)	Owner	Owner / Technology Services Department (SDOC)
		Commu	nication Location (CD - MDF / FD	- IDF) Configuration	
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
19	Backboard	Backboard assembly / lettering / painting	Architect / Engineer	Construction Manager	CM / Electrical Contractor
20	Conduit	ceiling) - appropriate conduit for underground application	Architect / Engineer	Construction Manager	CM / Electrical Contractor
21	Mechanical Fire Stop	Mechanical Fire Stop devices / appliances	Architect / Engineer	Construction Manager	CM / Electrical Contractor
22	Non-Fire Rated penetrations	EMT sleeving / support	Architect / Engineer	Construction Manager	CM / Electrical Contractor
23	Grounding Systems	Ground Bars (copper) for all Technology Systems (all locations and all applications)	Architect / Engineer	Construction Manager	CM / Electrical Contractor

174	Rack / Wire Management / Ladder Rack	Technology Systems - Rack / Wire management / ladder rack / associated hardware / devices / components - all locations and all applications	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
			Power Applications Configu	ıration	
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
25	Primary Electrical	Provision / installation of dedicated general power receptacles / cabling / panels and associated power surge suppression system for Technology Systems	Architect / Engineer	Construction Manager	CM / Electrical Contractor
26	Active Electrical System	Provision / installation / testing / adjustment of power generation system	Architect / Engineer	Construction Manager	CM / Electrical Contractor
1.7/	Uninterruptible Power Supply (UPS) Equipment	Provision / installation / testing of UPS equipment for all Technology Systems	Technology Services Department / Network Division (SDOC)	Owner	Owner / Technology Services Department (SDOC)
			Distributed Antenna Sys	tem	
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
28	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor / DAS Contractor
29	Cabling	Cabling / grounding / support	Architect / Engineer	Construction Manager	CM / Electrical Contractor / DAS Contractor
30	Components (DAS)	DAS requirements	Architect / Engineer	Construction Manager	CM / Electrical Contractor / DAS Contractor
			Security Systems		
			Video Surveillance		
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
31	Raceway / Pathway	Video Surveillance conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
32	Interior Premise Cabling	Video Surveillance System premise cabling	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
33	Components	Installation of Servers / cameras / exterior components / patch cords		Construction Manager	CM / Electrical Contractor / AV Contractor
	Intrusion Detection				
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility

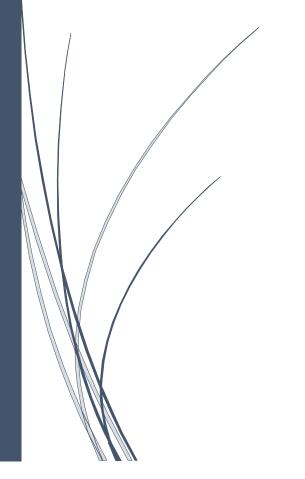
34	Raceway / Pathway	Intrusion Detection conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
35	Interior Premise Cabling	Intrusion Detection System cabling	Architect / Engineer	Construction Manager	CM / Electrical Contractor / DMP Contractor
36	Components	Provision / installation of control panels / keypads / sensors / strobes / horns / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor / DMP Contractor
			Access Control		
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
37	Raceway / Pathway	Access Control conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
38	Interior Premise Cabling	Access Control System cabling	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
39	Components	Provision / installation / of control panels / readers / magnets/ electronic locking system	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Access Control Contractor
	Gate Control				
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
40	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
41	Exterior Cabling	Gate Control Cabling	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Gate Control Contractor / Low Voltage Contractor
42	Components	Provision / installation of entrance / exit gate control / transmitters / receivers / detectors / sensors (infrared / light / edge) / keypad (with hood) / pedestal	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Gate Control Contractor / Low Voltage Contractor
			Radio System		
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
43	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
44	Cabling	Cabling / grounding / support	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Radio Contractor
45	Components	Provision / installation of Master Radio headend unit / license / antenna / mast / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Radio Contractor

	Audio / Visual System				
			Classroom System	1	
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
46	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
47	Balance Box Mount	Balance Box / in wall backing to sustain minimum 250 pounds mounted	Architect / Engineer	Construction Manager	CM / Electrical Contractor
48	Interior Premise Cabling	HDMI / Teacher Station	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
49	Components	HDMI / Teacher Station	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage Contractor
50	Monitor (Interactive)	SMART MX-275 (or equivalent) interactive Flat Panel Monitor	Architect / Engineer	Construction Manager	CM / Low Voltage Contractor
51	Monitor (Flat Panel)	52" Flat Panel Monitor (or equivalent)	Architect / Engineer	Construction Manager	CM / Low Voltage Contractor
52	Audio Enhancement	Classroom Amplification System	Architect / Engineer	Construction Manager	CM / Sole Source Contractor
53	Performance / Athletic A/V Systems	Projector / screen / sound system/cafetorium / theater / gymnasium / stadium / active- passive equipment / hardware / cabling / supports / pathways	Architect / Engineer	Contractor Manager	CM / Low Voltage / AV Contractor
			Video Wall		
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
54	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
55	Interior Premise Cabling	Cabling / grounding / support	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage / AV Contractor
56	Components	Video Wall components / devices / hardware	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage / AV Contractor
			Display Monitors		
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility
57	Raceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
58	Interior Premise Cabling	Cabling / grounding / support	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage
59	Components	Stream Beam	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage
	Elevator Communication System				
Item	System	Scope	Design Responsibility	Procurement Responsibility	Construction Responsibility

60	IRaceway / Pathway	Conduit / sleeving / mechanical fire stop devices / boxes / etc.	Architect / Engineer	Construction Manager	CM / Electrical Contractor
61	Interior Premise Capling	Cabling / grounding / support / cross-connection	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage
62		Emergency 2-way communication components / devices / hardware / cabling	Architect / Engineer	Construction Manager	CM / Electrical Contractor / Low Voltage / Elevator Contractor
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### Division 27

School District of Osceola County



David Hiers – Network Analyst / Kenny Shocklee – TIS Revised December 31, 2024

#### SCHOOL DISTRICT OF OSCEOLA COUNTY

#### **DIVISION 27**

#### STANDARDS AND SPECIFICATIONS

#### **REVISION LOG**

Section 27 00 00	Revised 11.13.2024
COMMUNICATIONS SYSTEMS	
Section 27 05 26	Revised 11.13.2024
GROUNDING - BONDING	
Section 27 05 28	Revised 11.13.2024
PATHWAYS FOR COMMUNICATIONS SYSTEMS	
Section 27 05 36	Revised 11.13.2024
CABLE TRAYS FOR COMMUNICATIONS SYSTEMS	
Section 27 11 10	Revised 11.13.2024
TELECOMMUNICATIONS SPACES, EQUIPMENT AND FITTINGS	
Section 27 13 13	Revised 11.13.2024
COMMUNICATIONS COPPER BACKBONE CABLING	
Section 27 13 23	Revised 11.13.2024
COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING	
Section 27 15 13	Revised 11.13.2024
COMMUNICATIONS HORIZONTAL COPPER CABLING	
Section 27 15 43	Revised 11.13.2024
COMMUNICATIONS FACEPLATES AND MODULES	
Section 27 16 19	Revised 11.13.2024
COMMUNICATIONS PATCH CORDS, STATION CORDS AND CROSS (	CONNECT CABLING
Section 27 21 33	Revised 11.13.2024
WIRELESS ACCESS POINT SYSTEMS	
Section 27 41 16	Revised 11.13.2024
CLASSROOM AMPLIFICATION SYSTEM	
Section 27 51 23	Revised 11.13.2024
EDUCATIONAL INTERCOM AND PROGRAM CLOCK SYSTEM	
Section 27 53 21	Revised 11.13.2024
DISTRIBUTED ANTENNA SYSTEM - PUBLIC SAFETY	
Section 28 10 00	Revised 11.13.2024
ACCESS CONTROL	
Section 28 20 00	Revised 11.13.2024
VIDEO SURVEILLANCE	
Section 28 30 00	Revised 11.13.2024
INTRUSION DETECTION	

PRE-APPROVED PRODUCT LIST	Revised 11.13.2024
MASTER SYMBOLS	Revised 11.13.2024
GENERAL NOTES	Revised 11.13.2024
RESPONSIBILITY MATRIX	Revised 11.13.2024
REVISION LOG	Revised 11.13.2024
TABLE OF CONTENTS	Revised 11.13.2024
DETAILS (ALL)	Revised 11.13.2024

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