



Architect and Engineer DESIGN GUIDE

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Table of Contents

2 – 14 ARCHITECTURAL

1. GENERAL
2. PHOTOREALISTIC RENDERINGS/3D VISUAL CRITERIA
3. CONCRETE
4. MASONRY
5. METALS
6. WOODS, PLASTICS AND COMPOSITES
7. THERMAL AND MOISTURE PROTECTION
8. OPENINGS
9. FINISHES
10. SPECIALTIES
11. EQUIPMENT
12. FURNISHINGS
13. SPECIAL CONSTRUCTION
14. CONVEYING EQUIPMENT

21 FIRE PROTECTION

22 PLUMBING

23 MECHANICAL

26 ELECTRICAL

27 COMMUNICATIONS

- 27.1 TELECOMMUNICATIONS
- 27.2 AUDIO SYSTEMS
- 27.3 ASSISTED LISTENING SYSTEM

28 ELECTRONIC SAFETY AND SECURITY

- 28.1 SECURITY SYSTEMS
- 28.2 FIRE ALARM SYSTEM
- 28.3 VIDEO SURVEILLANCE SYSTEM (VSS) STANDARD

31 CIVIL

31. EARTHWORK
32. EXTERIOR IMPROVEMENTS

33 UTILITIES

APPENDICIES

ARCHITECTURAL

INTRODUCTION

The Charlotte-Mecklenburg Schools (CMS) Architects and Engineers Design Guide has been developed to assist in the planning and design of new, expanded, or renovated facilities and has been organized to mirror CSIs format. It is not intended to place limits on the Designers' creativity and resourcefulness. Rather, it reflects experience with similar projects and/or systems, products, or components. The CMS A/E Guide is to be applied by the Designer as necessary to accomplish a solution to the project utilizing sound architectural and engineering judgment and practices.

The CMS System consists of 175+ schools, over 500 buildings, more than 22 million square feet and 5,000 +/- acres. Its building program is expanding at a steady pace to meet the needs of Mecklenburg County. The need to develop building standards is a natural process that follows in an expansive building program. CMS's AE Guide is a collection of these building standards to guide the architect with basic design requirements. The primary intent of these guidelines will be to make CMS's facilities equitable, easier to build and maintain.

The designer should receive from CMS the current version of the following documents at the beginning of each project: AE Guideline, Master Specifications and Facility Program for that facility.

Should the project design vary from the CMS A/E Guide, or if the Guidelines do not align with the problem as understood by the designer, then it must be identified with the owner for clarification or direction. The designer is required to identify any deviations to the CMS A/E Guide immediately and resolve them before proceeding with the next phase of the project.

Technical specifications should be prepared in conformance with the most recent edition of the CMS Master Specification. The architect/engineer should bring variations and additions between the proposed project specification and the Master Specification to the attention of CMS as early as possible. Pre-bid substitution requests which pertain to specific sections of the A/E Guide, and which are proposed to be accepted by the architect/engineer, should be submitted to CMS for written approval prior to the A/E's formal approval. All post-bid substitutions which vary in character from the approved specification should be brought to CMS's attention.

There are many products and specifications included in a project that are not addressed in the CMS Master Specification. CMS approval or disapproval for any item covered or not covered in the CMS Master Specification is not required if, in the architect/engineer's judgment, the request for substitution should be denied.

The designer is reminded to refer to NC General Statute 133-3 for current regulations regarding specifications to carry competitive materials. It is the designer's responsibility to evaluate different products or proposed substitutions and request the owner's concurrence before bidding on the project.

It is the intent of CMS to update and improve the A/E Design Guide periodically. Comments and recommendations from designers will be considered for future revisions.

1. GENERAL

- 1.1. Refer to CMS Facility Program for all attributes of spaces. In all cases, where high ceilings occur, particular attention must be given to maintenance of space, including light fixture lamping, window cleaning, etc.
- 1.2. Refer to sheet name and numbering standards. **See Appendix 1.2.**
- 1.2.1. Provide a civil site plan C600 that illustrates Fire Department requirements for fire truck access and hydrants that must be functional prior to going vertically.
- 1.3. All major entrances are to be covered.
- 1.4. Main entrance ramps shall be of such width and appearance that they are the main and preferred route of travel for all.
- 1.5. Classroom numbers shall be three digits with the first digit corresponding to the assigned level – 101, 201, 301, etc. Rooms accessed from a connector like a corridor, lobby or atrium should increase in the direction one would typically access the wing/area with rooms on the left being odd numbers and rooms on the right being even numbers. The designer may encounter spaces that are not specifically on the right or left and may assign numbers at their discretion. Support spaces accessed from inside a main room should adopt the same main room number and simply add a letter at the end; Example - a storage room inside classroom "205" would be "205A". Additional support spaces accessed from "205" simply progress thru the alphabet "205B", "205C", etc.

2. PHOTOREALISTIC RENDERINGS/3D VISUAL CRITERIA

- 2.1. Minimum DPI Resolution: 150 DPI.
 - 2.1.1. For a 24x36-inch poster, the resolution depends on the desired print quality.
 - 2.1.1.1. High quality print (professional): Use 300 DPI (dots per inch). Image format to be 7200 x 10800 pixels.

ARCHITECTURAL

- 2.1.1.2. Good quality (large format posters often use this): 150 DPI is acceptable. Image format to be 3600 x 5400 pixels.
- 2.2. Submit a minimum of 12 hi-res photorealistic renderings (still images and two (2) animations) from a variety of projects and at different times of the day (morning, afternoon, and night) that conveys the firm's ability and quality.
- 2.3. Confirm firm's ability to produce Virtual reality (VR) experiences or augmented reality (AR) compatible files.
- 2.4. Content – people entourage is allowed but only in silhouette or “ghosted” appearance with the respective age group/classification of the school.
- 2.5. Content – vehicular entourage to be domestic vehicles only.
- 2.6. Content – flag: USA flag only.
- 2.7. Content – Trees and shrubs to be indigenous to the area and allowed by respective AHJ.

3. CONCRETE

- 3.1. **FLOOR SLABS** (unless otherwise recommended by soils and/or structural engineer):
 - 3.1.1. Slabs not to bear on grade beams, walls, or piers.
 - 3.1.2. The following surfaces, as well as other exterior concrete surfaces that may become wet shall receive a non-slip, broom finish: ramps, walks, ground surface loading area, aprons, or as required by ADA for accessibility.
 - 3.1.3. At slab edge of walls utilize 15 mill vapor barrier or black tar paper as the bond breaker in lieu of ½” expansion joint material. Consult with structural engineer for recommended method.
 - 3.1.4. At thick set tile locations (kitchen, group toilets, etc.) slab shall be depressed 3”.
 - 3.1.5. The foundation type and allowable soil bearing pressure shall be determined with the assistance of a qualified geotechnical engineer.

4. MASONRY

- 4.1. **REFER TO THE NATIONAL CONCRETE MASONRY ASSOCIATION AND THE BRICK INSTITUTE OF AMERICA FOR DETAILING OF MASONRY WALLS.**
 - 4.1.1. Attention should be paid to details and joints to minimize contraction cracks. Clearly indicate on the drawings where control joints are necessary. Provide control joint covers at control joints in circulation areas.
 - 4.1.2. Use non-corrosive ties to prevent spalling of brick veneer.
 - 4.1.3. Do not use a water repellent coating unless approved by the Owner.
 - 4.1.4. Indicate precast concrete cap at exterior masonry screen walls (no rowlock terminations).
 - 4.1.5. Do not use colored mortar unless approved by the Owner.
 - 4.1.6. Interior CMU walls: Provide special shape, bull-nose corner masonry units in traffic areas one course above the base course to continue to one course below ceiling height for cove base and ceiling grid installation.
 - 4.1.7. When expansion joint metal covers are used inside or exterior, they shall be vandal resistant.
 - 4.1.8. At new construction, field masonry to be standard wire cut, running bond. No glossy finishes. Rowlock and soldier course accents may be used at limited locations. Brick colors to be limited to red, brown, or neutral light brown/beige. Concrete masonry units (for example, split-face units) may be used as an exterior accent material. Do not use light colors at base of building.
 - 4.1.9. Minimize exterior brick extrusions to a ½” maximum.
 - 4.1.10. A beige tone mortar color is preferred when using a tan or red brick; Grey tone masonry units should use a gray tone mortar mixture. At existing building conditions where a new addition abuts, match the existing mortar color, as best as possible, without using a colored mortar when using red, beige, or white sand.
 - 4.1.11. Minimize the use of firewalls as much as possible; take into consideration separate building areas and required stairs.
- 4.2. **PROCESS OF MASONRY SELECTION**
 - 4.2.1. Submit unit masonry samples for each type of brick unit required (full range of exposed color and texture).
 - 4.2.2. The contractor shall erect sample panels of exterior materials proposed from above selection. The initial, selected samples must be on site when mock-up panel is reviewed. The CM shall provide and maintain a safe walking path to get to the mockup panel utilizing mulch, stone, etc. and the mockup panel located in an area where it will receive direct sunlight and be located within reasonable distance of the work.
 - 4.2.3. The architect should recommend samples to be approved by the owner.
 - 4.2.4. At the same time all other exterior samples are proposed and recommended for approval.
 - 4.2.5. Sample panels that are approved are marked and maintained until the building is completed. CMS approval will not be given if approved samples are not available on site.
 - 4.2.6. The sample panels are also used as a quality standard to judge the masonry of the actual construction.

5. METALS

5.1 METAL FABRICATIONS

- 5.1.1. Ladders, ships ladders and railings
- 5.1.2. Under no circumstance will any roof access be provided that may be used by students.

ARCHITECTURAL

- 5.1.3. Where ladders are used, they should be provided in storage rooms or other spaces that can be secured.
- 5.1.4. Interior ladders, provided for roof or mechanical mezzanine access, shall be limited to ships ladders.
- 5.1.5. Where space and economy allow, stairs are preferred.
- 5.1.6. Handrails are to be provided on each side of ships ladders. The ships ladder assembly is to be an aluminum ladder including handrails designed to be permanently attached at the top and bottom. Ships ladders are not to extend beyond twenty (20) feet in height. The ships ladder is to have a 60% slope and is to be used to service roofs via a roof hatch.
- 5.1.7. External ladders from grade for access to roof are not permitted for security and safety reasons. Exterior ladders used to access one roof level from another roof level are permitted if no other means of accessing that roof level can be provided.
- 5.1.8. Where vertical ladders are used, extended handrails should be provided where applicable. A cage is required for all heights above twenty (20) feet. Ships ladders are to have deeply serrated treads for non-slip safety.
- 5.1.9. Finishes are to be mill finish on all aluminum components.
- 5.1.10. Hasps are to be provided for roof scuttles.
- 5.1.11. Exterior railing finishes shall be hot dipped galvanized steel, aluminum or stainless steel. All interior stairs to have aluminum handrails. Interior "main stair" or "learning stair" guardrail assembly with infill screen panels or vertical pickets can be all aluminum. Owner will consider aluminum handrails mechanically fastened to painted steel guardrail assembly at required egress stairs only. Painted steel to be a specific high-performance coating, however wall-mounted and center handrails are to remain aluminum. Floor-mounted center handrails without base escutcheons are preferred.
- 5.1.12. If roof top HVAC units are used, provide an over-sized roof hatch to allow heavy equipment access to the roof, using a pedestal-mounted (on roof) hoist system. Verify with CMS design manager for location and applicability.
- 5.1.13. All interior stair systems shall receive specified high-performance coating except the handrail at the monumental stairway which shall be aluminum or stainless steel.

5.2. ROOF STRUCTURE

- 5.2.1. Structural frame for roofs shall be sloped to drain.
- 5.2.2. Minimize the use of tapered insulation.
- 5.2.3. Do not cover exterior expansion joints with downspouts.
- 5.2.4. Preference to not have internal roof drains, utilize scuppers and downspouts.

6. WOODS, PLASTICS AND COMPOSITES

6.1. GENERAL

- 6.1.1. Countertops shall be a plastic laminate material with post-chamfer hardwood edge banding or solid phenolic. Finish options to be selected by the architect and approved by the Owner.
- 6.1.2. Select construction and finish materials for durability. Only cabinet plywood, not particleboard shall be used. Indicate solid 3/8" minimum wood edge banding on wood-faced shelves, doors, and drawers.
- 6.1.3. Use five knuckle butt hinges. Do not use Euro-style cabinet hinges.
- 6.1.4. Design cabinet door width to prevent warping.
- 6.1.5. Provide 3/8" +/- gaps between doors and/or drawers to improve the durability of the product.
- 6.1.6. In new construction use birch or oak veneer throughout, except in the media center. The media center circulation desk shall coordinate with the bookcases.
- 6.1.7. Provide mailroom casework. **See Appendix 6.1.7.**
- 6.1.8. Provide worktable, see appendices. **See Appendix 6.1.8.**

6.2. ELEMENTARY AND K8 SCHOOLS

- 6.2.1. Casework shall be constructed with birch or oak veneer plywood with clear finish with 3/8" min. matching wood edge banding on shelves, doors, and drawers. Use heavy-duty butt hinges or heavy-duty wrap around hinges.
- 6.2.2. Reception desk shall be constructed utilizing plastic laminate(s).
- 6.2.3. Provide casework in each elementary classroom. All classroom casework locks shall be keyed the same. **See Appendix 6.2.3.**
- 6.2.4. Provide locks on wardrobes in classrooms which are to be keyed alike.
- 6.2.5. Provide anti-tipping shelf clips for adjustable shelving.
- 6.2.6. In science prep rooms provide a chemical storage cabinet with anti-tip shelving, a metal corrosive storage cabinet and a separate metal flammable storage cabinet.

6.3. MIDDLE AND HIGH SCHOOLS

- 6.3.1. Casework in all areas (except science classrooms) shall be plastic laminate covered MDF with solid 3mm thick PVC edging and heavy-duty butt hinges.
- 6.3.2. Casework in science classrooms shall be veneer plywood with solid wood facing. Countertops to be acid/alkali resistant.

ARCHITECTURAL

- 6.3.3. Casework in parent centers, workrooms, lounges, and reception areas shall be plastic laminate covered MDF with solid 3mm thick PVC edging and with heavy-duty five knuckle hinges.
- 6.3.4. Provide locks on wardrobes in classrooms which are to be keyed alike.
- 6.3.5. Provide anti-tipping shelf clips for adjustable shelving.
- 6.3.6. In science prep rooms provide a chemical storage cabinet with anti-tip shelving, a metal corrosive storage cabinet and a separate metal flammable storage cabinet. In K8 science prep rooms these two metal cabinets can be smaller, stackable with safety warning.

6.4. **BLOCKING**

- 6.4.1. Blocking shall be provided in the wall where required to mount grab bars, handrails, casework, tack and marker boards, monitors, flag holder, wall stops etc. Use fire retardant wood where required.

7. **THERMAL AND MOISTURE PROTECTION**

7.1 **INSULATION AND FIREPROOFING**

- 7.1.1. The architect shall specify appropriate insulation and fireproofing to provide a safe, energy efficient, and quiet school environment that meets or exceeds code requirements. Insulation values shall be at least equal to those listed in the energy code. When possible, and at a reasonable cost, minimum requirements should be exceeded. Copies of the energy requirements shall be provided to the Owner during the design development phase.
- 7.1.2. Specify fireproofing (when required) that is approved for safe application in plenum spaces. Do not design roof systems that require the metal deck to be fireproofed.

7.2. **SOFFITS**

- 7.2.1. First choice: Commercial quality steel or aluminum soffit panel.
- 7.2.2. Second choice: Exterior cement board with cementitious finish.
- 7.2.3. Do not use exterior gypsum products or wood.
- 7.2.4. Soffit finish must withstand a low-pressure wash.

7.3. **BUILT-UP ROOFS**

- 7.3.1. General
 - 7.3.1.1. Roofs shall be four-ply built-up; or three-ply built-up with white modified bitumen cap sheet; or 60 mill single-ply PVC fully adhered system.
 - 7.3.1.2. No interior rain leaders.
 - 7.3.1.3. Consult latest edition of National Roofing Contractors Association (www.NRCA.net) roofing materials guide for low slope membrane and insulation board products for design, product, manufacturer and warranty information.
 - 7.3.1.4. Review access to the roof with the Owner. There shall be no access to the roof that would allow students to access the roof. Do not place ladders on the outside of the building from the ground level. Ladders shall be provided from one roof level to another.
 - 7.3.1.5. Number of roof penetrations should be minimized. Locate penetrations in a vertical outside wall whenever possible.
 - 7.3.1.6. Locate outside air intakes away from exhaust fans.
 - 7.3.1.7. All roofing materials and components comprising the total roof system shall be compatible with each other.
 - 7.3.1.8. Roof areas must be sloped sufficiently to produce good and complete drainage to the outlets. Roof slope shall be attained by sloping structure/deck, not insulation.
 - 7.3.1.9. A single subcontractor shall be responsible for the entire roof system.
 - 7.3.1.10. All roof areas to be inspected by Owner's roofing specialist for defects prior to installation of cap sheet.
 - 7.3.1.11. When provided, sloped roofs and canopies to have a maximum slope of 6:12.
- 7.3.2. Substrate
 - 7.3.2.1. The structural substrate shall provide a minimum slope of ¼ inch per foot.
- 7.3.3. Insulation
 - 7.3.3.1. The roof insulation shall comply with the North Carolina Energy Conservation Manual.
 - 7.3.3.2. Tapered insulation shall be minimized.
- 7.3.4. Membrane
 - 7.3.4.1. Currently preferred systems include but are not necessarily limited to the followings systems:
 - 7.3.4.2. First choice is fully adhered 60ml fleece backed PVC over a cover board. The deletion of cover board or reduction in thickness may be considered as alternate or value engineering items. Discuss with CMS Design Manager prior to completion of design development phase.
 - 7.3.4.3. Second choice is 4-ply with type VI fiberglass felts with modified cap sheet.
- 7.3.5. Detailing
 - 7.3.5.1. Consult National Roofing
 - 7.3.5.2. Contractors Association (NRCA) Manual (latest edition) for roofing design and detail recommendations.
 - 7.3.5.3. Refer to SMACNA for sheet metal designs and details.

ARCHITECTURAL

- 7.3.5.4. Detail flashing against parapets under copings, gravel stops, over shelf angles, windows, doors, horizontal relief joints, penetrations and at changes from horizontal to vertical plane. **See Appendix 7.3.5.4.**
- 7.3.6. Project Conditions
- 7.3.6.1. For additions and renovation projects, provide alternate for fume recovery system if students and staff are on site.
- 7.3.7. Roof Walk-Pads
- 7.3.7.1. Show walk pads on architectural roof plan in configuration to meet roof manufacturer's warranty requirements. As a minimum, provide from the point of roof access and to all equipment requiring service. Pads to be 10" – 12" apart.
- 7.4. **METAL ROOFS**
- 7.4.1. Manufacturers are required to inspect the installation prior to final acceptance.
- 7.4.2. Provide snow/ice guards. (T-Bar type that clamps to standing seams.)
- 7.4.3. Provide continuous one (1) piece metal panels.
- 7.4.4. Avoid steep pitches and low slopes (3:12 min. slope). When provided, sloped roofs and canopies to have a maximum slope of 6:12.
- 7.4.5. Provide 2-piece clips in standing seams for thermal movement.
- 7.4.6. Provide standing seam, 2" minimum height, 2 ½" maximum height, and factory-made panels.
- 7.4.7. All flashing and roof accessories shall match roof material and color.
- 7.4.8. Metal roofs are acceptable for use on entrance canopies, athletic buildings, i.e., concessions, ticket booths, etc.
- 7.5. **SEALANT/FIRE STOPPING**
- 7.5.1. Require contractor to submit details on each proposed assembly identifying intended products and applicable UL system number or UL classified device.
- 7.5.2. Require contractors to verify with local building officials when inspection of rated penetrations is required.
- 7.5.3. Specify manufacturers that are listed in the UL Fire Resistance Directory for the UL system used.
- 7.5.4. At painted drywall that terminates at brick, split-face block, or some other porous material that is not to be painted, provide a drywall edge and a thin bead of clear silicone caulk at that termination point and paint (cut) to that point.
- 7.6. **EXPANSION JOINT COVER**
- 7.6.1. Provide metal expansion joint covers at all expansion joints as per SMACNA requirements.
- 7.7. **GUTTER AND DOWNSPOUT**
- 7.7.1. Provide over-sized units – exceed code minimums. Tie downspouts into storm drainage system; provide aluminum or cast iron (preferred) boots 18" high above grade.
- 7.8. **SHINGLE ROOFS**
- 7.8.1. Shingle roofs are acceptable for dugouts, storage buildings, etc.
- 7.8.2. Provide 20-year 3-tab asphalt shingles with underlayment and metal drip edge. Installation and ventilation systems per manufacturer's warranty requirements.
- 7.9. **BUILDING ENVELOPE AND AIR BARRIER REQUIREMENTS**
- 7.9.1. The project shall be designed to conform to an air infiltration rate of no greater than 0.15 cfm per square foot of exterior envelope at 0.3 inches of water gauge (75 Pa) pressure difference when tested by a qualified testing agent.
- 7.9.2. Upon completion of the new buildings and/or additions CMS in coordination with the Designer and CM/GC will have an Air Barrier System Envelope Test performed to specifically measure the air leakage through the opaque and fenestration portions of the building envelope excluding HVAC related penetrations. Prior to initiating the test, the following steps will be taken:
 - 7.9.2.1. Windows and doors will be closed and latched except for those that contain test fans, which will be secured in the open position.
 - 7.9.2.2. All exhaust and make up air fans will be turned off, motorized dampers will be cycled to the closed position, and gravity dampers will be left in the closed position or blocked so they do not open from the pressures induced during the test.
 - 7.9.2.3. All other HVAC-related openings will be temporarily sealed.
- 7.9.3. Building designs resulting in actual air infiltration of less than or equal to .20 cfm when tested will be considered acceptable.
- 7.9.4. If after the CM/GC corrects the deficiencies and/or non-compliances the building does not conform to the acceptable leakage rate; at the discretion of the Owner; the designer shall be responsible for correcting the errors/omissions as required to bring the building into compliance including the cost of an additional retest.
- 8. **OPENINGS**
- 8.1. **ENTRANCE SYSTEMS**
- 8.1.1. ENTRANCE VESTIBULES – This section communicates the desired door function and associated hardware for all entrance vestibule doors. Entrance vestibules will have dedicated exterior/*primary* and interior/*secondary* doors to accommodate staff, students, and visitors. Staff and visitor doors should always be far left or right with student

ARCHITECTURAL

doors being in the center. When locating the staff and visitor doors, considerations should be given to accommodate the camera entrance system and access control card reader devices. Avoid overhead stops. CMS prefers utilization of wall stops or floor stops when possible. Note that all hardware required for the doors is not listed in this section as it is intended to communicate desired functionality with respect to security.

- 8.1.2. STAFF DOORS – Primary and secondary staff entrance doors will have card reader and keyed access.
 - 8.1.2.1. Night latch/cylinder with pull handle
 - 8.1.2.2. Electrified exit device/less dogging
 - 8.1.2.3. Door closer with hold open capability
 - 8.1.2.4. Wall stop or floor stop preferred (avoid overhead stop)
- 8.1.3. STUDENT DOORS – Primary and secondary student entrance vestibule doors shall always remain locked and have hold open capability. Discuss use of door pairs with mullion with CMS design manager and facility architect.
 - 8.1.3.1. No pull handle
 - 8.1.3.2. Exit device less dogging
 - 8.1.3.3. Door closer with cush stop and hold open capability.
- 8.1.4. PRIMARY VISITOR ENTRANCE DOOR – door from outside to secured vestibule will be released remotely by staff via the entrance camera telephone system.
 - 8.1.4.1. Pull handle
 - 8.1.4.2. Electrified exit device/less dogging
 - 8.1.4.3. Door closer
 - 8.1.4.4. Wall stop or floor stop preferred (avoid overhead stop)
- 8.1.5. SECONDARY VISITOR ENTRANCE DOORS – door will lead from secured vestibule to the reception area and be temporarily unlocked by staff via remote release button located at the transaction window.
 - 8.1.5.1. Pull handle
 - 8.1.5.2. Electrified exit device/less dogging (preferred) or electric strike as appropriate
 - 8.1.5.3. Door closer
 - 8.1.5.4. Wall stop or floor stop preferred (avoid overhead stops)
- 8.1.6. Aluminum storefront doors with clear anodized finishes will be used at all exterior door openings except utilitarian and back of house spaces which shall have hollow metal frames and doors.
 - 8.1.6.1. Provide aluminum storefront doors with half-lite glazing and insulated metal panels on the lower section. Discuss appropriate window treatment for doors with CMS Design Manager.
 - 8.1.6.2. Aluminum storefront doors and frames that are not part of a main building entrance should be independent of windows and storefront assemblies.
- 8.1.7. Whenever possible, exterior doors should be recessed or have some means of overhead protection. Primary entrance doors must be covered. Secondary doors without overhead protection must have rain drips.
- 8.1.8. Recessed doors shall have a vision panel for security and monitoring.
- 8.1.9. Avoid use of automatic door operators.
- 8.1.10. CMS prefers not to have glass in the lower half of the doors.
- 8.1.11. Provide security hardening at new schools and renovations to front entrances. Front door entry glazing and doors have security glass and a transaction window within a hardened vestibule shall be designed as a base bid feature. Classroom wings and entries will have security glass and be bid as an add alternate. **See Appendix 8.1.6.**
- 8.2. **EXTERIOR DOORS AND FRAMES**
 - 8.2.1. All exterior doors shall always remain locked. No dogging feature on exit devices.
 - 8.2.2. Aluminum store front doors should have wide stiles. The hardware supplier (not the door manufacturer) shall provide the hardware. Lite or narrow style doors are unacceptable; 6" nominal width, minimum.
 - 8.2.3. Exterior doors should be designed to swing open 105 degrees minimum to reduce abuse to the door frame and hardware.
 - 8.2.4. Exterior wood doors are not acceptable.
 - 8.2.5. Fabricate aluminum doors with mechanically fastened corners with reinforcing brackets or fillet welded or incorporate concealed tie rods.
 - 8.2.6. Provide stops for every exterior door, in the following order of preference:
 - 8.2.6.1. Wall stop
 - 8.2.6.2. Floor stop (if not creating a trip hazard)
 - 8.2.6.3. Spring stop arm on the door closer (SCUSH)
 - 8.2.7. When there is panic hardware specified for an aluminum storefront door, coordinate the glazed opening with the panic hardware.
 - 8.2.8. Provide stainless steel ball bearing hinges at exterior doors with non-removable pins. Discuss use of continuous hinges on aluminum doors with CMS Design Manager.
 - 8.2.9. Exterior Kitchen door shall typically be 42 inches wide with a fly fan, electrified exit device (QEL), less dogging, card reader, viewer, armor plate, doorbell, and night latch (NL) trim.

ARCHITECTURAL

- 8.2.10. In locations where multiple exterior doors are used, provide only one lock on the outside.
- 8.2.11. Exterior pairs shall have rim exit devices with removable mullion.
- 8.2.12. Non-main entrance doors:
 - 8.2.12.1. Typical: Exit only (EO) less dogging.
 - 8.2.12.2. If keyed access, provide night latch (NL) function less dogging (LD).
 - 8.2.12.3. If card access, provide electric latch retraction (QEL) with NL trim.
 - 8.2.12.4. High school stadium press box lock and keyway will coordinate with the field house building keyway.
- 8.2.13. Provide access from the bus parking lot into the multipurpose room or cafeteria or through to an adjoining corridor. These openings will provide a pathway through double doors with a removable mullion for the purpose of distributing or removing palletized materials. A 5' wide sidewalk providing access from the parking lot to this opening is required. The exterior doors supporting this opening will have hold open closers and a locking cylinder.
- 8.2.14. Exterior doors for Performing Arts spaces in K8, MS and HS shall be 42 inches wide.
- 8.3. **INTERIOR DOORS AND FRAMES**
 - 8.3.1. Generally, most interior doors shall be 3'-0" wide and 7'-0" high and solid core wood, 1 3/4" thick.
 - 8.3.2. Interior doors serving assembly spaces shall have exit device with dogging indicator and door hold open as appropriate for the space (cafeteria, multipurpose room, auditorium, gymnasium, etc.) Designer shall make every effort to locate those doors in "pockets" where magnetic hold open devices or wall stops can be accommodated.
 - 8.3.3. Interior doors for Performing Arts spaces in K8, MS and HS shall be 42 inches wide to facilities the transport of equipment and instruments. This includes all classrooms, storage, practice, performance, and repair areas.
 - 8.3.4. Interior door for the main custodial room only shall be 42 inches (minimum). Provide reasonable angle of approach for floor machines and pallet jacks.
 - 8.3.5. Do not specify gypsum core fire doors; use hollow metal.
 - 8.3.6. Wood finish shall be birch or oak veneer, custom grade with a clear finish. Make sure that the tops and bottoms of the wood doors are sealed.
 - 8.3.7. In renovation projects the new doors shall match the existing doors.
 - 8.3.8. Flush wood doors shall be obtained through one source from a single manufacturer.
 - 8.3.9. Avoid entrance doors to restrooms with multiple toilet compartments. Design entrances to toilet rooms with adequate screening that does not depend on doors.
 - 8.3.10. Provide vision panels in all public access doors, or doors requiring visual access to spaces. No half-lite in wood or hollow metal doors and frames. Glass lites shall be 1/4" clear, tempered glass.
 - 8.3.11. Inside gyms, take care to locate doors away from the end of the courts where students can easily run into the lever set or glass. If doors must be in these potentially hazardous situations, they will need recessed hardware and possibly pad protection.
 - 8.3.12. Where double egress fire doors are required, the following conditions are preferred:
 - 8.3.12.1. In a corridor area, design double egress single doors with an intermediate wall section and each door is held open with electromagnetic hold open devices.
 - 8.3.12.2. Minimum 3'-6" opening.
 - 8.3.12.3. Security Design (2) single doors with rim devices.
 - 8.3.12.4. No center mullion.
 - 8.3.12.5. No vertical concealed rod with top and bottom latches.
 - 8.3.12.6. Removable Mullions shall be standard type, with no keyed cylinders for removal.
 - 8.3.12.7. Vertical surface-mounted rod with top-only latch is acceptable under certain conditions – verify with CMS.
 - 8.3.12.8. At areas of double egress (near gym or multipurpose), provide alarm device at exit doors for segregated use after school hours. These doors shall be equipped with battery type alarm device.
 - 8.3.13. Interior corridor and stairwell doors that are to be held open most of the time shall have magnetic hold-open devices regardless of fire rating.
 - 8.3.14. Inside kitchens, specify HM door frames and HM doors with A60 galvanneal coating.
 - 8.3.15. Provide door identification tag on hinge side. **See Appendix 8.3.15.**
 - 8.3.16. At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
 - 8.3.17. Provide fire-rated doors with fire-retardant stiles matching face veneer that are labeled and listed without the need for formed-steel edges and astragals.
 - 8.3.18. At 20 minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.
 - 8.3.19. Door Size for all band rooms: Provide a minimum door width of 40 inches.
 - 8.3.20. Classroom/office/workroom-type corridor doors:
 - 8.3.20.1. Provide door with glass vision panel. No side lite windows or half-lite windows in wood or hollow metal doors and frames.
 - 8.3.20.2. Door width to accommodate floor buffer.
 - 8.3.21. Typical hardware functions:

ARCHITECTURAL

- 8.3.22. Classrooms shall have storeroom function locks.
- 8.3.23. Single exterior Classroom doors shall have panic hardware with NL function and pull handle.
- 8.3.24. Interior Kitchen doors to serving area shall have push/pull trim with recessed pulls, no closers, and wall-mounted hold-open (WS40).
- 8.3.25. Offices in administration area shall have office function locksets except at reception area.
- 8.3.26. Conference rooms in administration area shall have classroom function locksets.
- 8.3.27. Records room, and electrical rooms shall have storeroom function locksets.
- 8.3.28. Electrical rooms requiring panic hardware shall have NL function and hold-open function.
- 8.3.29. Custodial closets shall have storeroom function locksets with no closer.
- 8.3.30. TR/ER Rooms should have card reader access with storeroom function lockset and electric strike.
- 8.3.31. All K-1 classrooms shall have "no key cylinders" at toilet rooms.
- 8.3.32. Modified restrooms (with one or two door(s) to classroom and one door to corridor) shall have privacy function on the door(s) to the classroom, and staff bathroom function on the door to the corridor.
- 8.3.33. Provide staff toilets and family restrooms with storeroom function with deadbolt and occupancy indicator (Basis of design, Schlage L9480).
- 8.3.34. Collaboration rooms shall have classroom function lockset.
- 8.3.35. Stairwell doors should be non-locking lever trim, surface vertical rods with less bottom rods (LBR) and held open.
- 8.3.36. Resource rooms should have storeroom function lockset with no closer.
- 8.3.37. Planning rooms (teacher space) shall have classroom function lockset with closer.
- 8.3.38. For ~~typical~~ larger classrooms requiring multiple exits and panic hardware, provide one door with EO trim, and one door with key access with a pull (typically NL). For exterior exit doors from classrooms, provide NL function.
- 8.3.39. Storerooms within classrooms shall have classroom function locksets.
- 8.3.40. Kiln rooms shall have storeroom function locksets.
- 8.3.41. Pairs of doors at assembly spaces shall have rim panic devices with removable mullion (NL x DT). If rated, provide lever trim (L-F).
- 8.3.42. Door from reception into the school shall have classroom function lock
- 8.3.43. Doors from reception into office suite shall have an office function lockset, to be approved by CMS.
- 8.3.44. Doors from office suite to the corridor shall have a storeroom function lockset.
- 8.3.45. Where possible provide manual flush bolts in lieu of automatic or self-latching type.
- 8.3.46. Do not provide levers or offset pulls on exterior doors. EO, NL or DT (dummy trim) only
- 8.3.47. Include Molex connectors at all electrified door hardware.
- 8.3.48. Provide sound gasket at music and band room locations.
- 8.3.49. Double-acting, door-edge profiles shall have round vertical edges with 2-1/8" (54-mm) radius.
- 8.3.50. Kick and mop plates shall be used at utilitarian spaces and custodial doors.
- 8.3.51. Provide panic hardware devices on play area gates for emergency egress away from the play area.
- 8.3.52. Provide stops for doors in the following order of preference:
 - 8.3.52.1. Wall stop
 - 8.3.52.2. Floor stop (if not creating a trip hazard) will be Rockwood Model 466.
 - 8.3.52.3. Spring stop arm on the door closer (SCUSH).
- 8.3.55. Door handles shall be 99NL or 99DT straight pull handles.
- 8.3.56. All staff restrooms and wellness rooms shall have occupancy indicator feature.
- 8.4. **STEEL DOORS AND FRAMES**
 - 8.4.1. Knock-down frames are not permitted.
 - 8.4.2. Concealed fastenings shall be used.
 - 8.4.3. At exterior locations, provide doors fabricated with thermal-insulating door and frame assemblies (thermal break).
 - 8.4.4. Countersunk flat or oval heads shall be used for exposed screws and bolts.
 - 8.4.5. Frame stop/mullion shall be dimensioned to receive door closure for proper installation.
- 8.5. **WINDOWS**
 - 8.5.1. Provide fixed windows unless required by code.
 - 8.5.2. Do not provide low windows that may be compromised with lawn maintenance; breakage is an issue.
 - 8.5.3. Operable windows are to be provided only when required by Code.
 - 8.5.3.1. Do not provide operable windows that could project into a walkway path of travel.
 - 8.5.3.2. When required by code, horizontal slider operable windows are preferred.
 - 8.5.3.3. Do not provide double-hung windows without approval.
 - 8.5.3.4. For operable windows on upper levels, provide a windowsill height and window opening restrictor that complies with exit code requirements as well as safety (OSHA) requirements - minimum 42".
 - 8.5.3.5. Specify institutional grade heavy-duty hardware that will withstand heavy use and abuse.
 - 8.5.4. Glazing shall be clear insulated low-e glass, typically avoid low iron glass due to cost constraints. Recommend glazing in the low to medium range for solar gain.

ARCHITECTURAL

- 8.5.5. Architect must consider how windows will be maintained while designing the project, cleaning access to all interior and exterior glass surfaces.
- 8.5.6. Finish shall be clear anodized.
- 8.5.7. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- 8.5.8. Utilize daylighting when designing fenestration in all teaching spaces.
- 8.5.9. 1" mini blinds to match window framing system, use at exterior windows. Discuss with CMS Design Manager for direction regarding preference for built-in blinds or security film on exterior doors with half-lite glazing.
- 8.5.10. Insect screens are not required.
- 8.5.11. Tutor Room shall have angled wall with one-way glass vision panel for classroom monitoring. No windows on corridor wall. No window blinds. **See Appendix 8.5.11.**

8.6. **KEYING**

- 8.6.1. Submittal Sequence: Submit the final door hardware schedule at earliest possible date, particularly where approval of the door hardware schedule must precede fabrication of other work that is critical in the project construction schedule. Include product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware schedule.
- 8.6.2. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations. Including a bitting schedule at conclusion of project to CMS Locksmith Department.
- 8.6.3. Keying Conference: Conduct conference at project site to comply with requirements in Division 1 Section Project Meetings. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system. A copy of the items CMS will bring up is available upon written request to the CMS Locksmith Department.
- 8.6.4. All cylinders shall be factory master keyed and grand-master keyed as required by the Owner. All locks shall be construction keyed during the construction period.
- 8.6.5. Construction control and operating keys shall not be part of the Owner's permanent keying system or furnished on the same keyway as the Owners permanent keying system.
- 8.6.6. Locks will be supplied in manufacturers 6 pin standard key section except for the school is under an existing factory master key; cylinders will be supplied and keyed to the existing system.
- 8.6.7. Dry food storage at kitchen cafeteria shall be single, keyed different (SKD).
Provide CMS preferred pin coded padlocks at all gates, fencing, roof hatches or other access ways requiring security (new ES – 12 padlocks; new MS/K8 – 25 padlocks; new HS – 35 padlocks).

8.7. **WINDOW SECURITY SCREENS**

- 8.7.1. For windows required by code for classroom egress, if wire security mesh covers are provided, one per classroom must have mesh hinged with a sign on the interior of the mesh stating, "Emergency Egress". If the security mesh is attached to the operable window instead of attached to the frame, then there is no need to provide a sign.
- 8.7.2. Use security screens in exterior kitchen windows.

8.8. **OVERHEAD COILING DOORS**

- 8.8.1. Overhead doors shall be motorized if larger than 6' wide x 8' tall.
- 8.8.2. Utilize standard manufacturer finish.
- 8.8.3. Overhead door at dishwasher location shall be stainless steel.
- 8.8.4. Obtain overhead coiling doors, operators and controls through one source from a single manufacturer.
- 8.8.5. Overhead coiling door curtain shall be fabricated of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Inside curtain slat face shall match the material of the outside metal curtain slat. If there is more than one overhead door, lock cylinders will be keyed alike. Curtain jamb guides for counter doors shall be fabricated of material and finish to match curtain slats.
- 8.8.6. Exterior coiling doors shall be provided with replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to the bottom and top of exterior doors.

8.9. **ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**

- 8.9.1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealants or tape or installing nonconductive spacers as recommended by manufacturers for this purpose.
- 8.9.2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- 8.9.3. Flashing shall be manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials. Exposed flashing shall be sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

ARCHITECTURAL

- 8.9.4. Provide blast resistant glazing at new schools and renovations at main, bus lot, student parking and public entrances. A transaction window within a hardened main entrance vestibule shall be designed as a base bid feature. Classroom wings and other entries will have blast resistant glazing bid as add alternate.

9. FINISHES

9.1. GYPSUM BOARD

- 9.1.1. Gypsum wallboard thickness shall be 5/8" minimum when used in single layer applications, in appropriate areas high-impact gypsum board shall be used.
- 9.1.2. Minimum stud spacing shall be 16" o.c. for 3-5/8" studs.
- 9.1.3. All classroom demising walls shall be constructed from slab to deck with continuous acoustic separation.
- 9.1.4. Provide blocking or metal strapping for attachments to gypsum wallboard partitions. Metal strapping should not be used for high-use applications.
- 9.1.5. Where gypsum board edges abut porous material not to be painted, provide edge trim and caulk.
- 9.1.6. Middle, K8, and high school toilet ceilings use moisture-resistant gypsum board with epoxy finish. Access to all equipment is required.
- 9.1.7. Provide protective (FRP) board or stainless steel with eased edges on non-CMU walls behind utility type sinks, typically in custodial spaces, art and CTE classrooms.

9.2. CEILINGS

- 9.2.1. If the building configuration can accommodate a 10' ceiling, that height is preferred over 9' (minimum and in general type spaces and classes)
- 9.2.2. Refer to Facility Programs for specific ceiling heights in the specialty spaces.
- 9.2.3. Acoustic Panel Ceilings
- 9.2.3.1. The standard suspended acoustic ceiling system shall be a 2x2 lay-in, square edge tile. Do not use a regular edge tile.
- 9.2.3.2. Concealed-spline ceiling tiles shall not be used.
- 9.2.3.3. Ceilings at elementary school group toilets shall be flat lay-in vinyl faced panels with white aluminum grid.
- 9.2.3.4. Ceilings at individual staff toilets shall be flat lay-in vinyl-faced panels with an aluminum grid.
- 9.2.3.5. Kitchen and serving area ceilings shall be flat lay-in tile. Finish should be vinyl covered meeting Health Department standards. Size to be 2'x2'; grid to be aluminum finished white.
- 9.2.3.6. Corridors and main lobby shall use lay-in acoustic panels. Gypsum wallboards may be used as an accent. Consider exposed painted structure on a case-by-case basis.
- 9.2.3.7. Provide panels with a minimum NRC of .70 in classrooms.
- 9.2.3.8. Provide panels with a minimum NRC of .90 in music and band rooms.
- 9.2.3.9. Provide panels with a minimum NRC of .90 in cafeteria dining area and multipurpose rooms.
- 9.2.3.10. For any circular or non-linear penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

9.3. RESILIENT FLOOR AND BASE

- 9.3.1. Resilient floor tile shall be the predominant floor covering material in the school. Review a preliminary floor finish plan with the Owner prior to developing the construction documents.
- 9.3.2. Refer to the Appendix for ES and K8 Multipurpose Room play striping. **See Appendix 9.3.2.**
- 9.3.2.1. ES platforms shall be resilient floor tile.
- 9.3.3. Do not use rubber risers and treads on stairs, concrete filled pan stairs preferred.
- 9.3.4. Color of base to be selected by AE using standard color selections.

9.4. CARPET

- 9.4.1. Carpet tiles (preferred) shall be used in the administration area, media center, remote office locations, SRO office, except for Makerspace. Selection and size of carpet tiles shall be presented to CMS for approval.

9.5. CERAMIC TILE

- 9.5.1. Use ceramic tiles that is impervious to soil and stains to reduce the amount of grout and to facilitate easy cleaning.
- 9.5.2. Toilets and Locker Rooms
- 9.5.2.1. Toilet and locker room floor and base shall be non-slip porcelain tiles with epoxy grout. (White or light-colored grouts are not to be used.) 1"x 1" or 2"x 2" mosaic tile will not be accepted.
- 9.5.2.2. Toilet and locker room walls: Ceramic tiles with epoxy or cementitious grout on CMU block is first choice. Epoxy painted CMU is second choice.
- 9.5.2.3. Contractor to plug floor drain during construction to prevent grout from setting in P-trap.
- 9.5.2.4. Tile backing isolation membrane over cracks with concrete substrate and over areas susceptible to cracking.
- 9.5.2.5. Set tile on thickset mortar bed in all group restrooms (including elevated slabs) to provide proper slope to drains.
- 9.5.2.6. Use different colors of wall tile in male/female group restrooms for wayfinding.
- 9.5.2.7. Preferred: 5-foot-high tile wainscot in group toilets on wet and end walls, and in Health room toilet room. Provide tile finish on wet walls and below and around the hand dryer to protect wall finish.

ARCHITECTURAL

9.5.3. Kitchen

- 9.5.3.1. Use non-slip quarry tile on thickset mortar bed with epoxy grout as a flooring material in all kitchen areas.
- 9.5.3.2. Quarry tile floors shall have epoxy grout and positive slope to drain to ensure water will not stand.
- 9.5.3.3. Walk-in cooler and freezer floor to be quarry tile with epoxy grout.
- 9.5.3.4. Walls and Base: Epoxy painted CMU meeting Health Department requirements.
- 9.5.3.5. Review a preliminary floor finish plan showing floor slope and floor drain locations with the Owner prior to developing the construction documents.

9.6. PAINTING

- 9.6.1. Standard field paint color to be Sherwin Williams CMS UPDATED JAN 17, 2020, OYSTER WHITE.
 - 9.6.2. Semi-gloss latex paint for gypsum board walls, CMU walls and hollow metal frames unless specified otherwise.
 - 9.6.3. Preference for accent colors in higher locations. Door frame and HM door color to coordinate with rubber base color.
 - 9.6.4. Custodial, toilet, kitchen areas and anywhere food will be served to receive semi-gloss epoxy paint over a higher grade of block fill.
 - 9.6.5. Painting includes field painting of interior exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
 - 9.6.6. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts and labels. Prefinished items may include the following factory-finished components:
 - 9.6.6.1. Architectural woodwork
 - 9.6.6.2. Overhead coiling doors
 - 9.6.6.3. Door hardware
 - 9.6.6.4. Acoustic wall panels
 - 9.6.6.5. Metal toilet enclosures
 - 9.6.6.6. Metal lockers
 - 9.6.6.7. Finished mechanical and electrical equipment
 - 9.6.6.8. Light fixtures
 - 9.6.6.9. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - 9.6.6.9.1. Furred areas
 - 9.6.6.9.2. Ceiling plenums
 - 9.6.6.9.3. Utility tunnels
 - 9.6.6.9.4. Pipe spaces
 - 9.6.6.9.5. Duct shafts
 - 9.6.7. Finished metal surfaces may include the following:
 - 9.6.7.1. Anodized aluminum
 - 9.6.7.2. Galvanized metal
 - 9.6.7.3. Stainless steel
 - 9.6.7.4. Operating parts include moving parts of operating equipment and the following:
 - 9.6.7.4.1. Valve and damper operators
 - 9.6.7.4.2. Linkages
 - 9.6.7.4.3. Sensing devices
 - 9.6.7.4.4. Motor and fan shafts
 - 9.6.7.5. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in occupied spaces. Exposed mechanical items to be painted include, but are not limited to, the following:
 - 9.6.7.5.1. Pipe hangers and supports
 - 9.6.7.5.2. Heat exchangers
 - 9.6.7.5.3. Tanks that do not have factory-applied final finishes
 - 9.6.7.5.4. Ductwork
 - 9.6.7.5.5. Insulation
 - 9.6.7.5.6. Motors and mechanical equipment
 - 9.6.7.5.7. Accessory items
 - 9.6.7.5.8. Exposed electrical items to be painted include, but are not limited to, the following:
 - 9.6.7.5.8.1 Conduit and fittings
 - 9.6.7.5.8.2 Switchgear (Not already pre-finished)
 - 9.6.7.5.8.3 Panelboards (Not already pre-finished)
 - 9.6.8. At the TV Studio in Media Centers coordinate the painting of the appropriate wall(s) to receive the “Green Wall” paint with CMS ISS and Design Manager.
- ### 9.7. WALL COVERING
- 9.8.1 Not allowed on CMS projects without written permission from CMS (on Letterhead).

ARCHITECTURAL

9.9. WOOD FLOOR

- 9.9.1. Provide a wood gym floor in all MS, K8 and HS and not a sports or rubber floor. **See Appendix 9.9.1.**
- 9.9.2. K8, middle school and high school dance floors: Provide sprung wood floor system.
- 9.9.3. K8, middle school and high school: Provide wood floor on platform (stage) on a sleeper system that allows for replacement of damaged panels or areas.

10. SPECIALTIES

10.1. MARKER BOARDS

- 10.1.1. Locate in consideration of the teaching station, teacher's desk, glare and view-ability for all students from all locations in the classroom.
- 10.1.2. See Appendices for standard teaching wall layout.

10.2. TACK BOARDS and STRIPS

- 10.2.1. Locate in consideration of the teaching station, teacher's desk and view-ability for all students from all locations in the classroom.
- 10.2.2. Provide a minimum of one 4' x 8' tack board outside each elementary and K8 school classroom.
- 10.2.3. Provide a minimum of one 4' x 4' tack board outside each middle and high school classroom.

10.3. FIRE EXTINGUISHERS/CABINETS

- 10.3.1. Do not use plastic bubble type door or breakable glazing.

10.4. TOILET PARTITIONS

- 10.4.1. Toilet and urinal partitions to be floor mounted, overhead-braced, solid plastic, or solid phenolic core.
- 10.4.2. Minimum 3' wide stalls.
- 10.4.3. Provide a wall mounted bumper for the accessible stall door.
- 10.4.4. Preference for textured finish and color in the charcoal gray range. Panel thickness to be ¾" thick.

10.5. TOILET ACCESSORIES

- 10.5.1. Provide sanitary napkin disposal receptacles in all facilities at female group toilets, female staff toilets and unisex toilets except at PK-1 classroom toilets. Coordinate locations with CMS.
- 10.5.2. CMS standard toilet tissue dispensers to be installed at all locations and above grab bars in accessible stalls. **See Appendix 10.5.2.**
- 10.5.3. Electric hand dryers to be located in close proximity to the sinks to minimize water on the floor.
- 10.5.4. Child environment water closet (K-1) where flush valve is in conflict with the rear grab bars, plumbing code (604.5.2) allows the grab bar to be separated to provide maintenance access.

10.6. LOCKERS

- 10.6.1. **See Appendix 10.6.1. Locker Schedule.** Discuss locker location and quantity preferences with CMS Design Manager.
- 10.6.2. Locate ADA lockers at the end of a row, NOT all grouped together. Hooks and shelves inside this locker are to be at accessible heights plus an extra shelf at 16" above locker floor. When 2-tier lockers are used, the ADA locker will be the lower one.

10.7. OPERABLE PARTITIONS

- 10.7.1. Partitions to be supported independently off the roof structure or joists of the floor above (do not use floor-supported partitions). Verify structural requirements to ensure that the mid-span deflection will not impede movement of the operable partition or affect the performance of acoustic seals. Include the supporting miscellaneous steel required as part of the general construction contract.
- 10.7.2. Partitions should include mechanically operated top and bottom sound seals.
- 10.7.3. Single-lead partitions are less expensive and have many operational advantages.
- 10.7.4. CMS prefers NO pass doors.
- 10.7.5. Provide walls to house the partition in the open position.
- 10.7.6. Wall height to be 14' AFF.

10.8. INTERIOR SIGNAGE

- 10.8.1. Signs to comply with NCSBC accessibility and ADA requirements. **See Appendix 10.8.1.**
- 10.8.1.1 Screw-attach to wall with tamper-proof screws. Use adhesive tape only over glass.
- 10.8.2. Verify sign titles with Owner prior to shop drawing approval.
- 10.8.3. Dedication Plaque location to be confirmed with CMS (new or replacement schools only). **See Appendix 10.8.4.**
- 10.8.4. Provide mechanically fastened, clear acrylic 8.5 x 11 fire evacuation route map holder in all occupied spaces (evacuation route signage to be developed by architect and printed/inserted by Contractor). Provide wayfinding signage at the following locations: corridor door(s) leading to "ROOF ACCESS", "KILN INSIDE" at art room and kiln room doors. Four inch (4") minimum wayfinding signs that correlate to the fire alarm device map above both sides of fire doors and at "wing changes", "SPRINKLER ACCESS ABOVE" at freezer/cooler, "FACP" or "FIRE ALARM CONTROL PANEL" at door(s) to equipment and "BDA" or "BI-DIRECTIONAL AMPLIFIER" at door to equipment.

ARCHITECTURAL

- 10.8.5. Provide panel signage with two inserts at all offices and classrooms. **See Appendix 10.8.1.**
- 10.8.6. Provide special signage at residential dishwashers in science prep rooms. See specifications.
- 10.9. **TELESCOPING BLEACHERS**
- 10.9.1. Bleachers for gymnasiums should be included in the general construction contract.
- 10.9.2. Architect to indicate layout of bleacher seating on plan and provide appropriate accommodations for wheelchairs per ADA requirements. Bleacher seating and accessible routes must not encroach onto the playing surface when fully open.
- 10.9.3. Telescoping bleachers must be attached to the wall and be electrically operated.
- 10.9.4. Provide safety end closure panels with all telescoping bleachers.
- 10.9.5. Bleachers to have integrated plastic seats in school colors in existing schools or new schools where school colors are established.
- 10.9.6. Provide seating for approximately 400-500 people at middle schools and K8s. Provide seating for approximately 1500-1600 at high schools.
- 10.10. **EXTERIOR SIGNAGE**
- 10.10.1. The entry sign shall not obstruct the view of a motorist. Coordinate with CMS for landscaping in the area of the sign.
- 10.10.2. School Marquee - All facility marquees shall be LED, programmable information type and provided at a location near road, as coordinated with Owner. **See Appendix 10.10.2.**
- 10.10.3. Directional signs are to be located at intersections or key points throughout the campus. The signs shall contain arrows to direct traffic to individual buildings and designated parking lots.
- 10.10.4. Traffic signs shall be the standard signs used by the local government or the North Carolina DOT; traffic signs shall have reflective graphics.
- 10.10.5. Provide school name with metal letters on building façade. Coordinate name and location with CMS. Provide 35 letters.
- 10.10.6. Provide a fire department designation sign for new construction projects on multi building campuses.
- 10.10.7. CM/GC to provide a construction sign for the project, see appendices for details. **See Appendix 10.10.7.**
- 10.11. **CLOCKS**
- 10.11.1. Clocks shall be provided in all teaching spaces (opposite teaching wall) and in all public spaces. Provide clock in Health Room.
- 10.12. **AUTOMATED EXTERNAL DIFIBRILLATOR (AED)**
- 10.12.1. Provide AEDs per specifications.
- 10.13. **WALL PROTECTION**
- 10.13.1. Provide corner guard at outside corners on non-CMU walls in main corridor, cafeterias, ES multipurpose room, column wraps adjacent to circulation paths and other areas where appropriate. Use of corner guards in other areas should be discussed with CMS. See specifications for material, dimensions and installation.
- 11. **EQUIPMENT**
- 11.1. **FOOD SERVICE EQUIPMENT**
- 11.1.1. See 114000 ES/K8 Master Specification
- 11.1.2. See Master Specification
- 11.1.3. See 114000 HS Master Specification
- 11.1.4. The ratio of walk-in freezer vs cooler storage in the new schools to be 60% freezer and 40% cooler.
- 11.1.5. CMS Child Nutrition requires the Manufacturer, Model Number and cost of equipment with closeout documents.
- 11.2. **PE EQUIPMENT**
- 11.2.1. Designer to allow for owner provided and installed (vendor) climbing wall in elementary schools and K8 multipurpose rooms, coordinate with CMS.
- 11.2.2. Designer to coordinate with CMS on locations and attachment of owner provided and contractor installed ~~TRX~~ Foundation Fitness system for all MS and K8 facility types only. Provide 14 snap on training stations at 5'-6" OC and at 6" and 96" AFF. Provide 10 snap on training stations at 5'-6" OC at 96" AFF, on a separate (perpendicular) wall.
- 11.2.3. Pavement stenciling at ES and K8 facilities. At exterior paving locations contractor to provide installation of pavement stenciling to support PE activities.

ARCHITECTURAL

12. FURNISHINGS

12.1. SOLID WOOD MEDIA CENTER CASEWORK

- 12.1.1. Capacity - Refer to CMS media services book collection worksheet.
- 12.1.1.1. Generally, a new 45 classroom elementary school, 54/63/66 classroom, K8 or 54 classroom middle school utilizes perimeter shelving with mobile shelving to house a maximum of 10,000 volumes. Refer to CMS media services book collection worksheet. For language immersion schools or other magnet/specialty programs consult CMS Media Services regarding quantities of collection.
- 12.1.1.2. Generally, a new 100 classroom high school utilizes perimeter shelving with mobile shelving to house a maximum 10,000 volumes.
- 12.1.2. Perimeter Shelving
 - 12.1.2.1. Elementary School/K8: 5' high x 12" deep with 3 adjustable shelves (divider type).
 - 12.1.2.2. Middle School: 6' high x 12" deep with 4 adjustable shelves
 - 12.1.2.3. High School: 7' high x 12" deep with 5 adjustable shelves
 - 12.1.2.4. Top of shelving unit shall have a valance, and bottom should have a toe plate/kick.
- 12.1.3. Double-faced mobile divider wood shelving:
 - 12.1.3.1. Elementary School/K8: Centrally located shelving shall be 3' high x 24" deep (double sided) with one adjustable shelf on each side (divider type). Provide 3-foot-long sections to supplement perimeter shelving to meet book collection requirements.
 - 12.1.3.2. Middle and High School: Centrally located shelving shall be 3'-9" high x 24" deep (double sided) with one adjustable shelf on each side, with no dividers. Provide 3-foot-long sections to supplement perimeter shelving to meet book collection requirements.
 - 12.1.3.3. Each section must be capable of carrying 1,000 pounds.
- 12.1.4. Media Center - All Shelving
 - 12.1.4.1. 12" minimum clear spacing between all shelves.
 - 12.1.4.2. All units to be solid oak. No particleboard allowed.
 - 12.1.4.3. All units shall have a 1/4" plywood back panel of plain sliced oak veneer.
 - 12.1.4.4. Adjustable shelves to be set at 1/2" increments.
 - 12.1.4.5. All shelving units should utilize individual sectional tops to allow maximum flexibility in reorganizing shelving ranges. Continuous tops are not acceptable.
 - 12.1.4.6. All shelving units are to be assembled using a minimum of four (4), 5/16" hex bolts with washers and nuts per section face to provide maximum strength, stability and easy disassembly and re-assembly. The use of screws into the wood panel stock is not an acceptable method of assembly.
 - 12.1.4.7. Divider shelves are required in elementary school main rooms only. Shelves shall be solid oak with a 2 1/2" high back and three 3/4" solid oak dividers that are glued and screwed in place. Dividers are to be 6" high and equally spaced along shelf width.
 - 12.1.4.8. Shelf pins are to be double-pin, anti-tipping shelf locks capable of supporting 300 pounds.
 - 12.1.4.9. Casters: 2" diameter casters shall be provided in the island shelving units and concealed within the base of the shelving unit. Caster supports to be designed so that the shelving range height is not increased more than 5/8" and will support minimum 250 pounds each. Provide (4) casters for each 3-foot-long shelf section. Color to be black.
- 12.1.5. Book Drop: Coordinate height of the book drop cart with the modular circulation desk slot.

12.2. LAMINATE CLAD CASEWORK

- 12.2.1. Refer to the appendices for casework elevations and details.
- 12.2.2. Casework in all middle, K8 and high school areas (except Science Classrooms) shall be plastic laminate covered MDF with solid 3mm thick PVC edging or solid wood chamfered banding and with heavy-duty five knuckle hinges.

12.3. DISPLAY CASEWORK

- 12.3.1. Provide built-in display casework at all schools. Quantity and location to be determined by CMS staff.

12.4. SCIENCE CASEWORK

- 12.4.1. Science casework (manufactured) shall be hardwood (with a preference for red oak) cabinets and drawers with acid proof tops with integral sink bowls and sink filler panels.
- 12.4.2. Science lab sinks and casework to be around the perimeter of the classroom in middle schools, K8, and general science classrooms at high schools. Provide protruding peninsulas in high school biology and chemistry.

12.5. CAFETERIA SEATING (Not in Contract)

- 12.5.1. Cafeteria seating to utilize folding, 12 seat table configurations.
- 12.5.2. At the cafeteria serving line at the menu screens, CMS's Child Nutrition vendor is providing the TV brackets and 67" - 70" monitors for the digital menu boards. The designer of record only needs to design the pathway, blocking and infrastructure to support this equipment provided by others.

ARCHITECTURAL

12.6. HORIZONTAL BLINDS

12.6.1 Provide motorized roller shades at Media Center interior and exterior windows. Discuss window treatments for Makerspace with CMS Design Manager.

12.6.2 No blinds on doors.

12.7. ATHLETIC INTERIOR

12.7.1. MS/K8/HS Scoreboard should be visible by the coaches and players.

13. SPECIAL CONSTRUCTION

13.1. BLEACHERS

13.1.1. High school football stadiums - Provide permanent aluminum bleachers for 2,500 home and 1,500 away spectators. Provide accessible route and companion seating per ADA requirements. Provide covered filming platform on press box roof accessed only through the press box.

13.1.2. High school baseball - Provide an accessible route, slab and aluminum bleacher seating for 250 spectators. Ensure slab design meets specified bleacher manufacturer requirements.

13.1.3. High School softball - Provide an accessible route, slab and aluminum bleacher seating for 200 spectators. Ensure slab design meets specified bleacher manufacturer requirements.

13.1.4. Middle school football fields - Provide an accessible route and slab.

13.1.5. K8 soccer fields - Provide an accessible route and slab.

14. CONVEYING EQUIPMENT

14.1. Elevators shall have a side entry single acting door (no center bi-parting doors) and adequate platform space to allow EMS use with an ambulance stretcher and multiple wheelchairs.

14.2. Hydraulic lines (if used) shall be accessible, not buried underground.

14.3. A grate shall be provided over the sump pit. A/E to coordinate with Specification 221429 to select correct sump pump.

14.4. Elevators shall be programmed to automatically go to the first floor in the event of a power outage. The Designer shall resolve code requirements and provide an area of refuge.

14.5. Request that the elevator floor finish be provided by the general contractor and it should be the same finish as the corridor.

14.6. Keying features shall not affect emergency firefighters' service.

14.6.1. Provide knox box to accommodate key/tool for emergency opening of elevator door – placement of box per Fire Marshal's direction.

14.6.2. Provide card reader at elevator door to enable call button. Retain cylinder and barrel key.

FIRE PROTECTION

INTRODUCTION

Division 21 is the fire protection portion of this Standard. It is intended to assist a qualified Plumbing Engineer in the preparation of drawings and specifications for the fire protection system to be included in school construction. It is not intended to serve as a code book or a construction specification. It also does not relieve the Plumbing Engineer of his responsibility for adequate design and coordination, and for compliance with the criteria provided by Charlotte-Mecklenburg Schools for a specific project.

Division 21 is compiled primarily to describe the fire protection system for new schools. In schools undergoing expansion and/or renovation, extent and condition of existing facilities and budget restraints may limit the scope of the fire protection renovation. In such cases, where feasible, the design shall facilitate the future implementation of the “New School” criteria.

The A&E and construction manager/general contractor shall obtain from the CMS the latest version of the Charlotte-Mecklenburg Schools Architect and Engineer Design Guide.

21. FIRE PROTECTION

- 21.1. Underground water service; 2 ½ in. and less – type “K” copper with silver solder joints; 3 in. and above; cement lined ductile iron ASTM C151 with mechanical joints except straight sections may be push-on joints.
- 21.2. Backflow Preventer for fire line service, use double check type.
- 21.3. Backflow preventer for fire loop shall be located in an insulated cover. See 5.07.
- 21.4. Appropriate local authorities shall approve fire hydrants and valves.
- 21.5. Provide profile of water distribution lines to site from nearest source of municipal water with all interferences.
- 21.6. Provide hydrant protection with pilings.
- 21.7. Fire loop around building shall be sized appropriately with fire hydrants spaced per authority having jurisdiction.
- 21.8. Fire Protection: The Mechanical Engineer is responsible for obtaining flow test data on the fire main and building protection requirements to make a preliminary assessment of the need for a booster pump for the fire line before construction documents are issued for review.
 - 21.8.1. On new projects plan for a space in each footprint of a new building to accommodate a fire pump.
 - 21.8.2. At existing facilities make certain the nearest hydrant serving the property is tested properly to fulfill the needs of the design. The test cannot be older than one year.
 - 21.8.3. Pressure tests of public hydrants will occur at schematic and 50% construction document phase.
- 21.9. Provide concrete bunker around control valve boxes, meters, etc.
- 21.10. Ductile iron class 50 with push on type joints – ASTM C-150 (for 8 inch and larger).
- 21.11. Valve covers for fire line will use a lockable cover that is painted red.

PLUMBING

INTRODUCTION

Division 22 is the plumbing portion of this Standard. It is intended to assist a qualified Plumbing Engineer in the preparation of drawings and specifications for the plumbing system to be included in school construction. It is not intended to serve as a code book or a construction specification. It also does not relieve the Plumbing Engineer of his responsibility for adequate design and coordination, and for compliance with the criteria provided by Charlotte-Mecklenburg Schools for a specific project.

Division 22 is compiled primarily to describe the plumbing system for new schools. In schools undergoing expansion and/or renovation, extent and condition of existing facilities and budget restraints may limit the scope of plumbing renovation. In such cases, where feasible, the design shall facilitate the future implementation of the "New School" criteria.

The A&E and construction manager/general contractor shall obtain from the CMS the latest version of the Charlotte-Mecklenburg Schools Architect and Engineer Design Guide.

22.1. GENERAL

- 22.1.1. All provisions to the "General Plumbing & HVAC Requirements" in above shall apply to this section.
- 22.1.2. All water consuming devices shall be of the water saving type.
- 22.1.3. Provide positive freeze protection on all water lines fixtures subject to freezing conditions.
- 22.1.4. Provide outside freeze proof hose bibbs at 100 feet intervals around the building.
- 22.1.5. Provide a ball valve in branch piping to all exterior hose bibbs. Where suitable locate hose bibbs adjacent to exterior mechanical rooms, dropping branch piping exposed in mechanical room and locating ball valve a maximum of 6' above finish floor. Provide 18" clearance under all hose bibbs.
- 22.1.6. Contractor shall be required to completely rod and flush out all sanitary waste lines both new and existing after a building is completed. A diagnostic video of all sanitary waste lines will be performed. One video will be done after the slab is poured and another at the completion of the project. The design engineer and CMS engineer should be informed prior to making this video.
- 22.1.7. Provide isolation valves in cold water and hot water piping so that water can be shut off to each classroom wing, administration area, each individual group toilet (separate shut-off for boys and girls) and science classrooms.
- 22.1.8. Provide chrome escutcheon rings at all exposed ceiling and wall penetrations.
- 22.1.9. Engineer shall specify plaster solids interceptor for all art room sinks.
- 22.1.10. Install all V.T.R. (vent through roof) a minimum of 15 ft. from fresh air intake.

22.2. PLUMBING VALVES

- 22.2.1. Gate valves are not allowed.

22.3. PLUMBING FIXTURES

- 22.3.1. Provide floor mounted type water closet, vitreous china.
- 22.3.2. Elongated bowls on water closets and open front seats, without covers, with stainless steel or solid brass closet, bolts and nuts and black seats.
- 22.3.3. Utilize acid-resistant, cast-iron (no ceramic) lavatories with through wall carriers.
- 22.3.4. Grid type strainers are specified in lavatory drains in public toilets and restrooms.
Provide tamper proof aerators and faucets.
- 22.3.5. Only single purpose fixtures shall be specified.
- 22.3.6. Waste fittings to be cast iron type with 17-gauge traps.
- 22.3.7. Provide wall hung type urinals with removable strainers.
- 22.3.8. Provide water coolers with a bottle filler (50% of units).
- 22.3.9. Provide a mop sink, mop rack and stainless-steel backsplash within the kitchen laundry room
- 22.3.10. Provide plumber key operated, chrome plated, box type, hose bibb/vacuum breaker mounted flush with wall for group toilets.
- 22.3.11. All water closets and urinals shall have manual flush valves
- 22.3.12. Local AHJ requires a CMS Letter of Deviation for modified restrooms **See Appendix 22.3.12.** The modified restroom fixtures cannot be used in calculations for overall fixture counts. This document is to be inserted next to the plumbing fixture schedule for all projects which have a modified restroom.

PLUMBING

22.4. WATER SUPPLY

- 22.4.1. Main domestic water supply line shall have a pulse meter located in, or close to the boiler room interconnected to Energy Management System, and a reduced pressure backflow preventer installed downstream of the CMUD meter on the school property.
- 22.4.2. Provide shock absorbers on supplies to all fixtures/appliances that have quick closing valves.

22.5. HOT WATER

- 22.5.1. New School
- 22.5.1.1. Maintain 85-110 deg F hot water to lavatories and sinks. Discuss with CMS Engineers.
- 22.5.1.2. In renovation projects, consider need for water temperature of 110° at all handwash sinks and lavatories in existing toilet rooms and After-School Enrichment Program (ASEP), staff-use lavatories, and as required by code and/or the Health Department.
- 22.5.1.3. Any shower in the school shall have an anti-scald mixing valve.
- 22.5.1.4. Provide one set of tankless heaters to serve only the 140 deg F kitchen hot water loop and separate set of tankless heaters to serve the 110 deg F building loop.
- 22.5.1.5. Provide an installed spare tankless water heater for each system to allow for uninterrupted maintenance.
- 22.5.1.6. Preference is to not to use master mixing valves. The new 2018 code requires point of use ASSE 1070 mixing valves at each public lavatory. Preference is to circulate building hot water loop at 110 deg F with a separate 140-degree loop for the kitchen area. Where applicable, provide mixing valves to reduce the temperature of the hot water to 110 ° F. Do not use heat tape as a means of maintaining water temperature on hot water lines.
- 22.5.1.7. In renovation projects, discuss hot water requirements with CMS.
- 22.5.1.8. In renovation projects, consider the location of programs/functions requiring warm water temperature of 110° including Pre-K, After-School Enrichment Program (ASEP) and lavatories in all restrooms.
- 22.5.1.9. Safety showers will be tempered to 85 degrees F or as required by code.
- 22.5.1.10. Provide a hot water system in a loop configuration.
- 22.5.1.11. If hot water is required at locations that require very long runs of piping and/or circulation pumps, special consideration should be given to an alternate source. An electric instantaneous hot water system sized to meet the demand is an economical source for continuous hot water. An energy efficient water heater would be the last consideration due to size and cost of operation over the years.
- 22.5.1.12. If tempering valves are used, locate these at point of use.
- 22.5.1.13. NSF approval required for 180-degree F water-heaters.
- 22.5.1.14. Circulators for domestic hot water shall be bronze.
- 22.5.1.15. Provide shock absorbers in supply line between hot water heater and dishwasher machine.
- 22.5.1.16. Install tees, valves and male pipe nipple with cap on the hot and cold-water lines close to the water heater for emergency purposes.
- 22.5.1.17. Provide “tepid” water for emergency eye wash units.

22.6. COLD WATER

- 22.6.1. Provide appropriate protective boxes for shut-off valves, etc. on CMS property.

22.7. DOMESTIC WATER PIPING

- 22.7.1. Provide hot and cold water to all lavatories.
- 22.7.2. Underground piping
- 22.7.2.1. Domestic water piping shall not be below slab-on-grade construction, except at riser room. Provide Type “K” copper with silver brazed joints for domestic water piping underground at riser room.
- 22.7.2.2. PVC piping can be used starting five feet outside of the building.
- 22.7.3. Above ground piping
- 22.7.4.1. Type “L” copper with lead free soldered joints (95/5 solder).
- 22.7.4. Backflow Preventer Applications:
 - 22.7.4.1. Domestic water service, use reduced pressure type backflow preventer.
 - 22.7.4.2. Fire Line service, use reduced pressure backflow preventer.
 - 22.7.4.3. Irrigation service, use reduced pressure backflow preventer.
 - 22.7.4.4. Provide pressure gauges on entering and leaving sides of backflow preventer assembly.
 - 22.7.4.5. Applications for all backflow prevention assembly installations must be submitted to and approved by Charlotte Water.
 - 22.7.4.6. Provide heated, insulated enclosure (hot box) for backflow prevention assemblies installed outside and above ground. Coordinate with electrical design engineers for adequate power supply.
 - 22.7.4.7. All underground non-metallic pipes must be marked and identified with tracer wire tape.
 - 22.7.4.8. Pressure reducing valves shall be installed in domestic water service and irrigation service when the water pressure exceeds 65 psi.

PLUMBING

22.8. IRRIGATION SYSTEMS

- 22.8.1. Provide irrigation system for athletic fields at Middle Schools, K8s and High Schools. Discuss each project with CMS Engineers.
- 22.8.2. Install backflow preventer for irrigation service, use double check type.
- 22.8.3. Install metal identification tapes (or 14 gauge or larger tracer wire) over PVC lines.
- 22.8.4. Minimum 24" cover to top of irrigation piping.
- 22.8.5. Meter the irrigation water supply so the amount of water can be subtracted from main meter to save sewage charges.
- 22.8.6. Use triple elbow swing joints at all heads.
- 22.8.7. Provide head protection from aeration.
- 22.8.8. Configure underground solenoids to minimize distance of underground wiring from head-end. Drive at least one ground rod at head-end.
- 22.8.9. Provide concrete bunker around control valve boxes, meters, etc.

22.9. PLUMBING SUPPORTS AND ANCHORS

- 22.9.1. One hanger manufacturer used throughout the job is preferable.
- 22.9.2. Horizontal piping hangers – insulated piping shall have hanger around insulation with rigid insulation above shield. Adjustable steel clevis hangers are recommended.
- 22.9.3. Vertical piping clamps – size to fit bare pipe, copper plated for copper piping.
- 22.9.4. Building attachments – use beam clamp with retaining strap or concrete inserts.
- 22.9.5. Use trapeze hangers where possible to rack piping together.
- 22.9.6. Do not support piping from bar joist bridging and/or roof deck.
- 22.9.7. Support all piping so as to prevent excessive movement.

22.10. NA

22.11. NA

22.12. SEWAGE DISPOSAL

- 22.12.1. Public Sanitary Sewer Lines
- 22.12.2. All plumbing 5' beyond all buildings on property shall be installed under DIVISION 2.
- 22.12.3. Manholes shall be spaced no more than 300' apart.
- 22.12.4. Provide manhole to make tie-in to 6" and larger sewer.
- 22.12.5. Use 4' diameter pre-cast eccentric manholes with steps 15" on center.
- 22.12.6. Minimum cover in non-traffic areas will be 3'.
- 22.12.7. Minimum cover in traffic area shall be 3' for ductile iron on Class 1 bedding.
- 22.12.8. See Section 5.02 for sewer material.
- 22.12.9. Provide profiles of sanitary sewer lines between manholes.
- 22.12.10. Use laser instrument to install all exterior sanitary sewer lines
- 22.12.11. Use drop manhole if elevation of sewer line exceeds 24" above manhole invert.
- 22.12.12. Minimum slope of sewer lines:
 - 22.12.12.1. Minimum of 1/4" per foot slope inside and under the building until the first manhole connection.
 - 22.12.12.2. Minimum flow velocity – 2fps
 - 22.12.12.3. Sewer lines shall be located outside of building. Design sanitary sewer lines to exit the building as soon as possible.
 - 22.12.12.4. Sewer lines shall be straight with uniform slope between manholes.
 - 22.12.12.5. Maximum slope is 10%.
 - 22.12.12.6. Show new and existing grade contours on plan.
 - 22.12.12.7. Exterior area cleanouts shall have pre-cast concrete donuts installed to protect cleanouts, valve boxes, meters, shut-off valves, etc. Donuts are to be no higher than 1" above grade.
 - 22.12.12.8. Install stub-outs for future mobile classrooms per CMS Engineers. Mechanical and civil engineers to coordinate.
 - 22.12.12.9. Engineers shall require contractor to dimension actual location of all sewer lines on as-constructed drawings. A minimum of two (2) dimensions from building reference points shall be provided and a bury depth indicated at a minimum spacing of 100'.
 - 22.12.12.10. Provide a minimum of a 6" sewer waste line from all group toilet restrooms.
 - 22.12.12.11. If applicable, sewage ejectors and lift stations shall be installed with a cellular (preferred) phone line for the alarm package. These systems are not preferred.

PLUMBING

22.13. KITCHEN PLUMBING

- 22.13.1. Maintain 140 deg. F. water to dishwasher, prep and pot sinks, can wash, and mop receptor.
- 22.13.2. Maintain 110 deg. F. water to hand sink. Discuss alternate designs with CMS Engineers.
- 22.13.3. Maintain 140 deg. F. and 110 deg. F. water loops by means of a recirculation system. Verify recirculation pump head and flow rate.
- 22.13.4. Provide wrist blade activated faucets at all food service hand wash sinks and lavatories.
- 22.13.5. Provide stainless steel or enameled cast iron floor sink for indirect waste from prep and pot sinks and steamer.
- 22.13.6. Provide 7" round recessed strainer floor drain for indirect waste from ice machine, serving line equipment and cooler/freezer.
- 22.13.7. Provide stainless steel floor troughs for wastes from cutter mixer, tilting skillet and area in front of steamer and steam kettle. Use stainless steel strainers built-in as a component of trough. PLEASE NOTE: Drain for tilting skillet installed parallel to skillet, not perpendicular to the skillet. Place ½ of floor drains (each floor drain) in front of equipment for cleanout purposes.
- 22.13.8. Provide cleaning faucet as required – American Standard or similar and mount under hand sink. 18" above finish floor.
- 22.13.9. Provide floor drain under cleaning faucet.
- 22.13.10. Provide an adequate number of general area floor drains to kitchen so entire floor can be easily hosed down (drains shall be sloped at ½" below finished floor, and floor shall be sloped to drains)
- 22.13.11. Provide a minimum of two wash down stations for cleaning purposes, one ~~feet~~ close to the rear door entrance and another to serve dish washroom and serving line.
- 22.13.12. Provide a utility distribution system to serve equipment under hood. Use flexible hoses under hood. Adjust hose lengths to prevent hoses from lying on floor.
- 22.13.13. Kitchen equipment shall utilize natural gas where available. Do not use LP gas.
- 22.13.14. Hood manufacturer shall furnish solenoid gas shut off valve to Plumbing Contractor for installation.
- 22.13.15. Provide freeze proof mixing faucet with a vacuum breaker for can wash. Provide shut-off valves in a protected location on hot and cold water supply lines to faucet.
- 22.13.16. Provide non-clog floor drain for can wash.
- 22.13.17. Provide minimum 1,000-gallon capacity outdoor grease interceptor (use Charlotte Water outdoor sizing requirements). Provide minimum 500-gallon capacity outdoor solids interceptor.
- 22.13.18. Connect disposals to solids interceptor prior to the grease interceptor.
- 22.13.19. Provide fill faucet for cutter mixer.
- 22.13.20. Use copper pipe for prep and pot sink for continuous waste.
- 22.13.21. Provide shock absorbers for all solenoid operated equipment.
- 22.13.22. Provide water filter at kitchen icemaker connection.
- 22.13.23. Provide hot and cold-water supply for steamer.
- 22.13.24. Plumbing Contractor shall do all final connections to kitchen equipment except items connected to the utility distribution system.
- 22.13.25. All floor drains shall be accessible.
- 22.13.26. Check all kitchen equipment to be sure we pick up all faucets.
- 22.13.27. Provide water cooler with bottle filler at cafeteria next to kitchen.

22.14. DRAINAGE, WASTE AND VENT SYSTEMS

- 22.14.1. This section includes sanitary, acid and storm drainage and vent piping systems inside building to a point 5 feet outside building. Roof drains are to be furnished and installed by General Contractor. Plumbing Contractor connects to roof drain outlet.
- 22.14.2. All cast iron piping and fittings shall meet the latest standards and specifications of the Cast Iron Soil Pipe Institute (CISPI) and of the American Society for Testing and Materials (ASTM).
- 22.14.3. Sanitary lines and drainage under slab shall be videotaped twice by a third party:
- 22.14.4. Following the pouring of the slab.
- 22.14.5. When all underground sanitation and the pouring of the slab is complete, third party to issue report of test identifying any deficiencies and marking on drawings where applicable. Videoing to be performed in the presence of CMS Plumbing department representative.

22.15. FLOOR DRAINS

- 22.15.1. Provide floor drains in all toilet rooms with more than one water closet and in the staff restroom in the kitchen area.
- 22.15.2. Provide floor drains at all water heater locations.
- 22.15.3. Provide all floor drains and floor sinks with SureSeal, deep seal P-trap. Provide hose bibb at all deep P-trap locations.
- 22.15.4. Minimum drain size shall be 3".

PLUMBING

- 22.15.5. Floor drains shall be located in all boiler rooms and in all mechanical equipment rooms (including laundry rooms) containing any equipment utilizing steam or water or that produces condensation. Drain shall be located ½" below finished floor. Slope floor toward drain.
- 22.15.6. At group toilets locate floor drains in the center of the space.
- 22.15.7. Kitchen can wash areas: Provide floor drain and non-freeze faucet with permanent vacuum breaker.
- 22.15.8. Provide in rooms with washer and dryers.
- 22.15.9. Provide in all kitchens, mechanical rooms and modified restrooms. Locate floor drain in a central location near equipment but accessible to squeegee wet floor surfaces but not under a partition floor support.
- 22.15.10. Science classrooms with emergency shower.
- 22.16. CLEANOUTS**
 - 22.16.1. Do not design clean outs in a space with carpet or wood flooring.
 - 22.16.2. Floor cleanouts:
 - 22.16.2.1. Exposed rim type, install flush with floor finish.
 - 22.16.2.2. Exposed flush type, standard non-slip scored or abrasive finish.
 - 22.16.2.3. Design clean outs to be flush with floor finish material.
 - 22.16.3. Wall cleanouts:
 - 22.16.3.1. Utilize cast iron body with cast-bronze clean-out plug, stainless steel cover.
 - 22.16.3.2. Exterior cleanouts at finish grade: Cast brass plug with recessed slot in fitting or in caulked cast iron ferrule. Exterior area cleanouts shall have pre-cast concrete donuts installed to protect cleanouts, valve boxes, meters, shut-off valves, etc. Donuts are to be no higher than 2" above grade.
 - 22.16.3.3. Pipe sleeves – schedule 40 black steel.
- 22.17. ACID WASTE**
 - 22.17.1. Reference CMS Master Specifications for point of use acid waste neutralization Basis of Design.
 - 22.17.2. When point of use neutralization cannot be utilized route acid waste piping from science classrooms to acid neutralization tank before tie in to sanitary sewer. Preference for one large tank outside of the building in lieu of point of use system(s).
 - 22.17.3. When point of use neutralization cannot be utilized provide access to sensor probes in acid waste discharge line.
 - 22.17.4. When point of use neutralization cannot be utilized alarm panel for neutralization tank should be mounted inside science lab/classroom.
 - 22.17.5. When point of use neutralization cannot be utilized high water alarm and flasher mounted outside building.
 - 22.17.6. Corrosion resistant traps required in all fixtures in chemistry classrooms.
 - 22.17.7. P-traps to wall are preferred in lieu of S-traps to floor.
 - 22.17.8. Plaster and/or interceptor traps are required for work sinks in areas such as art classrooms and shall be accessible for cleaning.
 - 22.17.9. When point of use neutralization cannot be utilized underground and above ground acid waste and vent piping shall conform to the following:
 - 22.17.9.1. When point of use neutralization cannot be utilized polypropylene piping is to be used below grade and outside of return air plenum spaces. PVDF piping provided in return air spaces.
 - 22.17.9.2. Electrical fusion or heat fusion joints are acceptable above grade but are typically specified for under slab piping conditions. No Hub mechanical joints are allowed above grade.
 - 22.17.9.3. Provide No Hub under slabs. Acid waste piping shall not use no Hub piping.
- 22.18. VENTS and VENT PIPING**
 - 22.18.1. Two-piece vent-pipe flashing at the roof is preferred, of which one should be a cap over pipe overlapping the base flashing. Use copper or lead. Roofing contracting to perform roof flashing.
 - 22.18.2. Use 3" minimum vent size at point of roof penetration.
- 22.19. ROOF DRAINS**
 - 22.19.1. Designed in accordance with the North Carolina State Building Code - Plumbing. CMS prefers to utilize gutters and downspouts.
 - 22.19.2. Roof drain installation to be by the general contractor/roofing contractor. Flashing to be done by general contractor/roofing contractor.
 - 22.19.3. Piping to roof drains by plumbing contractor.
 - 22.19.4. See Thermal and Moisture Protection in "General Design Guidelines" for boots.

PLUMBING

22.20. FITTINGS

- 22.20.1. Provide all lavatories with individual water supply cutoff valves. Provide separate supply cut off valves to each bank of urinals and water closets in the group toilets.
- 22.20.2. All exterior hose bibs to be freeze-proof type and key operated.
- 22.20.3. Lavatory waste fittings to be cast type not tube construction.
- 22.20.4. All group toilet rooms have isolation valves that are clearly located and marked and accessible.
- 22.20.5. Provide and install isolation valves at for each group toilet, wing/area, gym/locker rooms and kitchen that will facilitate easy access, maintenance, and repair of fixtures and equipment of total plumbing and mechanical systems.

22.21. NATURAL GAS SYSTEMS

- 22.21.1. Engineer and Contractor shall coordinate with Gas Company and have high-pressure gas line routed to gas meter. Plumbing contractor shall connect to load side of meter and extend inside building. Gas meter shall have pulse attachment for EMS interface.
- 22.21.2. Provide main gas valve above ground prior to entrance to building.
- 22.21.3. Provide adequate air for combustion and proper ventilation when locating gas-fired water heaters.
- 22.21.4. Preference to route gas piping outside of the building, however gas piping may be installed above accessible (lay-in) ceiling if outside the building preference is not feasible. Do not locate gas piping under floor slab and inside solid partitions including CMU. Provide accessible chases for concealed gas piping, for example a floor trench. Route gas piping exposed where possible. Gas line not allowed in return air plenum.
- 22.21.5. Provide gas shut off valves at each piece of equipment.
- 22.21.6. Final connections to equipment shall be made with flexible connectors.

22.22. COMMISSIONING

- 22.22.1. CMS has incorporated a Commissioning Program for all its Capital Improvement Program schools. CMS shall hire an independent Commissioning Agent; however, this shall not relieve the contractor or the engineer from their prime responsibilities. The architect shall incorporate into each project specifications defining the commissioning plan provided by the Commissioning Agent. It will be the responsibility of the Plumbing contractor to provide all required labor and/or material to comply with the commissioning plan.

MECHANICAL

INTRODUCTION

Division 23 represents the mechanical portions of this Standard. It is intended to assist a qualified Mechanical Engineer in their preparation of drawings and specifications of the complete system. This information is not intended to serve as a code book or a construction specification. It also does not relieve the Mechanical Engineer of their responsibility for adequate design and coordination, and for compliance with the criteria provided by Charlotte-Mecklenburg Schools for a specific project.

Division 23 is compiled primarily to describe the mechanical system for new schools. In schools undergoing expansion and/or renovation, extent and condition of existing facilities and budget restraints may limit the scope of the mechanical system renovations. In such cases, where feasible, the design shall facilitate the future implementation of the "New School" criteria.

The A&E and construction manager/general contractor shall obtain from the CMS the latest version of the Charlotte-Mecklenburg Schools Architect and Engineer Design Guide.

23.1 GENERAL

- 23.1.1. Design conditions will follow North Carolina Mechanical and Plumbing and Energy Codes for Charlotte, NC.
- 23.1.2. New schools, additions, and renovations to existing facilities shall be air-conditioned, and all areas shall have the means for CO₂ and dehumidification control except in the kitchen. The heating and air conditioning systems, i.e., the type of system must be discussed with the Charlotte-Mecklenburg Schools (CMS) representative(s) before the design work begins. (See 23.1.5 for preference). Dehumidification and CO₂ control are generally not provided on the kitchen RTU. In a gas/DX arrangement, you must add a hot gas reheat or an electric duct heater to dehumidify with that unit. DCV is not recommended from a kitchen pressure standpoint.
- 23.1.3. In accordance with Chapter 4, Section 403.3 of the NC State Mechanical Code, 2018 Edition, outside air intake components shall be sized per Table 403.3. The 2018 NCMC now simply shows 7.5 cfm/person and 0 cfm/sf for classrooms, no more footnotes or verbiage about systems designed to handle additional OA under special circumstances. The only time you should run into 10 cfm/sf and 0.12 cfm/sf would be on LEED projects. For ES/K8/MS, the dedicated outside air ventilation strategy preference is to provide constant minimal outside/fresh air to all spaces served by the DOAS during occupied hours, providing supplemental outside air as required via demand signal from the CO₂ sensor located in the DOAS return air duct.
- 23.1.4. Additional ventilation and/or exhaust systems shall be provided as required for conditions that generate unusual odors or sensory irritating contaminants. Test and Balance for outside air shall be 7.5 CFM per person. Once the determination of the system has been agreed upon, load calculations, including existing buildings when adding to these buildings, shall be submitted to CMS Design Team for review and comments prior to the final selection of equipment.
- 23.1.5. The preferred heating and air conditioning system for new schools shall be comprised of water-sourced heat pumps, a cooling tower, recovery wheels, DOAS and condensing boilers. It shall be the responsibility of the designer or engineer to determine in consultation with CMS the type of HVAC system to be designed and installed, considering the project specific conditions and location. The total building cooling load shall cater to the diversity, including the full cooling load of all classroom wings/floors, Media Center, Auditorium, and administrative zones. For the Gymnasium and Café/Multipurpose room, at least 50% of the cooling load shall be catered to in the total building cooling load.

23.2. OBJECTIVES

- 23.2.1. The following factors must be carefully considered in determining the most suitable type of system:
 - 23.2.1.1. Simplicity of operation and maintenance
 - 23.2.1.2. Operating costs, total energy analysis for normal operation
 - 23.2.1.3. Equipment noise criteria (NC) level
 - 23.2.1.4. Durability
 - 23.2.1.5. Cost
 - 23.2.1.6. Reliability of maintaining room comfort
 - 23.2.1.7. For renovations, the best system for the existing building layout and envelope

23.3. DESIGN REQUIREMENTS

- 23.3.1. NEW SCHOOL
 - 23.3.1.1. New schools shall be operating on a Direct Digital Control (DDC) system. All AHUs will have VFDs as applicable.
- 23.3.2. EXISTING SCHOOLS
 - 23.3.2.1. Additions to existing schools shall be operating on a Direct Digital Control (DDC) system. If the existing system is pneumatic then it shall be upgraded to DDC. If there is a DDC system, then the additions will have the same DDC system as the existing one. All AHUs will have VFDs.
- 23.3.3. SCIENCE LABS
 - 23.3.3.1. Meet NCDPI standards for Science Classrooms.
- 23.3.4. GYMNASIUMS

MECHANICAL

- 23.3.4.1. Gymnasiums shall be air-conditioned. The normal design load for K8 and Middle Schools shall be for 60 people, and the normal design load for High Schools shall be for 100 people. In addition to the normal design load, gymnasiums shall be designed to accommodate additional cooling and heat loads during spectator events. Duct sock air distribution is preferred in the gymnasiums.
VAV Boxes shall not be used in gymnasiums.
- 23.3.4.2. Ventilate gym storage rooms to prevent odors.
- 23.3.5. LOCKER ROOMS
- 23.3.5.1. The use of Energy Conservation applications is encouraged. Energy recovery ventilation units shall be included for locker rooms at middle, K8 and high schools. Locker room ventilation is not recirculated, i.e. 100% OA capability.
- 23.3.5.2. Swimming Pools shall have their own dedicated Natatorium units. They shall also have their own dedicated cast iron boiler for hot water system. If the Gymnasium and swimming pool are housed in same building then they shall share the same boiler.
- 23.3.6. COMPUTER CLASSROOMS
- 23.3.6.1. Computer classrooms shall be designed at 1.5 times the normal classroom load.
- 23.3.7. TELECOMMUNICATION & NETWORK CLOSETS
- 23.3.7.1. All ER & TR shall operate on a cooling only VAV. In addition, a DX ductless mini-split unit (cooling only) with hard wired controller shall be installed in each room. This system shall have sufficient airflow to keep the room below 75 degrees Fahrenheit. TR closets require 1.5-ton unit, ER closets require 2.5-ton unit.
- 23.3.8. KITCHEN
- 23.3.8.1. The kitchen area shall have negative pressure to the surrounding areas.
- 23.3.8.2. The kitchen shall be served by a dedicated Roof Top Unit.
- 23.3.8.3. Kitchen hood ventilation shall meet applicable codes and minimize net exhaust air.
- 23.3.9. MAIN MECHANICAL ROOM
- 23.3.9.1. Main mechanical equipment room shall be mechanically ventilated.
- 23.3.10. CLASSROOM
- 23.3.10.1. All classrooms shall have a minimum of four (4) diffusers.
- 23.3.11. NOISE CRITERIA
- 23.3.10.1. Design noise criteria for the classrooms shall be 35 NC with HVAC equipment running.
- 23.3.10.2. Design noise criteria for the property lines shall be 55 NC with HVAC equipment running.
- 23.3.12. K-1 Toilet HVAC
- 23.3.13. When a design places single fixture toilet rooms on an exterior wall, provide ducted supply air to the space.

23.4. PRODUCTS

- 23.4.1. CHILLERS
- 23.4.1.1. Air cooled chillers for all new schools and additions. Above 300 Tons of building cooling load, use 2 air cooled chillers. Above 130 Tons use only screw compressor machines (minimum 2 compressors each). Scroll compressor chillers to be used only for less than 130 Tons building cooling loads. The chillers shall be selected catering to 110% of total building cooling load.
- 23.4.1.2. Provide 10-year complete chiller warranty covering materials, parts, labor and refrigerant.
- 23.4.1.3. Maintenance Service: Furnish repair services and first-year manufacturers recommended equipment service of complete assembly for one (1) year from date of substantial completion.
- 23.4.1.4. All chillers shall include automatic reset/restart after voltage sag/interruption.
- 23.4.1.5. All chillers shall be set up with 30% current phase imbalance threshold.
- 23.4.1.6. Chilled water piping must be well insulated and must have a heat trace to protect piping from freezing on exterior installations.
- 23.4.1.7. All direct expansion (DX) Systems, package and split systems, must have low-pressure refrigerant control, manual reset high-pressure control, low ambient pressure control, and a crankcase heater.
- 23.4.1.8. Piping shall be installed with a tee connection, and isolation valve on the supply and the return chilled water piping, and isolation valves shall also be installed on the main chilled water supply and return piping to isolate a failed chiller. This will allow connections to a portable chiller. **See Appendix 23.4.1.8.**
- 23.4.1.9. Arrange piping for easy access to disconnect, maintain or replace the compressor, and any chiller accessories.
- 23.4.1.10. Condenser control panel (outside air cooled chiller), extend concrete pad a minimum of 36" beyond the control panel to allow for a maintenance technician's safety.
- 23.4.1.11. Utilize neoprene isolators beneath chillers, minimum 2.5" thickness.
- 23.4.1.12. A minimum of six (6) foot high chain link fence surrounding the high efficiency low noise air-cooled chiller(s) and other equipment in the chiller yard with a minimum four feet clearance around the equipment shall be installed to protect this equipment from vandalism.
- 23.4.1.13. Contractors shall spread gravel (coordinate with CMS on extents) around the chiller, heavy duty plastic cover shall be placed under the gravel, also gravel shall be placed between the chiller and the fence to prevent grass and weeds growing

MECHANICAL

too close to the chiller which will result in difficulty of the air flow to pass through the chiller coils. Storm water drains shall be installed to prevent the accumulation of water in the gravel area.

- 23.4.1.14. Sound attenuation packages, if necessary, shall be designed to meet local zoning ordinances.
- 23.4.1.15. Fin tube coils and micro-channel coils are both acceptable.
- 23.4.1.16. Chiller shall be furnished with architectural, full length coil guards for complete coverage of air-cooled condenser and to provide coverage to prevent access inside of chiller frame.
- 23.4.1.17. Chiller condenser coils shall have louvers, baffles or hoods to protect against hail damage.
- 23.4.1.18. The following areas shall be part of the central chiller and heating plant – dining room, auditorium, media center, administration spaces, and all other classrooms. Deviation from this preference shall be approved by CMS Sr. Mechanical Engineer.
- 23.4.2. BOILERS
- 23.4.2.1. It shall be the responsibility of the designer to select a boiler to accommodate the heating capacity needed to maintain a comfortable atmosphere in the building. Depending on the application and the availability of energy, the selected boiler shall be efficient and equipped with all necessary accessories. **See Appendix 23.4.2.2.**
- 23.4.2.2. Boilers shall have port to read gas pressure.
- 23.4.2.3. Burners shall be UL/FM/IRI approved for use.
- 23.4.3. PUMPS
- 23.4.3.1. Related documentation (Section: 23.4.13) HVAC Identification & Pipe Markers.
- 23.4.3.2. Pumps should be equipped with high-efficiency motors. Any motor that is controlled by a VFD shall have an Inverter Duty Motor. All motors shall be totally enclosed fan cooled (TEFC). **See Appendix 23.4.3.2.**
- 23.4.3.3. Secondary (building) pumping systems shall be equipped with VFDs, and parallel wired. Pumps shall be sized at 100% load for redundant operation at full load, two pumps minimum.
- 23.4.3.4. Primary (chiller) pumping systems shall be equipped with parallel standby pumps sized at 100% capacity each. The primary (chiller) pumps shall be controlled by the chillers to maintain warranty. Provide two full size pumps for each chiller.
- 23.4.3.5. Packaged factory assembled pumping systems shall be evaluated on projects. Packaged pumping system shall be controlled by the Building Automation System (BAS). VFD's shall be per acceptable to manufacturer listings mentioned in CMS specifications.
- 23.4.3.6. Packaged factory assembled pumping systems shall have a minimum of three (3) feet clearance around the equipment for service.
- 23.4.3.7. On a primary-secondary pumping arrangement, to avoid confusion, the primary hot water and chilled water pumps shall be labeled HWP and CWP. The secondary hot water and chilled water pumps for the building shall be labeled BHWP and BCWP.
- 23.4.3.8. Provide positive freeze protection for all water systems subject to freezing conditions such as air-cooled chillers, outdoor piping (above ground) etc.
- 23.4.4. AIR HANDLING UNITS
- 23.4.4.1. Variable air volume AHUs shall be equipped with a VFD control on the motor and shall be direct digital control (DDC) compatible. **See Appendix 23.4.4.1.**
- 23.4.4.2. Single zone and Single Zone VAV AHUs with 4-pipe system should have a heating coil mounted on the discharge side of the cooling coil for possible dehumidification control. Dehumidification control is required for all air handlers.
- 23.4.4.3. AHUs shall be equipped with economizer control. The control shall be "Enthalpy Differential" type.
- 23.4.4.4. All central station AHU's shall have a minimum six-row cooling coil.
- 23.4.4.5. Provide hinged doors between coils to enable repair/maintenance; minimum distance shall be 14".
- 23.4.4.6. Preheat coils shall be utilized for all air handlers.
- 23.4.4.7. All AHU fans shall be direct driven plenum fans (no belts). No more than 10 hp fan motors to be used (serviceability concerns)
- 23.4.4.8. Intentionally left blank
- 23.4.4.9. AHU's shall be constructed of double wall and shall be equipped with metal grid frames for media filter material.
- 23.4.4.10. All AHU's shall have metal handles with door hinges as CMS standard.
- 23.4.4.11. Contractor shall clean the unit from the inside and the unit shall be free of dirt and debris before turning the project to the owner.
- 23.4.4.12. Access doors to filters shall open fully in order to enable the maintenance staff to reach and change the air filters.
- 23.4.4.13. Mechanical Contractor shall provide any changes in the pulleys, belts, dampers, sheave or the addition of dampers required to achieve design requirements without motor overload at no additional cost to the owner as part of the system T&B.
- 23.4.4.14. Air handling units shall be set up in a draw-thru configuration. Air handling units consist of airside economizer section with variable speed relief fan, filter section with MERV-10 filters, bipolar ionizers, hot water preheat coil for freeze protection, chilled water coil, hot water reheat coil (for single zone and single zone VAV units) and variable speed supply fan.

MECHANICAL

23.4.5. VARIABLE AIR VOLUME (VAV)

- 23.4.5.1. Variable air volume (VAV) systems shall be adopted in all new schools and building additions system design.
- 23.4.5.2. In existing schools' renovations / additions, Variable Air Volume (VAV) system is preferred, if the ceiling space allows. If there is not enough room above the dropped ceiling, then the designer shall consider another means of heating and cooling. VAV system may be applied in auditoriums and cafeterias or multipurpose areas for the purpose of energy savings. Any departure from VAV system for renovations / additions will need prior approval of CMS during SD phase of projects.
- 23.4.5.3. During school renovations, the existing HVAC Multi-zone or VAV system shall be upgraded to the current state-of-the-art system and as required by the state code and guideline.
- 23.4.5.4. VAV throttling valves shall be of the sliding positive shut off type.
- 23.4.5.5. VAV applications, non-powered series units are preferred and shall be a pressure independent VAV Box.
- 23.4.5.6. Fan powered VAV units shall only be applied after approval of CMS engineers. When applied, they shall be of parallel flow type.

23.4.6. ROOF TOP UNITS (RTUS)

- 23.4.6.1. RTUs may be used in ES, MS, K-8 and HS addition / renovation projects. For new schools, RTUs shall only be used for kitchen. RTUs shall be DX cooling / gas heating type unless approved otherwise by CMS Sr. Mechanical Engineer and Design Manager.
 - 23.4.6.2. RTU shall be equipped with fully integrated, factory installed DDC controls that are BACNET or LonWorks compatible. Any gateway necessary to utilize BacNet or LonTalk will be supplied by the RTU manufacturer. RTU manufacturers shall make a controls technician available, onsite, if necessary, to expedite the integration of the RTU controls and the EMS controls for CMS's benefit.
 - 23.4.6.3. Contractor shall clean the unit from the inside, and the unit shall be free of dirt and debris before delivery to the owner.
 - 23.4.6.4. RTU shall be equipped with multiple scroll compressors. Compressors or circuits shall be lead/lag. A compressor size shall not exceed 25 tons (nominal). RTU shall utilize high efficiency motors. RTU shall have multiple circuits. Refrigerant shall be R-410a, R-134a.
 - 23.4.6.5. RTU shall be equipped with Liquid and Discharge service valves. Each circuit shall have liquid, suction and discharge valves for service and isolation.
 - 23.4.6.6. Local factory service support shall be available within four hours. Additionally, a local factory controls technician for the rooftop equipment shall coordinate with the EMS contractor for integration.
 - 23.4.6.7. Recommended spare parts list shall be submitted by the manufacturer.
 - 23.4.6.8. Mechanical Contractor shall provide any changes in the pulleys, belts, dampers, or the addition of dampers, required to achieve design requirements without motor overload at no additional cost to the owner.
 - 23.4.6.9. CO2 monitoring to be furnished with the RTU units.
 - 23.4.6.10. Natatoriums shall use RTUs with a stand-alone gas DX and heating plant.
- ### 23.4.7. FAN COIL UNITS (FCUS) & UNIT VENTILATORS (UVS)
- 23.4.7.1. FCUs / UVs shall only be used in renovation projects after obtaining prior approval of CMS during SD phase.
 - 23.4.7.2. Units shall have a 3-speed switch (Hi-Mid-Lo) with no 'Off' position. Additional independent means of fan shutdown shall be incorporated. This is a fire code requirement.
 - 23.4.7.3. HVAC unit ventilator units shall be supplied with face and bypass dampers.
 - 23.4.7.4. Control specifications to state humidistat to be installed in general areas served by Unit Ventilators.
 - 23.4.7.5. Exposed ceiling hung units shall be supplied with double deflection grilles.
 - 23.4.7.6. Ceiling hung ducted UVs in classrooms shall be flush with ceiling and have an exposed service grille on bottom.
 - 23.4.7.7. FCUs and UVs heating coil on 4-pipe system shall be on the leaving side of the cooling coil for dehumidification control.
 - 23.4.7.8. Fan Coil Units / Unit Ventilators shall not be installed above hard ceilings.
 - 23.4.7.9. If fan coil and unit ventilators are used, the outside ventilation air shall be treated utilizing a dedicated outside rooftop DX unit. The design conditions for the outside air will be 82 degrees F and 130 grains per pound dry air.

23.4.8. EXHAUST & SUPPLY FANS

- 23.4.8.1. Roof exhaust and supply fans shall be fabricated from heavy gauge aluminum. Hood shall be removable and accessible. Exhaust fans to be installed at least 15 feet away from all air intakes.
- 23.4.8.2. Fans shall be furnished with prefabricated roof curb, curb shall be constructed of aluminum with rigid fiberglass insulation and shall be self-flashing. Curb height shall be minimum 8" above finished roof and shall be constructed to conform to the roof slope.
- 23.4.8.3. Contractor shall anchor the ventilator to curb with stainless steel or cadmium plated screws, minimum two (2) per side.
- 23.4.8.4. Ceiling exhaust fans shall have galvanized steel housing, sound absorbing insulation, white grille, and outlet duct collar.
- 23.4.8.5. Belt driven fans shall be supplied with adjustable sheaves for capacity adjustment.

23.4.9. GRILLES & REGISTERS

- 23.4.9.1. Grilles and registers shall be fabricated from steel or aluminum with horizontal steel louvers, spaced 3/4" on centers and fixed 35 degrees deflection.

- 23.4.9.2. Grille and register faces shall have baked enamel factory painted finish.

23.4.10. DIFFUSERS

MECHANICAL

- 23.4.10.1 Diffusers shall be square, adjustable pattern, multicore type to discharge air in 360 degrees pattern.
- 23.4.10.2 Linear slot diffusers shall only be used in special applications, only with CMS approval.
- 23.4.10.3 Diffuser shall be fabricated of aluminum and shall have off-white baked enamel factory painted finish.
- 23.4.10.4 Provide diffusers with inverted T-bar type frame. In gypsum board ceilings, provide ceiling frame.
- 23.4.10.5 Diffusers in the kitchen, toilets and locker room area shall be perforated.
- 23.4.11. KITCHEN HOOD
 - 23.4.11.1. For new construction, CMS requires under the hood to have kitchen utility distribution system. In renovation projects utility distribution system should be used, with prior approval from CMS. The Mechanical Contractor shall install the hood and the Utility Distribution System which would be supplied by the Food Service contractor. The UDS allows for one point of connection for all the utilities. The Mechanical Engineer shall coordinate electrical power and control wiring with the Electrical Engineer. All electrical outlet faceplates will have a vertical plane presentation on the UDS in the direction of the equipment being served. Switches for the fans and lights will need to be field wired to the prewire package by the electrical contractor. Kitchen exhaust and make-up hood design shall comply with all the requirements of sections 507 and 508 of the North Carolina Mechanical Code. CMS has determined that makeup air will be tempered to 55 degrees if the incoming air is less than that temperature.
 - 23.4.11.2. Kitchen hood shall be eyebrow type. Provide a UL listed canopy type exhaust hood, sized per drawings to overhang equipment. Hood shall feature exposed surface 304 stainless steel, stainless steel UL baffle filters, integral insulated supply air plenum with combination UL listed fire/volume dampers, vapor proof UL listed light fixtures, stainless steel closure panels between hood and ceiling, integral grease gutters sloped to drain to grease receptacles, and a properly sized fire protection system to be provided to the hood supplier for installation, which shall meet UL 300 standards. Include a solenoid activated mechanical gas valve shutoff and micro switch for shutdown of electric equipment. Micro switch shall be double pole and double throw. There shall be an on/off switch for the kitchen hood for manual operation by remaining within the scheduled occupied hours.
- 23.4.12. AIR FILTERS
 - 23.4.12.1. General: The mechanical contractor shall provide "PERMANENT AIR FILTER FRAMES" with "throw away MERV-10 media" to fit the standard filter sizes required by the manufactures of the HVAC equipment utilized on the project. The Contractor shall provide four (4) complete media changes, as regular filter changes are required during construction and a final filter media change at the date of acceptance by the Owner.
 - 23.4.12.2. Tuck-In Metal Frame. The "permanent frames" shall be of 26 gage. Galvanized metal design. Frame will consist of a rigid channel no rivet construction as manufactured by United Air Filter Company using a spring-tensioned media-retaining grid incorporating a 16 gage. (1.0" x 1.0") galvanized wire, which provides a compression-type seal. Filter shall be sized accurately to meet the filter rack dimensions. Permanent frames shall be 1/2", 1.0" and 2.0" of thickness of the HVAC equipment to which they are applied.
 - 23.4.12.3. Filter Media shall consist of or be equal to United Air Filter 810A polyester filter. Filter Media shall be 84% polyester fiber, 16% Bicomponent fiber. Filter Media will be a distinct Dual Layered Garnetted product characterized by a large fiber denier air entering side and a smaller fiber denier air leaving side. Air leaving side shall also be Needled with a dry non-migrating lackiliar applied to the media. Filter Media must be treated with an Anti-Microbial agent consisting of or equal to POMOFRESH during the manufacturing process. Filter Media will have a loft of 1.25" and have a weight of 1 oz. per square foot of media. Media shall have a MERV rating of 10 @ 300 fpm with a maximum initial resistance of .30" w.g. as tested in accordance of ASHRARE Standard 52.2. Media will be required to have an average efficiency greater than 50% on particle sizes 1.0 to 3.0 um and an average efficiency greater than 80% on particle sizes 3.0 to 10.0 um. Media is classified UL-900
- 23.4.13. HVAC IDENTIFICATION & PIPE MARKERS
 - 23.4.13.1. In all existing schools renovations, engineers shall check the existing equipment numbers and start the new equipment numbers as a continuous sequence, for example in a school if the last air handling unit number finished with AHU-5 the new number shall carry from their AHU-6, and that shall be similar for fans, pumps, boilers, chillers, fan coil units, unit ventilators and other equipment.
 - 23.4.13.2. In all new schools equipment shall be identified as air cooled chiller (ACCH), boiler (B), pump (P) in the pumps case the engineer shall specify on the schedule whether the pump is a condenser pump, primary or secondary pump, air handling unit (AHU), rooftop unit (RTU), unit ventilators (UV), fan coil unit (FCU), exhaust fan (EF), supply fan (SF), condensing unit (CU), variable frequency drive (VFD), variable air volume (VAV), energy recovery ventilation unit (ERV), and kitchen hood supply fan (KSH), and kitchen hood exhaust fan (KEH). **See Appendix 23.4.13.2.**
 - 23.4.13.3. If the school contains multiple wings identified as A, B, C, D wings, the units shall be identified as AHU-A-1, AHU-B-1, etc. and that shall be the same for all equipment in each unit.
- 23.4.14. ISOLATION VALVES
 - 23.4.14.1. Provide and install mechanical system isolation valves for each wing / floor/ area facilitating easy access, maintenance, and repair of equipment. Isolation valves shall be reachable from a 10-foot stepladder. A phenolic tag (3 in x 2 in) shall visually identify isolation valve location with the valve number engraved on it and permanently attached by screws to the

MECHANICAL

ceiling grid directly under the valve(s). Hot water tags shall be red. Chilled water tags shall be blue. Domestic water tags shall be green.

23.4.15. HYDRONIC PIPING

- 23.4.15.1. All underground piping shall be insulated and jacketed and shall be Ricwil system or approved equal. No PVC piping for underground will be used.
- 23.4.15.2. All pressure relief piping shall be directed to the floor unless Code requires otherwise.
- 23.4.15.3. Exposed piping shall be protected from freezing by insulation and heat tracing when necessary.
- 23.4.15.4. All temperature and pressure gauges, and sensors installed on equipment and piping shall be no higher than 6' above finish floor for access and reading. Temperature and pressure gauges above 6' shall have remote read out located in the mechanical room at a central location. The remote read-outs shall be clearly marked with the appropriate reference to the temperature or pressure gauges from which they are receiving the information. Standing on the equipment or high ladder for a read out is not acceptable.

23.4.16. DUCTWORK SYSTEMS

- 23.4.16.1. Plenum return air shall be used. Create sound traps between spaces.
- 23.4.16.2. Maximum length of flexible ductwork shall be five (5') feet.
- 23.4.16.3. On multi-zone units, manual-balancing dampers shall be installed on each zone ductwork near the AHU.
- 23.4.16.4. Exposed supply and return air ductwork shall be spiral and shall be installed at highest point possible.
- 23.4.16.5. Fabric ducts shall be used for K8, Middle and High School gyms and other areas where applicable. It will also be used for Elementary School multipurpose rooms and other areas.
- 23.4.16.6. On renovation projects, ductwork to remain shall have the open ends sealed and taped as soon as possible. Remaining ductwork shall be cleaned by vacuuming the bottom and sides.

23.4.17. BIPOLAR IONIZATION

- 23.4.17.1. Provide bipolar ionization air cleaning systems with all AHU systems, mounted on the entering side of the cooling coil. Ionizers shall be self-cleaning and UL 2998 listed, equal to Global Plasma Solutions model FC-48.14.

23.5. INSTALLATION STANDARDS

- 23.5.1. Refer to manufacturer's installation specification for complete installation procedure.
- 23.5.2. In order to reduce field labor and related construction impacts, AHUs, UVs, and FCUs, controls shall be specified to be factory mounted and tested, readily accessible for service.
- 23.5.3. AHUs, UVs, FCUs, Pumps, Boilers, Air cooled Chillers, and all other system components requiring service or replacement shall be specified to be installed with isolation valves, flanged or union connections, and pressure and temperature gauges.
- 23.5.4. Whenever dissimilar metals are connected a dielectric union shall be installed.
- 23.5.5. All system components exceeding 50 pounds shall be installed in accordance with seismic requirements.
- 23.5.6. All materials installed on roofs or canopies, i.e. piping or duct, shall have a minimum of 12" clear for roofing maintenance.
- 23.5.7. There shall be a maximum of 24" and a minimum of 12" between the supply and return piping at the chilled water or hot water decoupling loop.
- 23.5.8. The VFD's shall be in same room as motor and not greater than 25' away.
- 23.5.9. No combustible material shall be used above ceilings.
- 23.5.10. Condensate drain lines shall be copper. Copper is allowed for drain lines not at floor or ground level. Drain lines shall run to floor drains. Drain lines shall maintain proper pitch 1/4" per 100' to allow the proper flow of condensate to the drain. Condensate pumps are allowed only if there isn't enough room for a condensate line pitch. Water spills on the floor shall not be acceptable.
- 23.5.11. A humidity sensor shall be installed in the return air duct of all AHUs for humidity control.
- 23.5.12. VAV boxes should be mounted within 18" of the drop ceiling for maintenance purposes.
- 23.5.13. Where possible, install VAV boxes on or near walkways or decks above hallways for ease of maintenance.
- 23.5.14. Automatic valves shall have a visual indication of valve position relative to the pipe flow that can be seen from floor level.
- 23.5.15. All valves on water systems installed for service to equipment or to isolated areas shall be installed within 18" of the drop ceiling and no higher than 12' from the floor with no ceiling.
- 23.5.16. Air handling units mounted 16 feet or higher above finished floor shall have maintenance platforms for convenience and safety. Provide permanent access to platforms.
- 23.5.17. Pump layout and installation shall have maintenance clearance of 36" minimum all directions around as a first consideration for future maintenance.

23.6. START UP

- 23.6.1 Fully trained service technicians employed or recommended by the manufacturer's representative(s) providing the main mechanical room equipment such as boiler(s), chiller(s), pump(s), etc. shall perform start up (Chillers only by manufacturer technicians). After start up, technicians shall complete start up form and mail three (3) copies to CMS/Building Services, Warranty Dept., 3301 Stafford Drive, Charlotte, NC 28208 for file verification (and included in the closeout manuals). A second start up shall be done at a mutually agreed upon time when a more consistent load will be available. A second set of

MECHANICAL

three (3) start up reports shall be sent to the CMS/Building Services, Warranty Dept., 3301 Stafford Drive, Charlotte, NC 28208 for file verification. This start up shall note any deficiencies and corrections to the initial startup. Manufacturers' representative shall warrant all equipment to be free from defect.

- 23.6.2 Per Building Standards, there shall be an automatic means of controlling the HVAC equipment during construction for unoccupied periods. Therefore, the control system shall provide this control or temporary time clocks shall be installed to cycle the equipment off during unoccupied hours.

23.7 TESTING AND BALANCING

- 23.7.1. Note: Work in this section will be contracted directly by the General Contractor or CMAR and NOT by the Mechanical Contractor. The Mechanical Contractor shall coordinate work with the Testing and Balancing Agency.
- 23.7.2. Testing and balancing shall be performed by a fully Certified, Independent, Test and Balancing Agency. Certification shall be from AABC or NEBB.
- 23.7.3. Mechanical Contractor shall provide any changes in the pulleys, belts, dampers, sheaves or the addition of dampers, required to achieve design requirements without motor overload at no additional cost to the owner.
- 23.7.4. All punch lists from the Test and Balance agency shall be submitted to the CMAR / GC and copies shall be sent to the Mechanical Contractor, CMS, Commissioning Agent and the A/E for information purposes.
- 23.7.5. The General Contractor or CMAR will NOT be able to achieve substantial completion until the Test and Balance final report is completed, submitted, and verified by the Commissioning Agent and the Engineer of Record.
- 23.7.6. Commissioning Engineer, at his discretion, may request a recheck or resetting of any outlet, supply or return air fan, or exhaust fan, or any hydraulic flow as listed in test report. Provide technicians to assist the Commissioning Engineer in making any tests required during this period of time. This recheck shall also include a spot check of the actual field balance with the Commissioning Engineer. Allow for spot-checking 25% of documented flow rates.

23.8 COMMISSIONING

- 23.8.1 CMS has incorporated a Commissioning Program for all its Capital Improvement Program schools. CMS shall hire an independent commissioning agent; however, this shall not relieve the contractor or the engineer from their responsibilities. The architect shall incorporate into each project specifications defining the commissioning plan provided by the commissioning agent. It will be the responsibility of the HVAC contractor to provide all required labor and/or material to comply with the commissioning plan.
- 23.8.2 For details of commissioning requirements, refer to relevant specification.

23.9 OPERATION/MAINTENANCE MANUALS AND TRAINING

- 23.9.1. When the project is 50% complete, it shall be the contractor's responsibility to provide and submit two (2) copies of the operation and maintenance manuals to the engineer for review. Once the review by the engineer is completed, one (1) manual shall be delivered to the CMS for their record, and one (1) manual the engineer will keep.
- 23.9.2. Operation and maintenance manuals shall be organized in 3 ring binders, in the index order of the project manual. Each Spec section shall be separated with a numbered divider tab matching the project manual index and shall include approved copies of all product data, shop drawings, cut sheets and operating and maintenance instructions for all equipment and materials (including sizes) that were installed in the project.
- 23.9.3. Startup sheets for all HVAC equipment chillers, boilers, VFD's, etc., shall be included in operation and maintenance (O & M) manuals and the warranty/closeout manual. All approved equipment suppliers shall maintain technical service manuals.
- 23.9.4. The Mechanical Contractor will provide on-site operator/maintainer training to CMS HVAC technicians through respective OEMs. All training shall be videoed by contractor or CMAR and 2 copies submitted to CMS.
- 23.9.5. Following the installation of any HVAC system the contractor shall provide at the main mechanical equipment room valve chart(s), sequence of operation, piping schematic(s), and control diagram(s). These items shall be reduced copies, 11"x17" in size and shall be in a laminated cover.
- 23.9.6. The mechanical contractor shall install a drawing holder in a convenient location in the main mechanical room. The drawing holder shall consist of a 4" PVC pipe of sufficient length to hold the mechanical drawings. The drawing holder shall have PVC pipe plug screwed into each end. The mechanical contractor shall place "Construction Record" drawings in the drawing holder when available. Contract drawings shall be in the drawing holder until replaced by "Construction Record" drawings. NCDOL Boiler Inspection Certificates shall be framed and mounted in the boiler room.
- 23.9.7. The following information / documents shall be required to be submitted separately to CMS HVAC; this is additional to the Maintenance Manuals:
- 23.9.7.1. Safety instructions.
- 23.9.7.2. Detailed spare parts lists (e-copies in MS Excel format) of each equipment.
- 23.9.7.3. Tabular list of warranties of each equipment (e-copy).
- 23.9.7.4. PM inspection procedures.

MECHANICAL

23.10 DEMOLITION STANDARDS

- 23.10.1. The owner reserves the right to reclaim refrigerant and oil prior to demolition. If the owner does not want refrigerant to be reclaimed, the Contractor shall be responsible for reclaiming refrigerant and refrigerant oil in conformance with all applicable laws and regulations. Contractor shall recycle or dispose of refrigerant and refrigerant oil in a lawful manner, completing all documentation regarding refrigerant. One copy of all documentation regarding refrigerant and refrigerant oil shall be forwarded to Owner for record keeping.
- 23.10.2. This shall apply to all units containing refrigerant and refrigerant oil including, but not limited to: chillers, freezers, coolers, water coolers, air dryers, window units, heat pumps, split units, and ice machines.
- 23.10.3. Owner has the right of first refusal on all HVAC / mechanical equipment unless specifically stated in the project documents.
- 23.10.4. Chillers shall have the piping seal welded shut with a ¼” Swagelock fitting for gas blanket. DX equipment shall have the refrigerant piping sealed.

COMMUNICATIONS

27.2. AUDIO SYSTEMS

27.2.1. Sound system diagrams See **Appendix 27.2.1.**

27.3. ASSISTED LISTENING SYSTEM

27.3.1. Assisted listening systems are only required at fixed seating assembly spaces in K-8, middle and high school gymnasiums and auditoriums.

27.3.2. High school stadiums should be designed with the appropriate infrastructure to support assisted listening hearing devices.

27.3.3. Replacement school projects shall review the condition of the existing receivers to determine if these devices can be reused and the new design would only provide assisted listening system infrastructure.

SECURITY SYSTEMS

INTRODUCTION

Division 28 represents security systems and the fire alarm of this Standard. It is intended to assist a qualified electrical engineer, architect and civil engineer in their preparation of drawings and specifications for the security system. The electrical engineer has the primary responsibility of designing the systems through collaboration with the architect, civil engineer, and owner. The incorporation of CPTED – crime prevention through environmental design principals is a requirement of the overall design outcome. This information is not intended to serve as a code book or a construction specification. It also does not relieve the engineers and architects of their responsibility for adequate design and coordination, and for compliance with the criteria provided by Charlotte-Mecklenburg Schools for a specific project.

Division 28 is compiled primarily to describe the security systems for new schools. In schools undergoing expansion and/or renovation, extent and condition of existing facilities and budget restraints may limit the scope of security system renovations. In such cases, where feasible, the design shall facilitate the future implementation of the “new school” criteria.

The A&E and construction manager/general contractor shall obtain from the CMS the latest version of the Charlotte-Mecklenburg Schools Architect and Engineer Design Guide.

28.1. SECURITY SYSTEMS

- 28.1.1. Contact CMS for system requirements, scope and equipment.
- 28.1.2. All Charlotte-Mecklenburg School facilities are protected by an electronic burglar alarm system during periods of non-occupancy. Each construction project is required to include the equipment, devices and wiring necessary for the system. See specification 281600 – Intrusion Detection.
- 28.1.3. CCTV surveillance will be implemented at Charlotte-Mecklenburg High Schools. Contact project manager for complete scope of work concerning CCTV. Camera locations shall be determined on a school-by-school basis. In general, cameras shall be provided at main gathering areas on the interior (hallways, cafeterias, doors of entry, auditoriums, gymnasiums, etc.) and exterior (parking lots, etc.). See “Charlotte-Mecklenburg Schools Video Surveillance System (VSS) Standard” specification 282300 – IP based video surveillance system.
- 28.1.4. Helios system - Provide pathway and back box to support owner provided system at front entry.
- 28.1.5. Door Access Control See **Appendix 28.1.5.** (S1 Helios back box) Locate back box under canopy adjacent to visitors out of the weather/rain.
- 28.1.6. Glass break and motion detector cannot exceed a height of 12’ above finish floor.
- 28.1.7. Motion detectors installed in gymnasiums and multipurpose rooms require a protective cage.

28.2. FIRE ALARM SYSTEM

- 28.2.1. Contact CMS for complete Fire Alarm System scope of work on renovation or addition projects.
- 28.2.2. Provide heat detectors in custodial spaces greater than 100 sq. ft., in laundry rooms in proximity to the dryer, kiln and main mechanical rooms.
- 28.2.3. All fire alarm wiring must be in conduit or utilize MC fire alarm/control cable.
- 28.2.4. Only provide fire alarm in exterior buildings (remote from the main school building) required by code (such as field houses). If not required in these exterior buildings, do not provide fire alarm annunciation. Coordinate with the fire marshal for required fire alarm activation as it relates to zoning with the main building and how that alerts each zone.
- 28.2.5. Provide first responder Bi-directional amplifier (800 MHz) and associated infrastructure to support the final system. Include testing and certifications as required by the emergency services departments. BDA system and devices will be supported by the emergency generator circuit.
- 28.2.6. Provide stand-alone carbon monoxide detectors in kitchen and CTE culinary (see Master Specifications)
- 28.2.7. Provide stand-alone carbon monoxide detectors in PK, Kindergarten and First Grade classrooms (see Master Specifications)

28.3. VIDEO SURVEILLANCE SYSTEM (VSS) STANDARD

- 28.3.1. See Specification 282300 - IP based video surveillance system, and 282310 - Video surveillance cabling. Designer shall provide a full camera schedule matrix including cabling, mounting, height, cabling zone and type on the plans for CMS to review.
- 28.3.2. PTZ cameras shall not be used for new projects. They shall be evaluated by CMS in existing schools where they are managed. Fisheye type cameras shall not be used

28.4. ACCESS CONTROLS

- 28.4.1. At elevator doors, provide access control card readers to enable elevator hall call button.

CIVIL

INTRODUCTION

Division 31 and 32 represent the earthwork, exterior improvements, physical education and exterior athletic competition features of this standard. It is intended to assist a qualified civil engineer and/or landscape architect in their preparation of drawings and specifications. The designer of record is to have a thorough knowledge of how K-12 environments operate on a day-to-day and annual perspective. Experience in land development design practices are essential of civil engineers and landscape architects. This information is not intended to serve as a code book or a construction specification. It also does not relieve the civil Engineer of their responsibility for adequate design and coordination, and for compliance with the criteria provided by Charlotte-Mecklenburg Schools for a specific project.

Division 31 and 32 is compiled primarily to describe the earthwork, exterior improvements, physical education and exterior athletic competition features for new schools. In schools undergoing expansion and/or renovation, extent and condition of existing facilities and budget restraints may limit the scope of renovations. In such cases, where feasible, the design shall facilitate the future implementation of the “new school” criteria.

The A&E and construction manager/general contractor shall obtain from the CMS the latest version of the Charlotte-Mecklenburg Schools Architect and Engineer Design Guide.

31. EARTHWORK

31.1. EXISTING CONDITIONS

- 31.1.1. Preserve existing landscape and natural vegetation whenever possible, especially trees larger than 6” trunk diameter measured at 4’ above grade. New projects shall include trees located and identified on the survey that are 12” diameter or greater, where practical.
- 31.1.2. Include in the construction documents the removal of trees and underbrush that is poisonous or otherwise harmful to children or staff.
- 31.1.3. Identify wetland areas requiring preservation or previous Corp of Engineers determination.
- 31.1.4. Identify and review with CMS, flood plain and tree save areas during schematic design phase.

31.2. GRADING

- 31.2.1. The Designer shall develop a cost-effective grading plan that provides a balanced site. Topsoil shall be stockpiled and properly reused as required. The grading plan should consider areas required for future expansion.
- 31.2.2. Top of finish grade next to exterior wall shall be a minimum of 6” below finish floor except at building entrances.
- 31.2.3. Take care to design and construct appropriate ground slopes to eliminate temporary ponding during heavy rain and prevent runoff from entering the building. Prevent conflicts with storm water requirements.
- 31.2.4. Avoid steep slope designs (steeper than 3:1) unless approved in advance by the Owner. Provide low maintenance non-invasive ground cover for long slope conditions.
- 31.2.5. The side slopes of ditches or swales shall be no steeper than 3:1; provide a stabilized mesh at the bottom of all ditches and swales.
- 31.2.6. Grassed areas (except for retention/detention pond/banks) shall have a minimum slope of 1% and a maximum slope of 3:1.

31.3. STORM WATER CONTROL & DRAINAGE

- 31.3.1. CMS prefers the following methods in this order: precast concrete underground detention systems as appropriate for project, other BMP’s appropriate for site. Designer to coordinate with CMS Design Manager and AHJ. If a dry detention basin is utilized ensure bottom is sloped to provide positive drainage.
- 31.3.2. CMS prefers reinforced concrete pipe for site drainage.
- 31.3.3. Playground drainage. **See Appendix 31.3.3.**
- 31.3.4. Use Super Silt Fence when silt fence is the last structural BMP to protect an existing waterway or other sensitive environmental condition against a sedimentation release.

32. EXTERIOR IMPROVEMENTS

32.1. PARKING AND VEHICULAR CIRCULATION

- 32.1.1. Refer to the current zoning ordinance for regulations regarding vehicular access to the site.
- 32.1.2. The safety of students shall be the primary consideration in designing vehicular circulation of the school site. Vehicle entrances and exits at the school site shall be located such that they facilitate safe access to and from the school. They should be designed without severe grade changes, blind curves and hills.
- 32.1.3. Provide striping for 5 lane walking track on bus lot for ES and K8 facilities. Provide indicator for distance on track.
- 32.1.4. Provide separate exit/entrance drives for bus parking and drop-off and visitors (cars) loading and drop-off. Entrance and exit driveways should be located to maximize visibility and with consideration for traffic flow during school hours.
- 32.1.5. Visitor parking spaces to be near the main entrance (administration) of the building and closer to the building than the staff parking.

CIVIL

- 32.1.6. Parking lots are to be located such that administration suite staff can monitor movement during the day.
- 32.1.7. Automobile parking is preferred to be 90 degrees.
- 32.1.8. Traffic and pedestrian routes must be safe, logical, and adequate circulation.
- 32.1.9. Sidewalks should be provided adjacent to all parking lots with curb cuts at each intersection.
- 32.1.10. Access and parking not open to public view should be provided for cafeteria deliveries and for other service vehicles.
- 32.1.11. All parking spaces and drives should be properly lined and have arrows indicating exits and entrances with stop bars.
- 32.1.12. Provide maneuvering for large delivery trucks to loading area even when bus parking and visitor/staff parking areas are occupied. Generally, most trucks that frequent the loading area are: Cube truck: 18'-0" long x 6'-0" wide x 10'-6" high. Warehouse truck: 24' – 0" long x 7'- 0" wide x 13' - 0" high.
- 32.1.13. Driveway turns should be laid out so the turning radius of each will adequately accommodate maximum length wheel base buses and fire trucks.
- 32.1.14. Maximum parking lot slope shall be 5%.
- 32.1.15. Provide accessible parking spaces near the main entrance and near the main staff entrance in accordance with the ADA requirements.
- 32.1.16. Verify with CMS if speed bumps are to be included in the project.
- 32.1.17. Total closure gates are to be installed at bus lots for hard surface activities and lock down procedures. Gate post should be spaced more than 32' apart to allow for mobile classroom installations. **See Appendix 32.1.17.**
- 32.1.18. Asphalt paving shall be provided for all parking and driveways. Provide heavy duty pavement design for heavy use areas such as bus loading, and delivery trucks. Loading area and dumpster apron shall be reinforced concrete. Provide a minimum of 40' reinforced concrete pavement in front of the dumpster enclosure. Paving at car parking areas and fire access shall be light duty pavement.
- 32.1.19. Curbs and accessible ramps shall be concrete. The car drop-off area and bus drop-off area need a continuous rolled concrete curb; however, note that code compliant curb cuts must also be located. Provide decorative spheres or decorative metal posts to prevent vehicles from driving up on the sidewalk. Roll-edge curbs are preferred.
- 32.1.20. Provide wheel stops when there are no curbs and gutters, and when needed to block vehicular traffic.
- 32.1.21. Provisions are to be made for the installation of basketball goals and court striping at the perimeter of the bus parking lot. Goals should be in a visible location. Provide at ES, K8 and MS facilities.
- 32.1.22. Provide numbering of parking spaces at HS facilities in the student parking lot.
- 32.1.23. Parking/Queue (Stacking) Requirements: Confirm parking and queue totals with CMS staff, quantities are a minimum goal. Provide car stacking for peak flow during drop-off and pick-up of students per NCDOT.

Facility Type (Classroom #)	Bus Spaces	Car Spaces Staff	Car Spaces Visitors	Bus Lot Over Stripe*	Student	Car Queue Length
ES (45)	18	100	25	100-125	0	Use Current MSTa Calculator to determine length
MS/K8 (54/63)	24	125	25	125-150	0	Use Current MSTa Calculator to determine length
HS (100)	40	200	25	250-300	Per zoning (1 per 5 students)	Use Current MSTa Calculator to determine length

*Provide for planning purposes on the design development and 95% construction documents but do not include on the building permit submittal.

- 32.1.24. At student drop-off (or pick-up) from buses, and drop-off (or pick-up) from cars, students shall not cross parking areas or drives. Avoid students having to cross parking lots or streets to get to the play fields, which should be as close as possible to the building.
- 32.1.25. Provide minimum 12' x 50' canopy at bus lot per ADA code at elementary schools. Provide minimum 12' x 50' canopy at middle and high school bus lots if project budget allows.
- 32.1.26. An accessible space should be provided parallel to the path of vehicular travel, beyond the front door for van loading/unloading.
- 32.1.27. Provide control signage at parking lots. In addition to the required traffic control signage and markings, provide additional wayfinding signage throughout the site communicating traffic patterns, designated parking lots, academic building and athletic event locations.
- 32.1.28. The parking area should be of sufficient size to accommodate all buses serving the school. Additional undeveloped space should be considered for future growth.
- 32.1.29. The bus parking area should be so planned that the movement of buses on the school site will be kept to a minimum. Bus parking should be established so that backing up of buses is avoided.

CIVIL

- 32.1.30. The bus parking area should be located adjacent to playground areas and should be separated from all other vehicle parking areas.
- 32.1.31. Preference for one single row of bus parking; if site conditions do not allow, it is acceptable for bus parking to be stacked nose to tail.
- 32.1.32. Pupils unloading from the bus door will walk away from the bus toward the school entrance.
- 32.1.33. Pupils should not cross any driveway on which other vehicles may be moving, and buses arriving on the lot will not cut through the line of pupils walking to the school entrance.
- 32.1.34. Bus Circulation Requirements:
 - 32.1.34.1. Accommodate the 84-passenger capacity buses.
 - 32.1.34.2. Minimum turning radius is 26' inside; 45' outside.
 - 32.1.34.3. Bus lot to be minimum 110' wide, preference for 120' wide for turn radius and to accommodate overflow parking.
 - 32.1.34.4. Bus parking space: min. 12' wide; max. 14' wide x 35' long.
 - 32.1.34.5. Maximum parking slope is 2% (the fueling procedure dictates this slope).
 - 32.1.34.6. Maximum driveway slope is 8 degrees.
 - 32.1.34.7. Lot to be well-drained and paved for a vehicle carrying 27,000 pounds.
 - 32.1.34.8. Note on construction documents for existing paving to be re-cycled for on-site re-use.
 - 32.1.34.9. Pavement sealants shall not include coal tar-based sealants.
 - 32.1.34.10. Consider use of lime stabilization (ASTMC977) when MH type soils or other unsuitable conditions are present within the subgrade soils.

32.2. SIDEWALKS AND PLAZAS

- 32.2.1. Review safety surveillance during the design of plazas, and parking with CMS. Special attention to be given to provide adequate visual control to the bus loading/unloading, staff, student parking, and visitor parking area to prevent potential concealed spaces near these and other drives.
- 32.2.2. Surfaces to be slip resistant under wet and dry conditions and to slope to drain away from building.
- 32.2.3. Pedestrian areas at major entrances shall have a minimum pavement width of 15'.
- 32.2.4. The width of walkways at minor entrances shall be 3' wider than the entrance door(s).
- 32.2.5. The designated crosswalk zone shall be provided at all pedestrian walks crossing drives and shall meet ADA requirements.
- 32.2.6. Sidewalks shall be concrete and 5' – 6' wide minimum (widths shall be determined by pedestrian usage). Maximum sidewalk slope 5%.
- 32.2.7. Provide appropriate control joints (6' o.c. max) and expansion joints in sidewalks and plazas to control cracking. Sidewalks (or concrete pavement) where service vehicles are anticipated should be designed and reinforced appropriately.
- 32.2.8. Locate sidewalks where pedestrians are most likely to walk in direct routes. Provide triangular infill at intersections.
- 32.2.9. All outside exits must have concrete sidewalks and extend to a public way where required by code.
- 32.2.10. At walks and paths, provide a minimum cross slope of ¼" per foot, not to exceed ADA requirements.
- 32.2.11. Plazas shall have a maximum slope of 2% with a uniform surface that prevents puddling/ponding.
- 32.2.12. Provide accessible route to Flagpole.
- 32.2.13. When stairs are required, provide ramp access in the same location.
- 32.2.14. All trench drain grate slots in court yards, pathways and means of egress shall be 3/8" wide maximum.

32.3. LANDSCAPING

- 32.3.1. General
 - 32.3.1.1. Provide minimum buffers to comply with local ordinance.
 - 32.3.1.2. Landscape design should preserve and enhance existing resources, improve overall environmental quality, minimize maintenance requirements and improve the visual quality of the site.
- 32.3.2. Trees and Shrubs:
 - 32.3.2.1. Select trees from the local municipalities approved list.
 - 32.3.2.2. Landscape plants should be selected to require a minimum of maintenance. Use of native and non-invasive species is preferred. Fruit bearing trees are not to be specified without written approval from CMS Director of Architecture.
 - 32.3.2.3. Do not use invasive plants and do not use poisonous plants or plants with sharp thorns or foliage near student's path of travel.
 - 32.3.2.4. Do not specify or locate planting material that will cause security problems, i.e., create hiding places. For example, shrubs no taller than 3' and tree limbs below 7'.
 - 32.3.2.5. Do not plant trees or shrubs in locations that will interfere with overhead, underground utilities, site lighting, or security cameras.
 - 32.3.2.6. Trees and shrubs to be readily available, locally if possible. Trees and shrubs to be native or hardy to the site area.
 - 32.3.2.7. The mature height and spread of all trees and shrubs to be considered during the design process. Trees and shrubs are not to be too close together or close to buildings. Avoid the overgrown look when plantings are mature.
- 32.3.3. Grass and Ground Cover:

CIVIL

- 32.3.3.1. Existing stockpiled topsoil or new topsoil must be spread and fine graded prior to installation of grass and ground cover.
- 32.3.3.2. Non-mowable and long slopes to be covered with appropriate vegetative ground cover with non-eroding mesh.
- 32.3.3.3. Provide synthetic turf lawns at the PK and K1 play areas adjacent to building outside of classrooms.
- 32.3.4. Soil
- 32.3.4.1. Topsoil shall be free of subsoil, roots, clods, stones, brush, weeds, or other debris and shall not contain any material toxic to plant growth.
- 32.3.4.2. New fill dirt and topsoil shall be tested for hazardous material prior to being moved onto site.
- 32.3.4.3. Areas next to the building and particularly courtyards get compacted by construction activity. These areas must be ripped and tilled after construction prior to installation of topsoil, landscaping or grassing.
- 32.3.4.4. Pre-installation of grassing/landscaping: Review soil conditions for (1) amount of rock and stone, and (2) depth of topsoil and condition of soil. Landscaping shall not void termite warranty.

32.4. FENCING

- 32.4.1. Fencing around storm water detention basins to be 5'-0" high, with (1) 12'-0" wide access gate for maintenance.
- 32.4.2. Fencing around track/football field to be 4'-0" high and with 10' wide access gates for emergency vehicles. The track/football field fence should have (2) remote, 4'-0" gates on each side, for band and cheerleaders, and (1) 12'-0" gate for equipment access.
- 32.4.3. Fencing around baseball and softball fields to be 5'-0" high and (2) 4'-0" with (1) 12'-0" equipment access gate.
- 32.4.4. Fencing around tennis courts to be 10'-0" high with vision screening mesh.
- 32.4.5. Fencing at discus throw to be 8'-0" high.
- 32.4.6. Provide Athletic playfield backstop at softball and baseball fields.
- 32.4.7. Exterior fencing around HVAC and electrical equipment, i.e., generator, transformer and chiller, etc., to be enclosed with code and service clearances and gates for service and maintenance.
- 32.4.8. Fencing used to reduce buffer widths shall meet the requirements of the local zoning department.
- 32.4.9. Provide steel lockable gates with duckbill latch at each post at bus and staff parking lots, see appendices.
- 32.4.10. Provide Knox padlock and CMS padlock at each vehicle gate.
- 32.4.11. All gates used as egress routes must have a sign attached stating "THIS GATE MUST BE UNLOCKED DURING ALL OCCUPIED HOURS".
- 32.4.12. Provide decorative aluminum or vinyl coated chain link fencing where appropriate outside PK-1 classroom egress doors to create a play area with a 4'-0" wide egress gate. PK play area shall be completely enclosed and independent of K-1 play areas, provide gate between PK and K-1 play areas as directed by CMS.
- 32.4.13. When fall protection fencing is required at retaining walls provide a barricading fenced panel at 90 degrees of the main fence to deter access to the top of the wall from below **See Appendix 32.4.13**. Barricade panels shall be installed at each end of retaining wall where falls from top of wall exceed five (5) feet. If, in the opinion of the designer this barricade panel is not recommended, designer shall discuss with CMS Design Manager to seek direction.
- 32.4.14. Provide 4'-0" decorative aluminum or vinyl coated chain link fencing where appropriate and gates around PK-5 playgrounds. Fencing may be reduced or eliminated if playgrounds are isolated from potential danger by other fencing, retaining walls or structures – discuss fence type and any proposed reductions with CMS.

32.5. FLAGPOLE

- 32.5.1. At Elementary, Middle, K8 and High Schools provide one aluminum flagpole with a maximum height of 30' at a prominent location near the primary building entrance.
- 32.5.2. At Middle, K8 and High Schools provide one aluminum flagpole with a maximum height of 30' at main athletic field.
- 32.5.3. Provide solar powered LED lighting device that clamps to the pole at all flagpole locations.

32.6. SPIRIT BOULDER

- 32.6.1. If a large boulder is found during construction of any facility type, it should be moved to a location identified near the front entrance for student painting. If no boulder is present, identify location for future boulder.

32.7. SITE EQUIPMENT

- 32.7.1. When requested, provide accessible benches and routes near the main entrance of the building. Seating is required in the pedestrian area of the main staff entrance and student courtyards. Bench design should be compatible with the building design. Benches shall be freestanding and anchored to be immovable.
- 32.7.2. Provide bike lockers and racks per county requirements.
- 32.7.3. Provide separate Knox Boxes for Fire and Police Departments at main entry and at fire riser (Fire only).
- 32.7.4. Provide Knox Locks at site access gates.
- 32.7.5. Provide Knox Cap at FDC.
- 32.7.6. Playground equipment for replacement schools should match school colors to the extent possible using standard color options from the playground equipment manufacturer.

CIVIL

- 32.7.7. Provide concrete pad (12' x 21') for each CMS provided Conex storage unit (8' x 20') with accessible walk. Elementary schools receive one-unit, middle schools and K8 receive two units, and high schools receive three units. Coordinate final location with CMS.
- 32.7.8. Coordinate mailbox location with CMS and local postmaster serving that facility. Do not mount mailbox on the building.

32.8. SERVICE AREA – DUMPSTERS

- 32.8.1. Solid waste is to be collected in dumpsters located in the service area. Provide space for two garbage dumpsters and two cardboard recycling dumpsters. Comply with zoning requirements for recycling at facilities that require more than two dumpsters. Dumpsters are approximately 6' x 6' and require approximately 4' – 5' between them.
- 32.8.2. Provide bollards, see appendices for locations and details.
- 32.8.3. Dumpster enclosure to be constructed of masonry to match building. **See Appendix 32.8.3.**
- 32.8.4. Provide exterior access to the loading area in the vicinity of the kitchen, to comply with Health Department restrictions for trash not being transported through kitchen.
- 32.8.5. Refer to the Charlotte zoning ordinance for screening requirements. Dumpsters are to have a lockable gate, or gates, on a rubber roller wheel. Gate construction shall be galvanized or aluminum with composite decking when required to comply with zoning ordinances. Refer to appendices.
- 32.8.6. All dumpsters are to be located on reinforced concrete slab. Provide striping on the pavement that reads “No Parking”.
- 32.8.7. Provide heavy-duty concrete paving in all truck turn around areas.

32.9. ATHLETIC FIELDS

- 32.9.1. High School Softball/Baseball Field Standards: Dugouts for softball recommend that distance from foul line to nearest obstruction shall be 25' minimum to 30' maximum. Dugouts for Baseball recommend that the distance from foul line to nearest obstruction shall be 60'.
- 32.9.2. Provide ADA access to all bleacher seating.
- 32.9.3. Provide synthetic turf at all middle and high school soccer, football, baseball, softball and practice fields at high schools. Include cannon type irrigation. Batting cages to be low-profile synthetic turf on concrete slab. All areas inside the track to be synthetic turf except at track and field event areas.
 - 32.9.3.1. Provide bullpens at middle and high school baseball and softball fields. Discuss design preferences with CMS Design Manager.
 - 32.9.3.2. Provide synthetic turf at K8 soccer fields. Provide ¾ inch in-ground hose bibb(s) with hose of sufficient length to reach entire field.

UTILITIES

INTRODUCTION

Division 33 represents coordination of the design with the water, natural gas, electrical power, and future mobile classrooms of this Standard. It is intended to assist a qualified civil engineer in their preparation of drawings and specifications for the overall utility systems and future mobile classroom coordination. The civil engineer has the primary responsibility of designing the systems through collaboration with the architect, owner and various utility companies serving Mecklenburg County. This information is not intended to serve as a code book or a construction specification. It also does not relieve the civil engineer of their responsibility for adequate design, coordination, and for compliance with the criteria provided by Charlotte-Mecklenburg Schools for a specific project.

Division 33 is compiled primarily to describe the utility systems for new schools. In schools undergoing expansion and/or renovation, extent and condition of existing facilities and budget restraints may limit the scope of the utility renovations. In such cases, where feasible, the design shall facilitate the future implementation of the “new school” criteria.

The A&E and construction manager/general contractor shall obtain from the CMS the latest version of the Charlotte-Mecklenburg Schools Architect and Engineer Design Guide.

33. UTILITIES

33.1. GENERAL

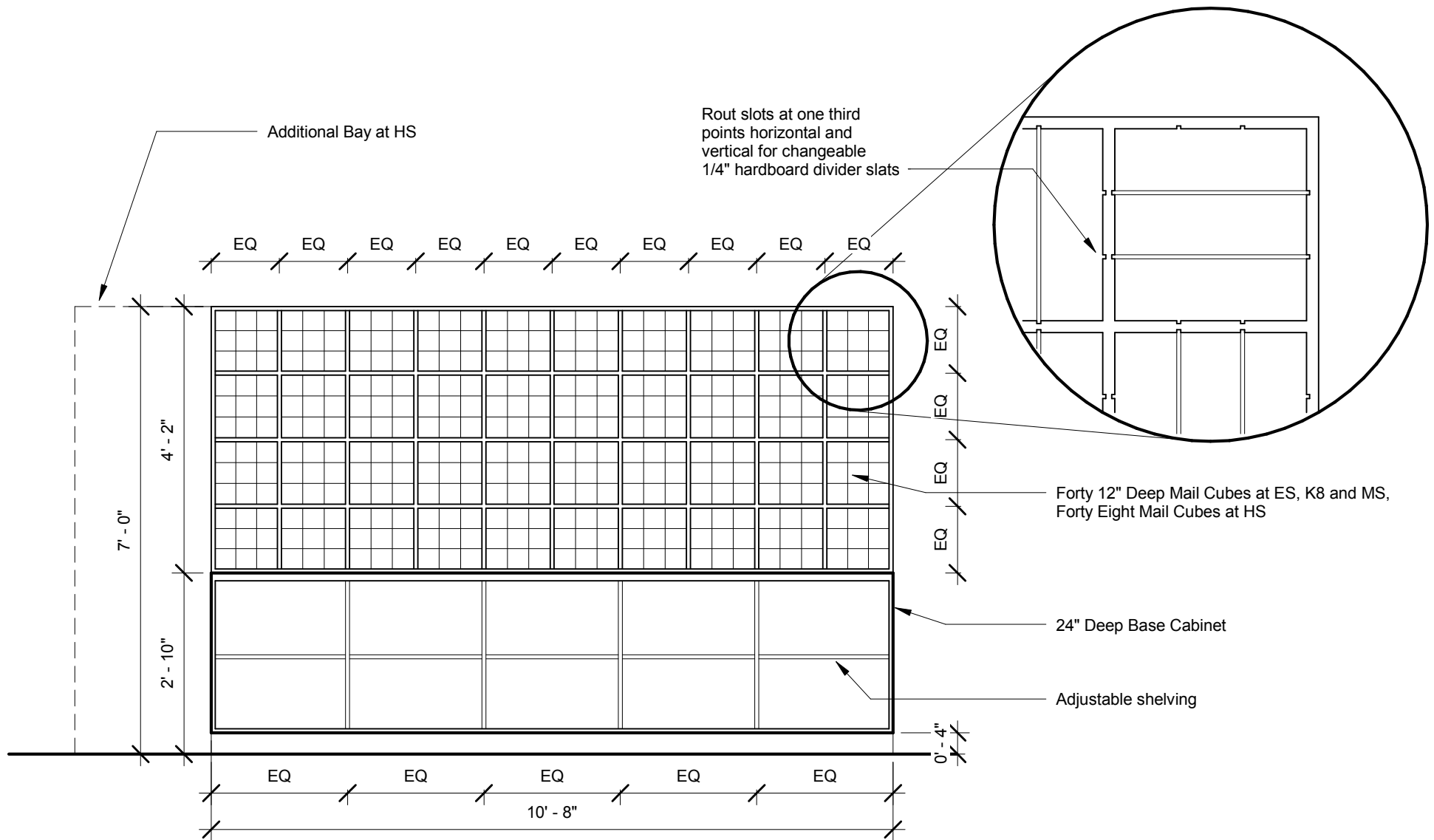
- 33.1.1. Designer should review site for available utilities and the requirements for each utility prior to the schematic design submittal.
- 33.1.2. Separate water tap, meter, back flow preventer per code for domestic water, irrigation, fire protection.
- 33.1.3. If lift station is required provide a hoist at lift station with a capacity for lifting the pump.
- 33.1.4. If plumbing clean out and underground valves in grassy areas shall be installed with white, donut precast concrete fittings.
- 33.1.5. All underground piping shall be installed with metallic marking tape above the utility.
- 33.1.6. Contractor to coordinate with gas utility to provide pulse meter attachment to gas meter. The cost of the pulse meter is the responsibility of the contractor and coordination with the utility is required. Size of the pulse meter to be determined by utility based on load information provided by mechanical engineers.
- 33.1.7. Contractor to coordinate with electric utility to provide pulse meter attachment to electrical transformer.

33.2. SITE LIGHTING - Refer to Electrical

33.3. MOBILE CLASSROOMS

- 33.3.1. Future mobile classroom locations shall be established and approved during schematic design by CMS. See mechanical, electrical and plumbing sections for additional requirements.
- 33.3.2. Provide stub connections in a heavy-duty underground vault for a 2” water line, 4” sewer line and two 3” conduits for fire alarm, intercom and telecommunications.
- 33.3.3. Architect and civil engineer to include on all appropriate site plans, proposed locations of future mobile classroom units and all associated site utilities required at each unit. Construction documents to be designed and drawn to account for all coordination required during construction to accommodate the safe, three-dimensional installation of utilities needed for the permanent school buildings in conjunction with all temporary buildings on site or proposed to be on site. **See Appendix 33.3.3**
- 33.3.4. The typical arrangement is: High Schools one, 10 Classroom Modular Unit or 10 single mobile units and associated restroom unit; Middle Schools and K8s one, 10 Classroom Modular Unit or 10 Single mobile units and associated restroom unit and Elementary Schools, 6 Single mobile units and associated restroom unit.

Discipline	Sheet	Title
Cover Sheet	CS	
Life Safety	LS100	Appendix B
	LS200	Egress Plans
	LS300	UL Assemblies / Details
Phasing	PF100	Phasing/fencing plans and notes
Site Survey	SS100	Site Survey
Civil	C000	Site Demolition
	C100	Erosion Control
	C200	Grading
	C300	Utility
	C400	Details
	C500	Road Improvements
	C600	Fire Access and Coverage Plan
Landscaping	L000	Landscape Demolition
	L100	Landscape Plans
	L200	Landscape Schedules
	L300	Landscape Details
	L400	Irrigation Plans
Architectural	A0000	Demolition
	A0100	Reference Plan
	A0200	Floor Plans
	A0300	Reflected Ceiling Plans
	A0400	Roof Plan and Details
	A0500	Exterior Elevations
	A0600	Building Sections
	A0700	Vertical Circulation
	A0800	Wall Sections
	A0900	Details
	A1000	Enlarged Plans and Details
	A1100	Interior Elevations, Casework and Library Shelving
	A1200	Door Schedule and Details
	A1300	Finish Schedule
	A1400	Finish Plans and Details
	A1500	Signage
Food Service	FS100	Floor Plan
	FS200	Schedules
	FS300	Details
Structural	S000	Structural Demolition
	S100	Legend, Schedule, Notes
	S200	Plans
	S300	Details
Fire Protection	FP100	Floor Plans
	FP200	Schedules, Details, Notes
Plumbing	P000	Plumbing Demolition
	P100	Legend, Schedule, Notes
	P200	Site Plan
	P300	Floor Plans
	P400	Details
Mechanical	M000	Mechanical Demolition
	M100	Legend, Schedule, Notes
	M200	Site Plan
	M300	HVAC Plans
	M400	Piping Plans
	M500	Details
Electrical	E000	Electrical Demolition
	E100	Legend, Schedule, Notes
	E200	Site Plan
	E300	Power Plans
	E400	Lighting Plans
	E500	Special Systems Intercom
	E600	Special Systems Fire Alarm
	E700	Special Systems Security
	E800	Details
Telecommunications	T100	Legend, Schedule, Notes
	T200	Floor Plans
	T300	Details



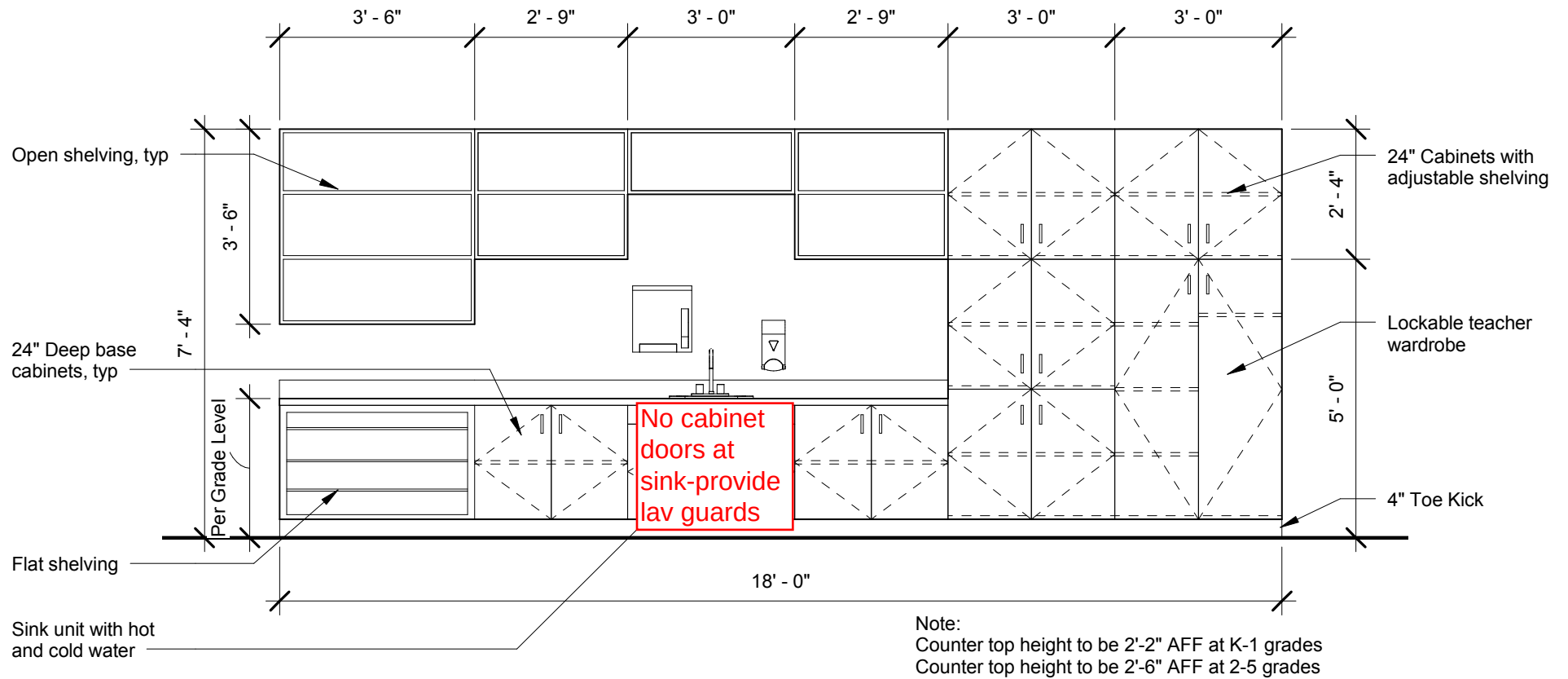
Technical drawing of a cabinet with dimensions and labels:

- Labels:**
 - ADJUSTABLE SHELVES (pointing to the shelves in the side compartments)
 - OPEN (pointing to the central open compartment)
- Dimensions:**
 - Overall width: 12' - 0"
 - Overall height: 2' - 10"
 - Top panel thickness: 1 1/2"
 - Side panel thickness: 1 1/2"
 - Base panel thickness: 4"
 - Side compartment width: 2' - 4 1/2"
 - Central open compartment width: 4' - 0"
 - Shelf spacing: EQ (Equal)

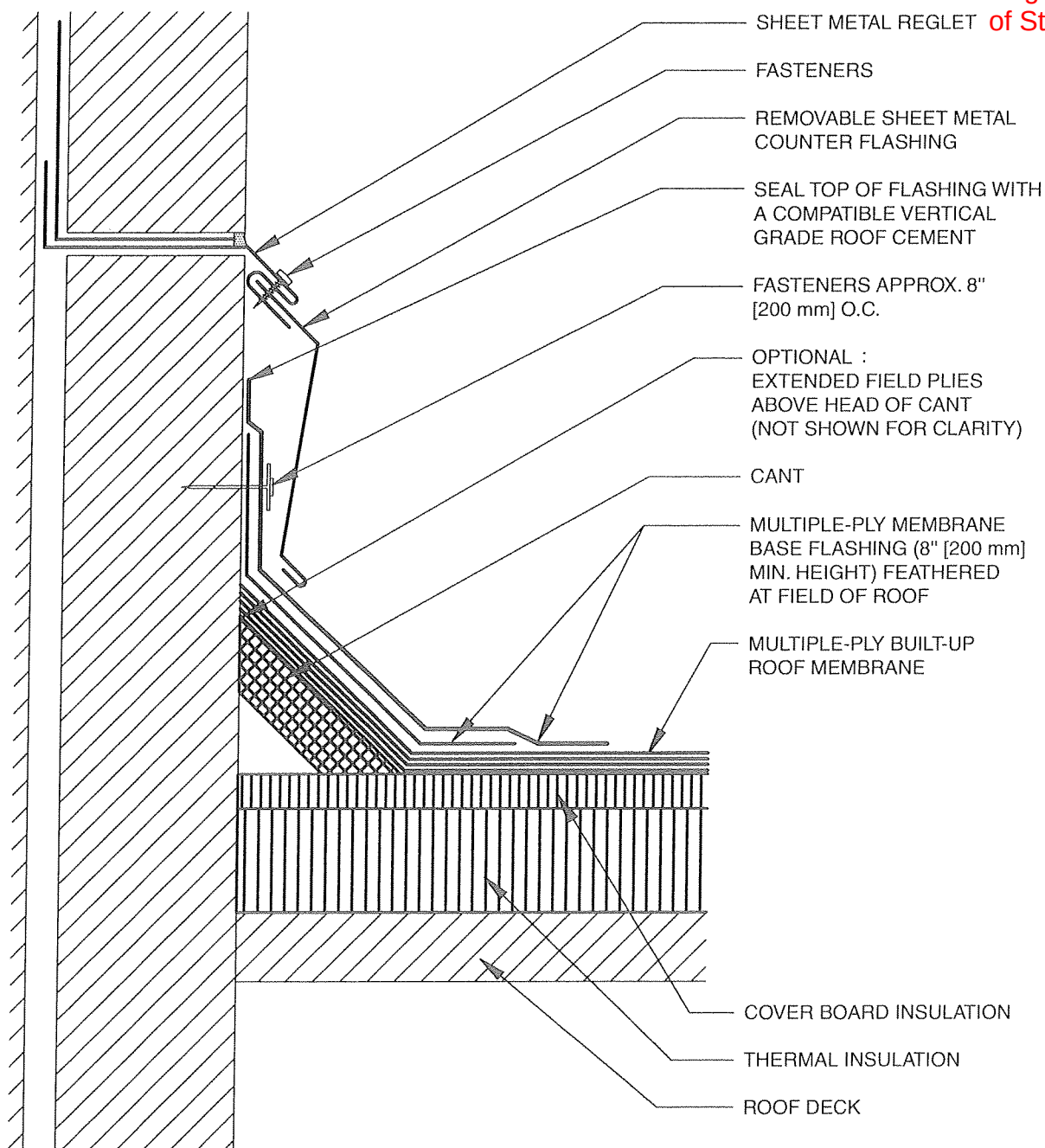
Diagram showing the rear elevation of a cabinet with dimensions and labels:

- Overall width: 4' - 0"
- Overall height: 2' - 10"
- Top section height: 2' - 4 1/2"
- Bottom section height: 4"
- Labels: REAR, OPEN, FRONT
- Annotation: ELEC / DATA OUTLET @ BOTH ENDS. SEE ELEC. (pointing to a small square outlet on the right side of the top section)
- Internal dimensions (from left): 1' - 5", 9", 1' - 10"

SIDE ELEVATION

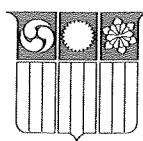


Reglet to be made
of Stainless Steel



NOTES :

1. THIS DETAIL SHOULD BE USED ONLY WHERE THE DECK IS SUPPORTED BY THE WALL.
2. REFER TO THE SHEET METAL SECTION OF THE METAL ROOFING MANUAL FOR JOINERY AND SECUREMENT OPTIONS FOR SHEET METAL.
3. REFER TO INTRODUCTION FOR ADDITIONAL INFORMATION.



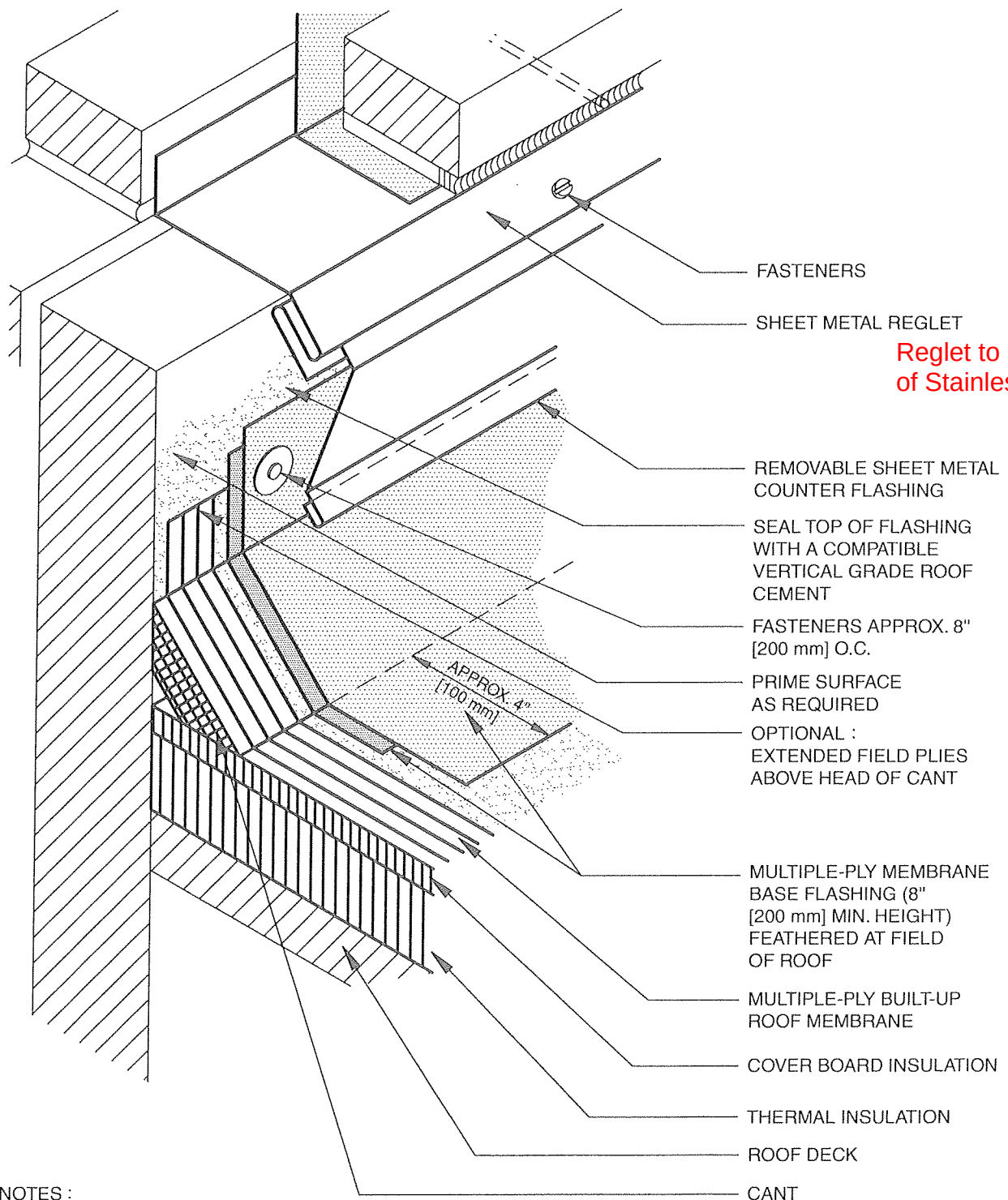
NATIONAL
ROOFING
CONTRACTORS
ASSOCIATION

BASE FLASHING FOR WALL-SUPPORTED DECK

2001

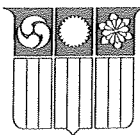
NOT DRAWN TO SCALE

BUR-5S



NOTES :

1. THIS DETAIL SHOULD BE USED ONLY WHERE THE DECK IS SUPPORTED BY THE WALL.
2. REFER TO THE SHEET METAL SECTION OF THE METAL ROOFING MANUAL FOR JOINERY AND SECUREMENT OPTIONS FOR SHEET METAL.
3. REFER TO INTRODUCTION FOR ADDITIONAL INFORMATION.



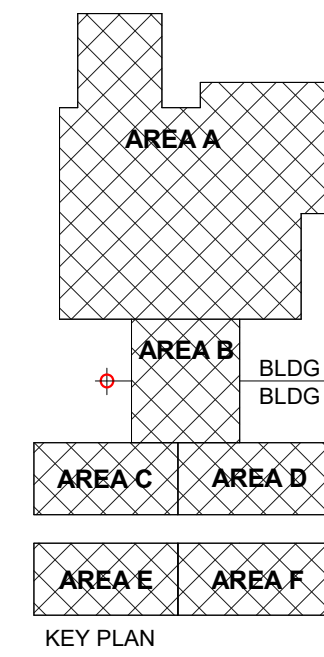
NATIONAL
ROOFING
CONTRACTORS
ASSOCIATION

BASE FLASHING FOR
WALL-SUPPORTED DECK

2001

NOT DRAWN TO SCALE

BUR-5



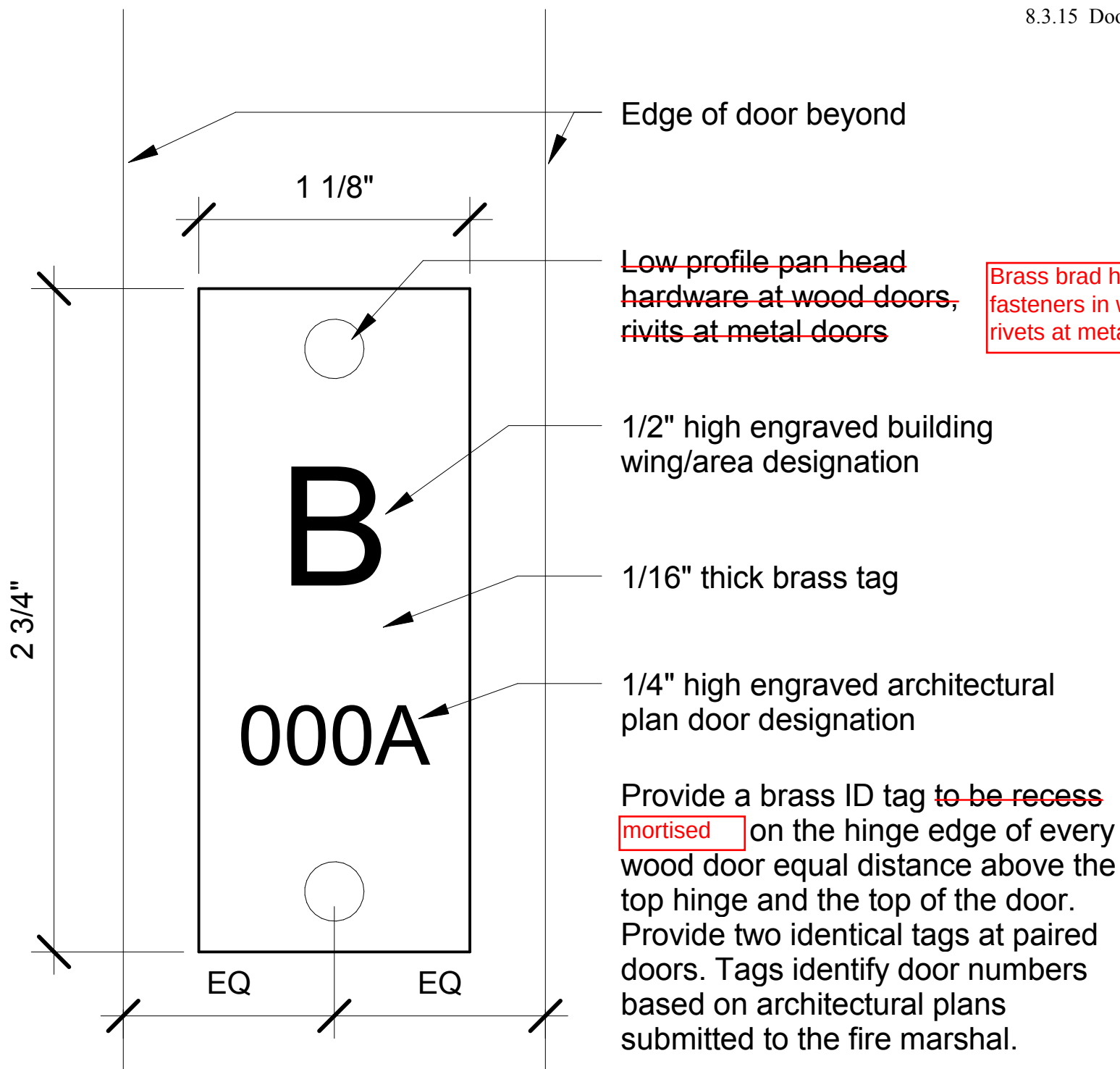
**EW ELEMENTARY
CHOOL NATIONS
ORD, STERLING,
TEELE CREEK
ELIEF (17)**
11 SANDY PORTER ROAD
ARLOTTE, NC

[illegible]

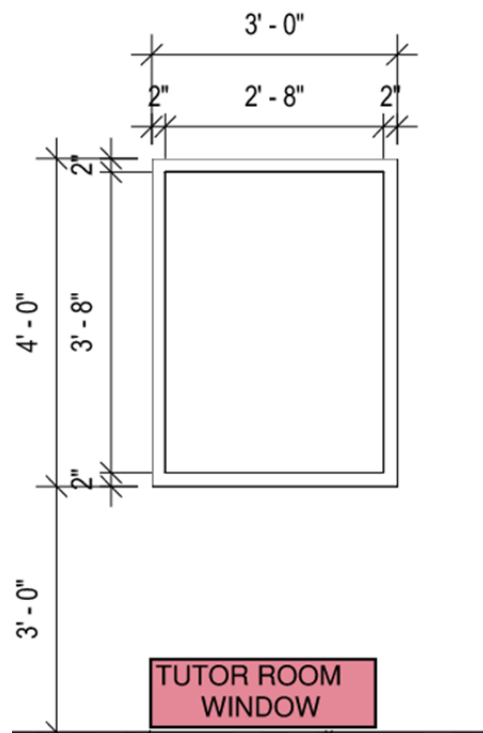
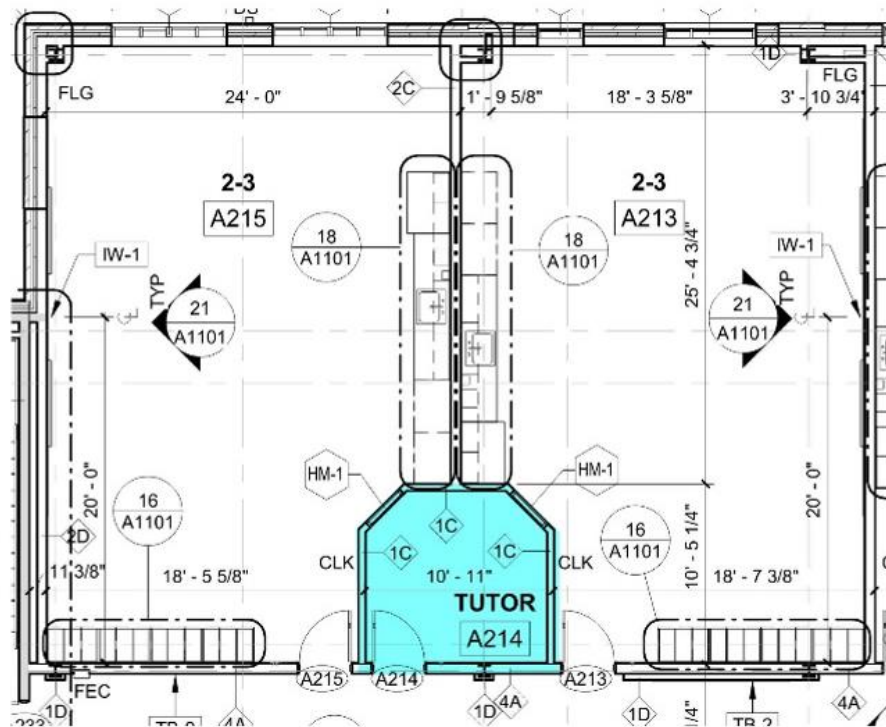
THESE DRAWINGS AND THE PROJECT MANUAL
ARE INSTRUMENTS OF SERVICE AND REMAIN
PROPERTY OF THE FWA GROUP ARCHITECTS.
UNAUTHORIZED DUPLICATION OR REUSE
WITHOUT WRITTEN CONSENT IS PROHIBITED.

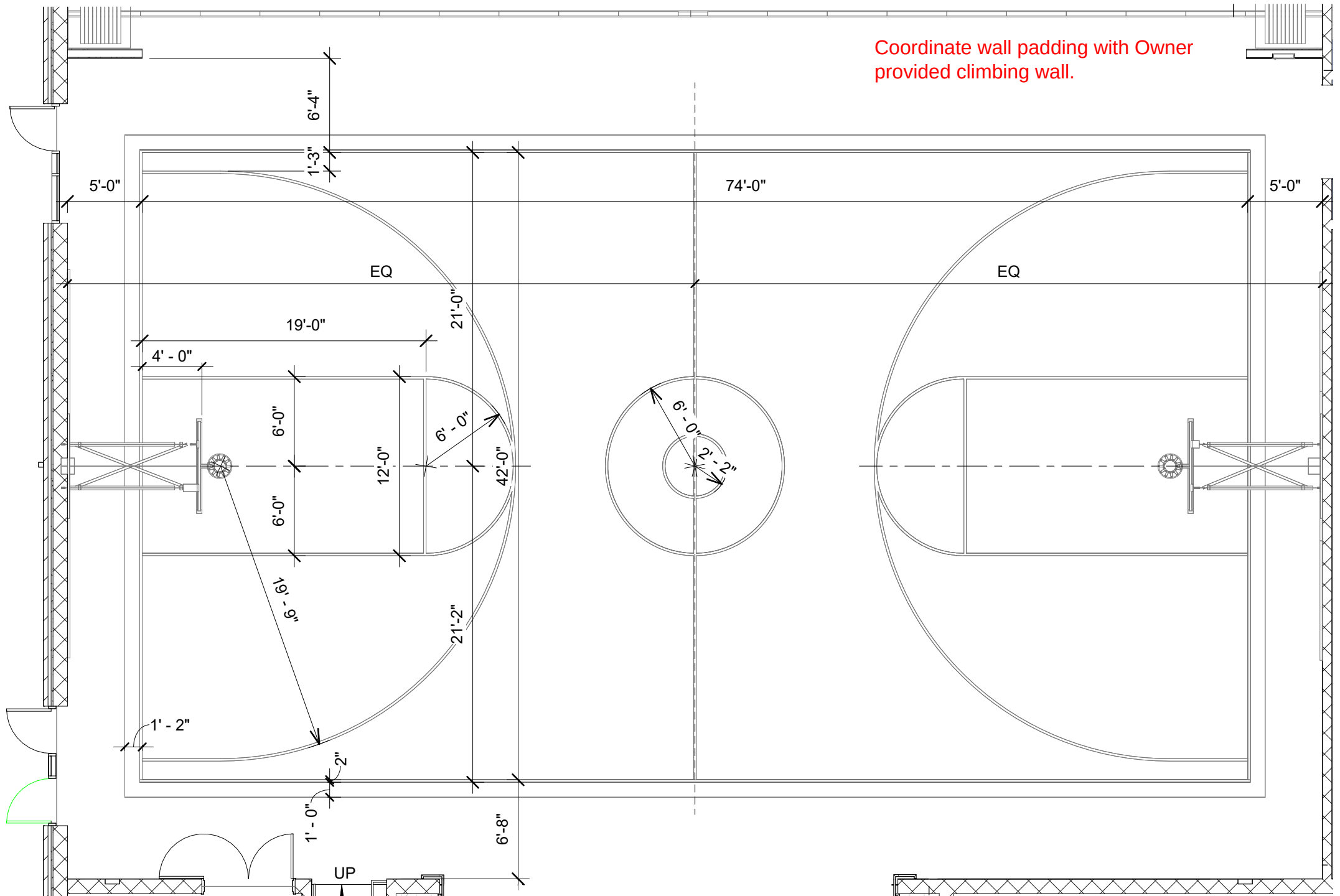
FIRST FLOOR PLAN - AREA A

A0201

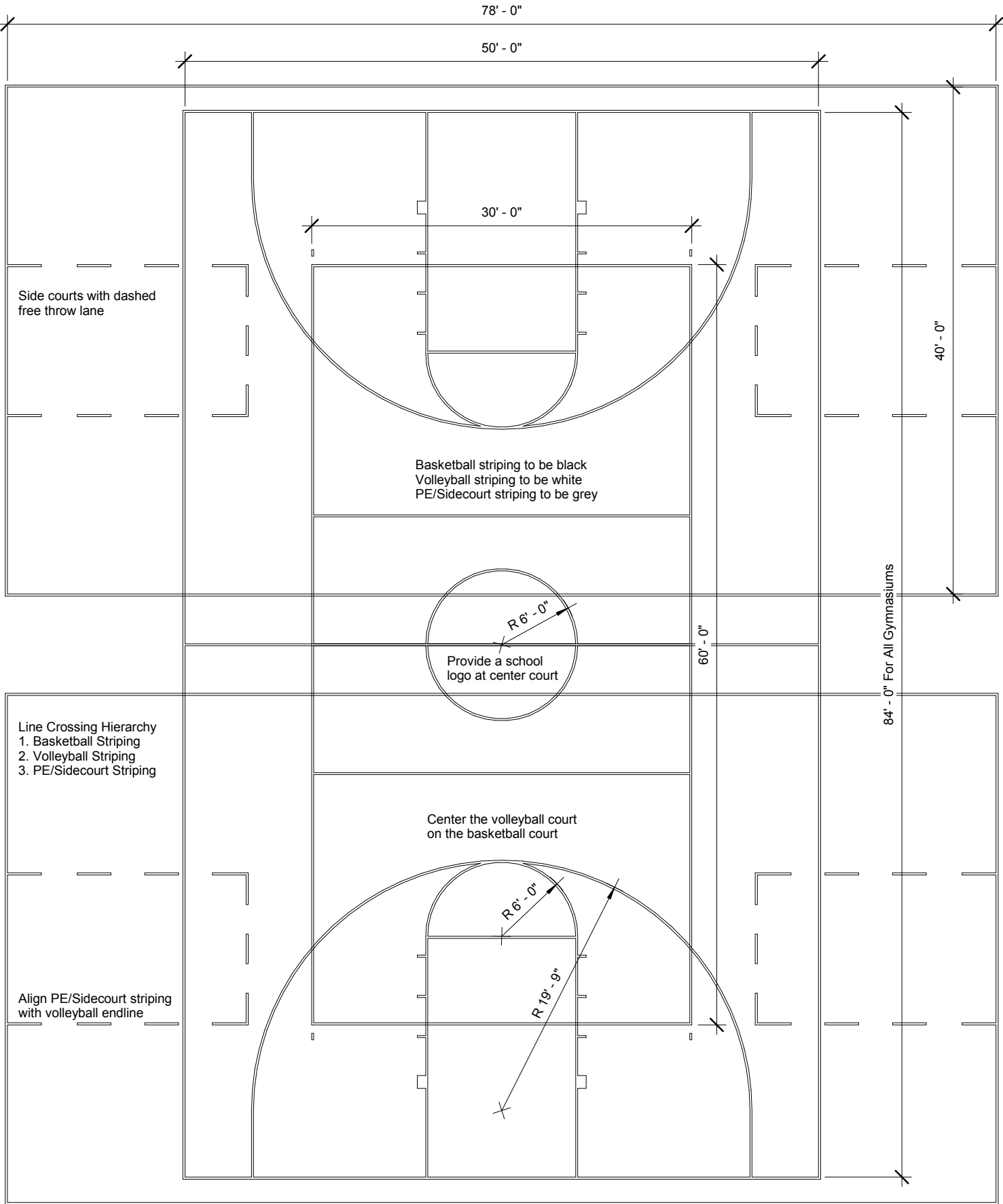


8.5.11 Tutor Room Window

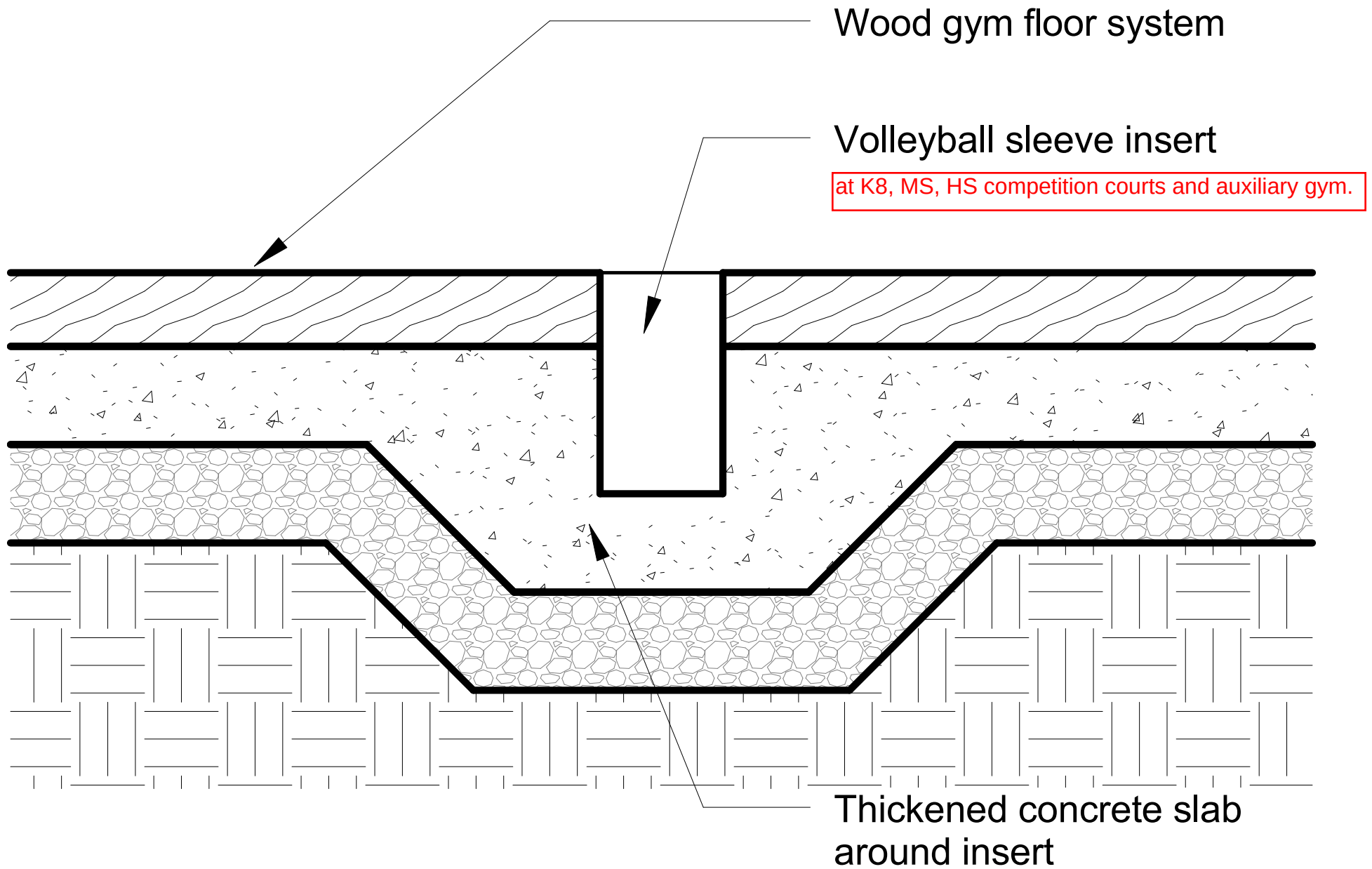


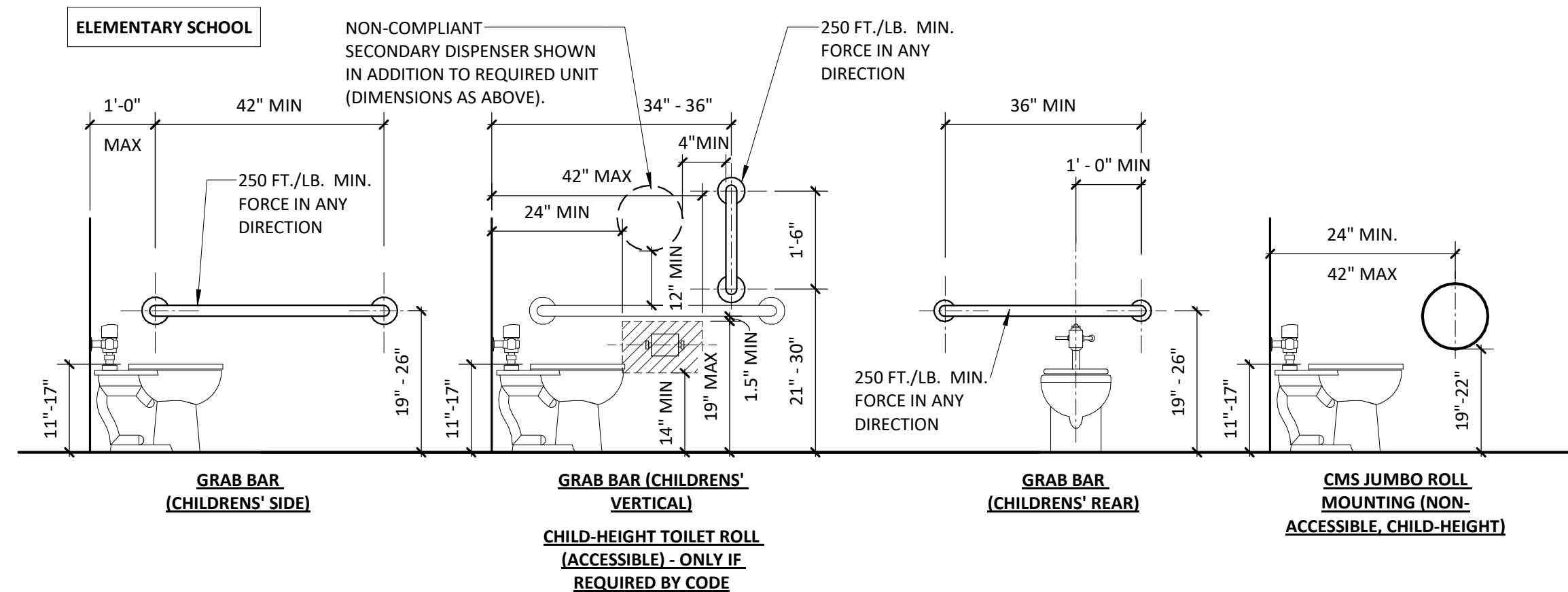
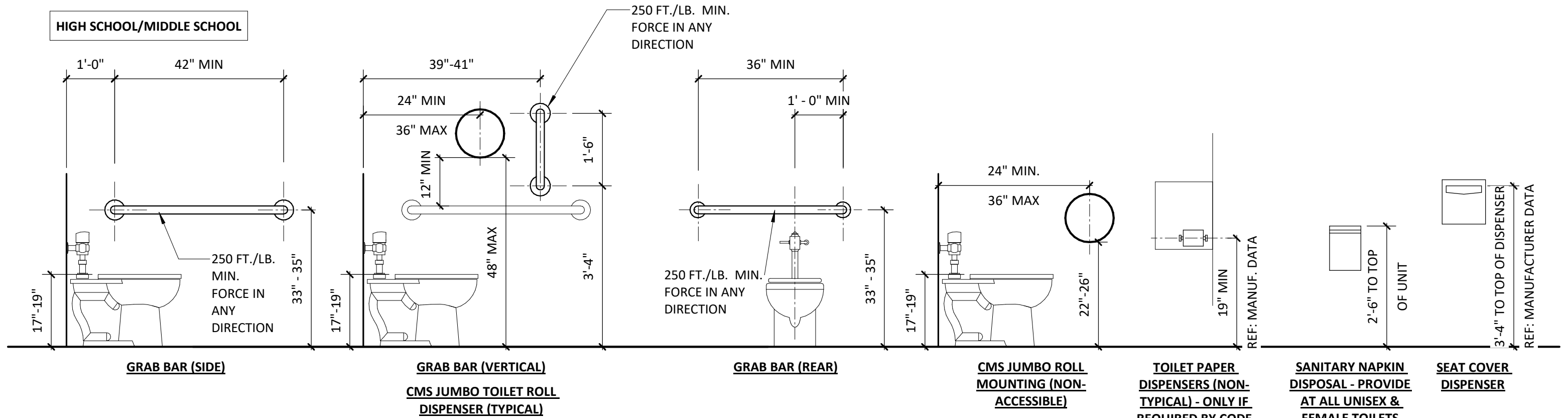


9.9.1 Gym Striping



Provide school name at one end of the court and school mascot name at the other





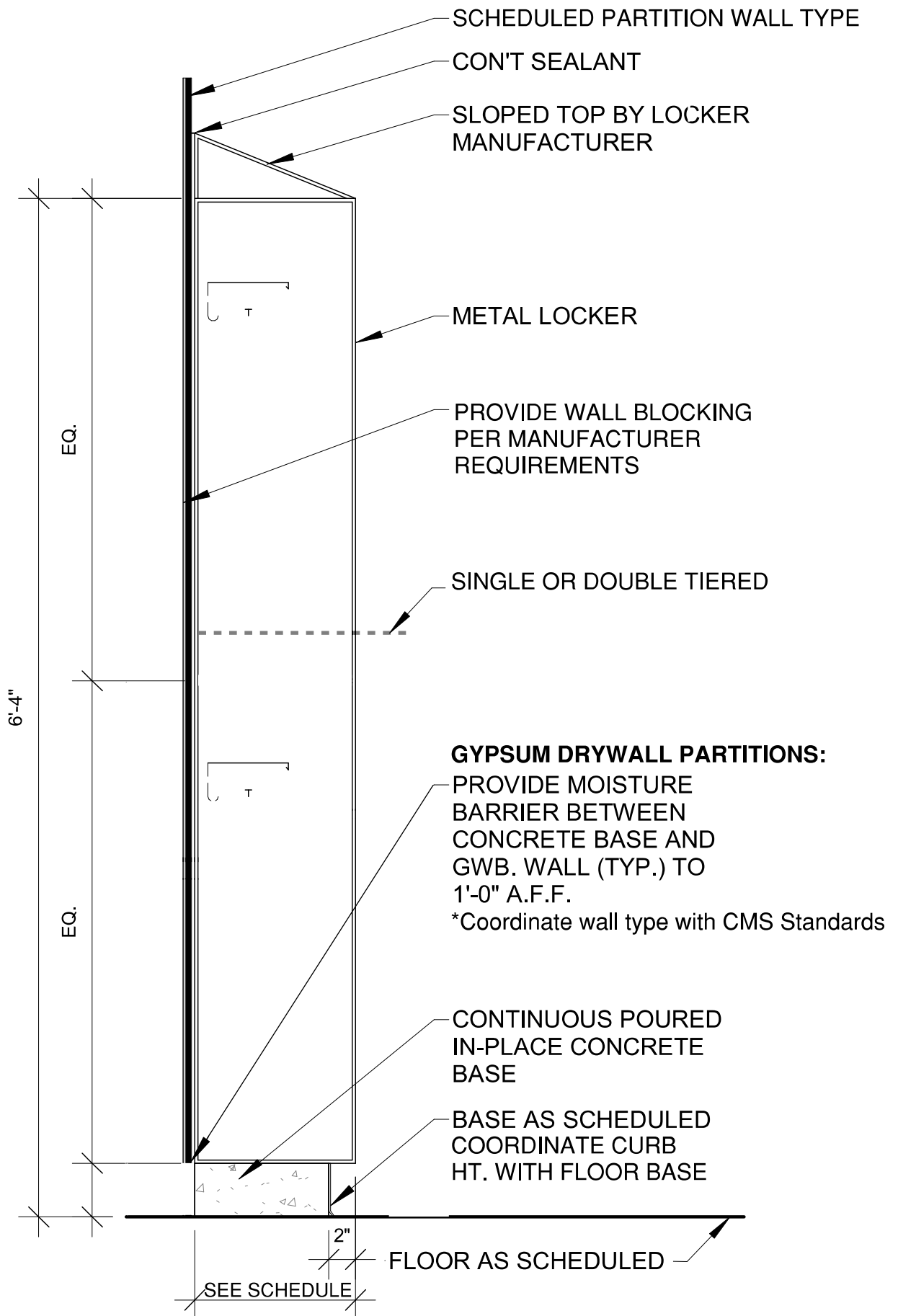
GENERAL NOTE:
VERIFY DIMENSIONS OF
DISPENSER UNITS FROM
MANUFACTURER DATA

CHARLOTTE-MECKLENBURG SCHOOLS - LOCKERS

LOCKER STANDARDS

Please reference this document for typical standard locker dimensions. Included are sample photographs and cut sheets. Please reference CMS Master Spec regarding manufacturers and source limitations.

Minimum Locker Requirements 07/08/25								
Tag	Location	Tier	Size	Ht	Locker Qty	Comments	Schools	Notes
ML-1	Staff - Kitchen/Children's Nutrition Locker	Double	12x15	36	10	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS,MS, ES, K8	1,2,3,5
ML-2	Commons - Breakout Collaboration 1 (worktable)	Single	12x15	36	>>	Limited Ventilation Doors (21%); Locker with flat top and worksurface counter; Continuous or knuckle type hinges. Location varies and can occur at perimeter walls or at center of commons space.	HS,MS,K8	1,2,3,5,6
ML-3	Commons - Breakout Collaboration 2 (wall mounted)	Double	12x15	36	>>	Limited Ventilation Doors (21%); Continuous Slope Top; Continuous or knuckle type hinges.	MS	1,2,3,5,6
ML-1	Gym - PE Locker	Double	12x15	36	160	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS,K8	1,2,3,4,5
ML-5	Gym - Athletic Locker	Single	18x18	72	60	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges;	HS,MS	1,2,3,4,5
ML-1	Gym - PE/Athletic Coach Locker	Double	12x15	36	10	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS,MS,K8	1,2,3,4,5
ML-1	Gym - Game Official Lockers	Double	12x15	36	10	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS	1,2,3,4,5
	Natatorium Locker	>>	>>	>>	>>	See Gym - Athletic Locker	HS	1,2,3,4,5
	Dressing Room - Auditorium (No lockers)					No lockers.	HS	
ML-6	CTE - JROTC Dressing Room	Double	12x12	36	16	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS	1,2,3,4,5
ML-6	CTE - Automotive	Double	12x12	36	40	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS	1,2,3,4,5
ML-7	CTE - Cosmetology	Triple	15x18	24	42	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges		1,2,3,4,5
ML-4	Field House - Player Locker	Single	18x18	72	50	Diamond Perforated; Continuous Slope Top; Two single-prong wall hooks bolted to back of locker; Seat/foot locker and upper shelf with security box areas are to be unperforated. Total qty to be divided by Visitor/Home; Continuous or knuckle type hinges.	HS	1,2,3,4,5
ML-1	Field House - Coach Locker	Double	12x15	36	10	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS	1,2,3,4,5
ML-1	Field House - Game Official	Double	12x15	36	10	Diamond Perforated; Continuous Slope Top; Continuous or knuckle type hinges	HS	1,2,3,4,5
Notes:								
1) Direct wall attachment to CMU - See locker profile sketch.								
2) Blocking per manufacturer requirements at walls that are not CMU.								
3) ADA locker count included in locker quantity. See AE Guide for additional requirements.								
4) Number of lockers may vary. Coordinate required quantity with CMS Design Manager.								
5) Concrete base for all lockers. Coordinate with finish schedule for floor base height.								
6) Commons Lockers - Coordinate location, quantity and type with CMS Design Manager. ~~Provide combination padlock with CMS master key(s).~~								



TYPICAL LOCKER PROFILE



GYM PE AND STAFF LOCKERS

- double tiered (stacked)
- 12" x 15"
- 36" high stacked
- curb base, no legs
- sloped top
- diamond perforated
- continuous hinge



CTE LOCKERS

- See locker schedule.
- multi-tiered (stacked)
 - sizes vary
 - curb base, no legs
 - sloped top
 - diamond perforated
 - continuous hinge



ATHLETIC LOCKERS

* PE Lockers in Middle School Program

- single tiered
- 12" x 15"
- 72" high
- curb base, no legs
- sloped top
- diamond perforated
- continuous hinge





FIELD HOUSE

ATHLETIC LOCKERS

- open
- 18" x 18"
- curb base, no legs
- sloped top
- upper shelf with security box
- vented seat foot locker
- perforated side walls (with exception of end lockers)



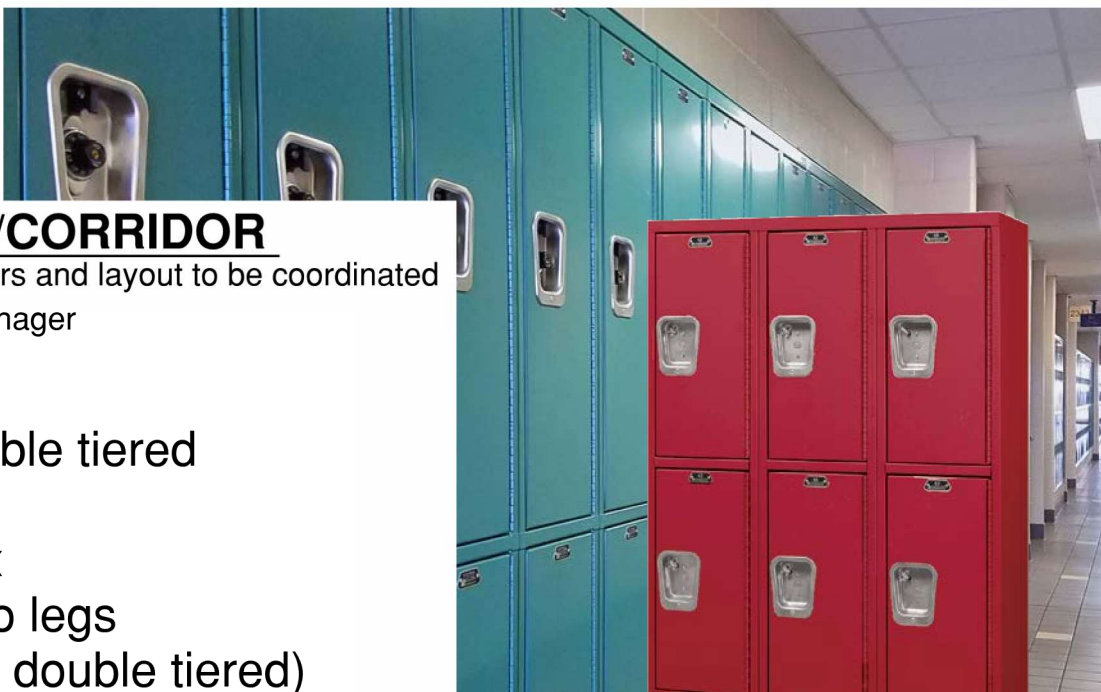
GAME OFFICIAL AND COACH LOCKERS

- double tiered (stacked)
- 12" x 15"
- 36" high stacked
- curb base, no legs
- sloped top
- diamond perforated
- continuous hinge

UNIBODY ALL-WELDED CORRIDOR LOCKERS**MARQUIS® BOOKSAFE® III CORRIDOR LOCKERS**

Our third generation Marquis Booksafe locker includes reinforced double frame, unibody construction and a modern seamless deep-drawn stainless steel recessed handle. The industry's first and best single-point, all-welded corridor

locker just got better, stronger and more durable, and backed by our written lifetime warranty. Doors are provided without louvers for a clean flush front.

**COMMUNITY/CORRIDOR**

* Location, level of tiers and layout to be coordinated with CMS Design Manager

- no hooks
- single or double tiered
- 12" x 15"
- 36" high max
- curb base, no legs
- sloped top (if double tiered)
- continuous hinge

*Triple Tier
3-Wide*

WHAT IS UNIBODY ALL-WELDED?

- Superior unibody all-welded corridor lockers include our double vertical frame design adding strength, integrity, durability and visual appeal.
- First we start with prime grade cold rolled sheet steel. 16 gauge for all body components except backs which are 18 gauge. Doors are heavy 14 gauge.
- Sides are formed to be an integral part of the front vertical locker frame which locks into the bottom for precise alignment and added strength.
- We MIG weld an additional channel shaped vertical frame member between doors providing a continuous door strike at both the hinge and latch side of the door.
- The top and bottom are flanged downward at the front to form a 1-1/2" high channel shaped top and bottom horizontal frame member continuous across the multiple column unit up to 60" wide.
- The base is a full 1-1/2" high keeping locker contents away from moisture on the floor and/or wood/concrete base.
- Front-to-back channel stiffeners are welded into the base under each side panel providing a strong anchor bearing surface for installation and increasing overall unit strength.
- Horizontal tier dividers for double and triple tier models project through to the face of the locker forming a horizontal cross member between doors for maximum strength.
- Guaranteed in writing by our lifetime warranty.

UNIBODY ALL-WELDED CORRIDOR LOCKERS

MARQUIS® BOOKSAFE® III
CORRIDOR LOCKERSDouble Tier
3-WideTYPICAL IN PE and
ATHLETICS

INTEGRAL SLOPE TOP is fabricated of heavy 16 gauge steel, runs continuous across a multiple column unit and is MIG welded at the factory replacing welded locker unit flat top. Sides are sloped at top providing rigid support beneath the slope top between each locker column.

STANDARD



Deep-drawn 304 stainless steel recessed handle with single-point latching

STANDARD



11 gauge single-point latch MIG welded to Hollow-T frame

STANDARD



16 gauge continuous piano hinge

STANDARD



Include a 3" wide 18 gauge full height door stiffener spot welded to the inner door face and MIG welded to the hinge side as well as to the top and bottom door flanges providing a rigid torque-free door. A 1-1/2" wide stiffener will be furnished for 9" wide Marquis doors.



FEATURES

BODY CONSTRUCTION: All-welded unibody construction, 16 gauge solid sides integral with frame, 16 gauge continuous top, 18 gauge solid back, 16 gauge bottom

DOORS: 14 gauge plain doors with a 3" wide 18 gauge full height door stiffener are **standard. Louvered, Security-Plus and diamond perforated door styles are optional.**

HANDLE: Deep-drawn seamless stainless steel recessed handle with single-point latching

DOOR STRIKE: Continuous vertical door strike at both hinge and latch side

LATCHING: Single-point maintenance-free quiet latching with 11 gauge MIG welded latch

HINGES: 16 gauge continuous piano type is standard. Heavy-duty 13 gauge 3-1/2" 7 knuckle hinges are available as an upgrade

SHELVES: 16 gauge hat shelf for single tier openings 60" and 72" high, 16 gauge intermediate shelves.



STANDARD
Deep-drawn stainless steel
recessed handle with
single-point latching



STANDARD
11 gauge single-point latch is
MIG welded to frame



STANDARD
16 gauge continuous
piano hinge



STANDARD
A 3" wide 18 gauge full height
door stiffener spot welded to
the inner door face and MIG
welded to the hinge side as
well as to the top and bottom
door flanges providing a rigid
torque-free door. A 1-1/2" wide
stiffener will be furnished for
9" wide Marquis doors.

MARQUIS[®] BOOKSAFE[®] III LOCKER SPECIFICATIONS

General: Lockers shall Be "Superior Booksafe III Unibody All-Welded Corridor Lockers" as manufactured by List Industries Inc. or approved equal. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.

Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. Two-tone color combination shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturer's standard selection.

Marquis Booksafe III Corridor Wardrobe Doors: Doors to be fabricated from single sheet prime 14 gauge with single bends at top and bottom and double bends at the sides. Doors shall include a 3" wide (1-1/2" for 9" wide doors) 18 gauge full height channel door stiffener MIG welded to the hinge side of the door as well as to the top and bottom door return bends and spot welded to the inside of door face and to form a rigid torque-free box reinforcement for the door. Doors to be solid (non-perforated) with ventilating perforations in the top and bottom door flanges.

Marquis Seamless Drawn Stainless Steel Recessed Locker Handle: All locker doors shall have a seamless drawn not less than 304, stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recess pan shall be deep enough to have the lock be completely flush with the outer door face. The pull handle shall be drawn into the left side of the handle for easy opening of the locker door.

Marquis Booksafe III Latch Assembly: Shall be single point rigid non-moving positive latch by means of a heavy 11 gauge (minimum) latch securely welded to the 16 gauge vertical frame member at both the continuous door strike as well as the integral locker side to prevent the latch and frame from twisting. The latch assembly must be made of a single piece of steel and have a padlock loop that inserts through the recess pan. The latch must be able to accept either a padlock or built-in combination lock. Rubber bumpers shall be securely attached to the latch.

Hinges: Hinges shall not be less than 16 gauge continuous piano type riveted to frame and welded to the door. All doors shall be right hand side hinged.

Twin-Frame / Vertical Side Panels: Shall be of integral frame and side wall construction manufactured from solid 16 gauge sheet steel. The one-piece side/frame shall be formed to provide a continuous door strike on the hinge side. An additional continuous vertical door strike shall be achieved at the latch side by MIG welding a 16 gauge full height channel frame member to the integral locker side producing a rigid torque-free welded locker body. The frame shall include a tab which engages a slot in the base locking the side panel and frame into position.

Integral Frame Locker Base: 16 gauge formed sheet steel with double return flanges at the front and rear. A full depth horizontal channel shall be MIG welded under the locker bottom front-to-back at the left and right side of each welded locker unit as well as beneath each vertical side panel for maximum rigidity.

Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple locker unit. Integral slope tops are optional.

Hat Shelves, Intermediate Shelves And Bottoms: Shall be 16 gauge sheet steel, have double bends at front and shall be MIG welded to the sides.

Backs: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple twin-framed unit and be welded to each vertical side panel.

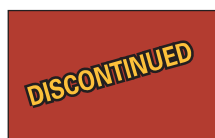
Locks (If Required): Shall be master keyed to one system for the entire project. (Go to www.ListIndustries.com for lock use chart and suggested lock application). Padlock only for 9" wide lockers.

Equipment: Openings 60" and 72" shall include one hat shelf.

Lifetime Warranty: Superior unibody all-welded lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

Example: Sample/Color Approved per finish review with Design Team and CMS.

Now Available in Standard , Hammertone and Antimicrobial Finishes



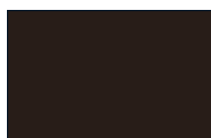
742
Rave Red



721
Relay Red



727
Maroon



708
Black



714
Snow White



738
Charcoal



743
Freshwater Blue



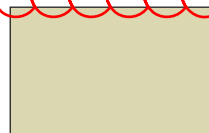
731
Denim Blue



720
Pep Rally Purple



710
Sandstone



729
Tan



746
Popular Gray



707
Marine Blue



717
Grand Slam Blue



719
Jersey Blue



711
Light Gray



706
Heather Gray



725
Dark Gray



744
Well Bred Brown



745
Deep Forest Brown



704
Evergreen



740
Stardew Gray



741
Rayo de Sol



728
Hoop Orange

NOTE: All body components of production KD lockers will be painted our standard neutral color, currently 729 Tan (choice of 729 Tan or 725 Dark Gray for HDV body).

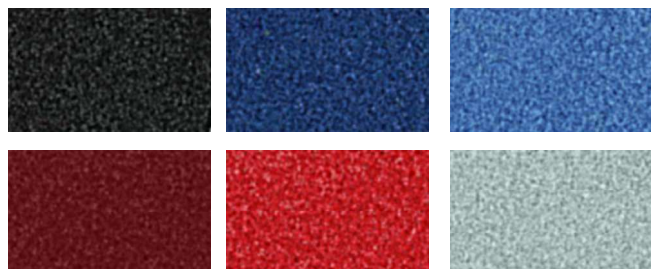
Enhance your decor with two-tone color combinations, doors one color and frame a second color, at NO ADDITIONAL COST.

LOCKER PREMIUM FINISH OPTIONS (additional charges apply)

HAMMERTONE FINISHES

Specially formulated with a unique hammer texture that is tough, highly durable and provides long lasting protection.

Note: Patterns/colors of textures and metallics will vary due to their nature. No touch up available for hammertone finishes.



Upgrade available for all 24 standard colors



Upgrade available for all standard 24 colors

Our MedSafe™ antimicrobial finishes with Microban® are specially formulated to protect against bacteria, mold, yeast & mildew for up to 20 years! Very beneficial for educational, healthcare, food processing and other hygiene conscious environments.

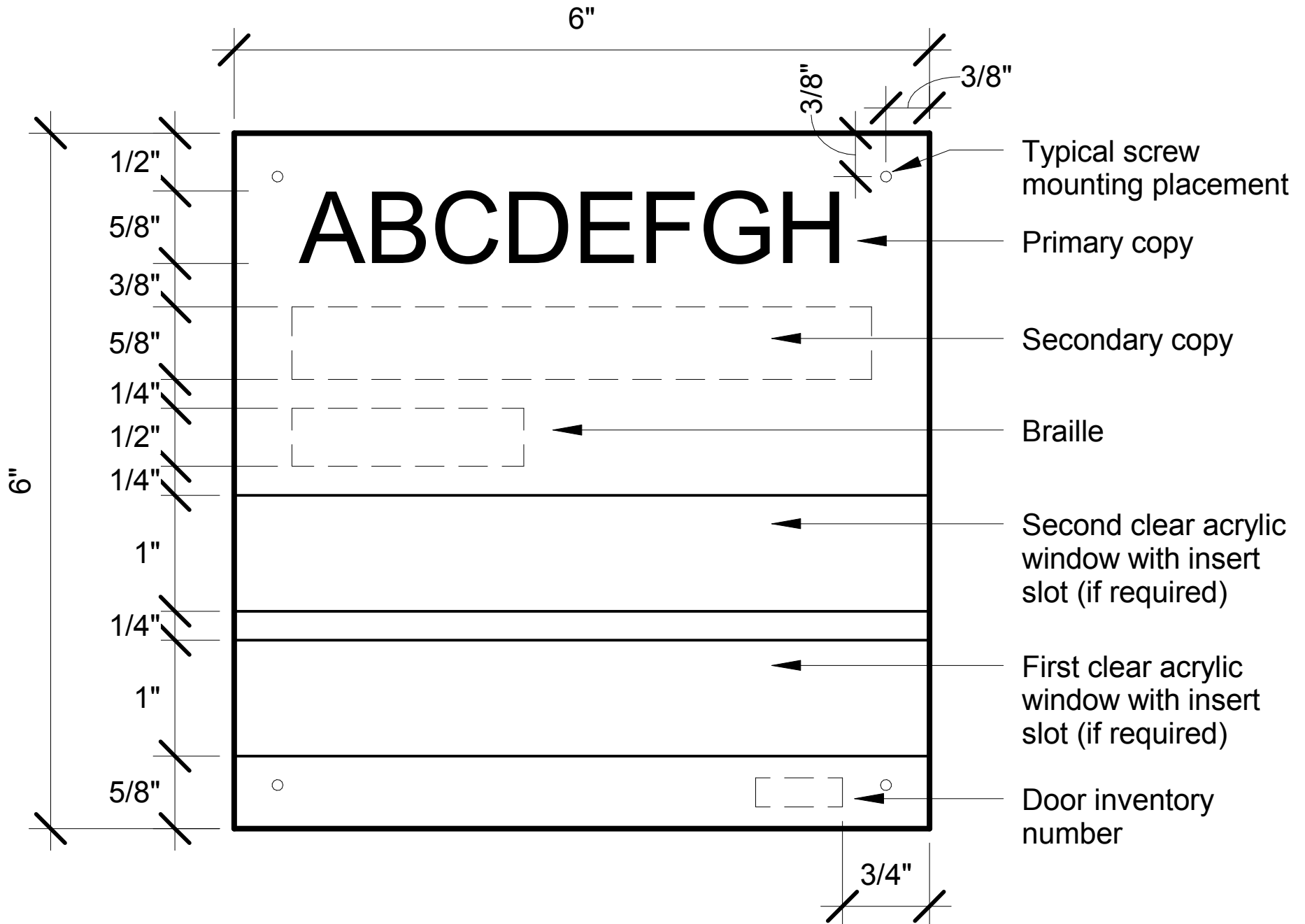
1-800-776-1342

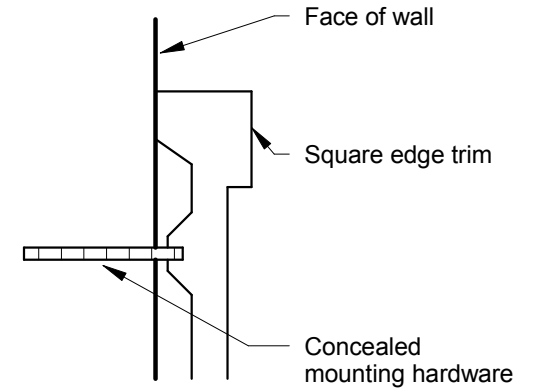
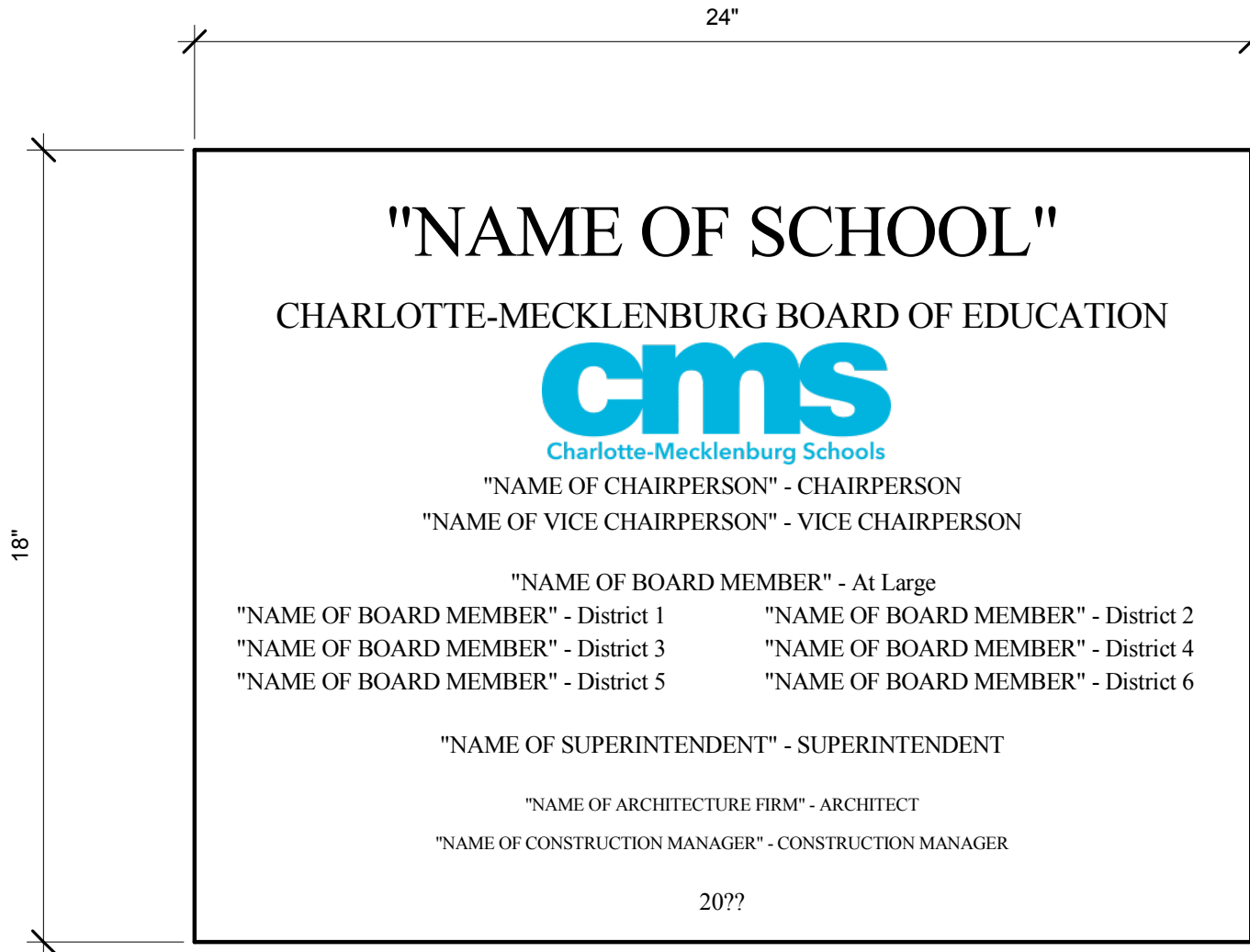
www.ListIndustries.com



401 Jim Moran Blvd. Deerfield Beach, FL 33442

Colors shown are an approximate printed representation of the actual color and will vary depending on light source. Actual color samples are available upon request.
List Industries reserves the right to modify its designs and/or make changes in specifications or colors without prior notice.





Use the names of board members active at the time of construction cost approval.

Cast bronze plaque with 1/4" raised Times Roman lettering, dark bronze leatherette background, single line border edge, and concealed stud mounting

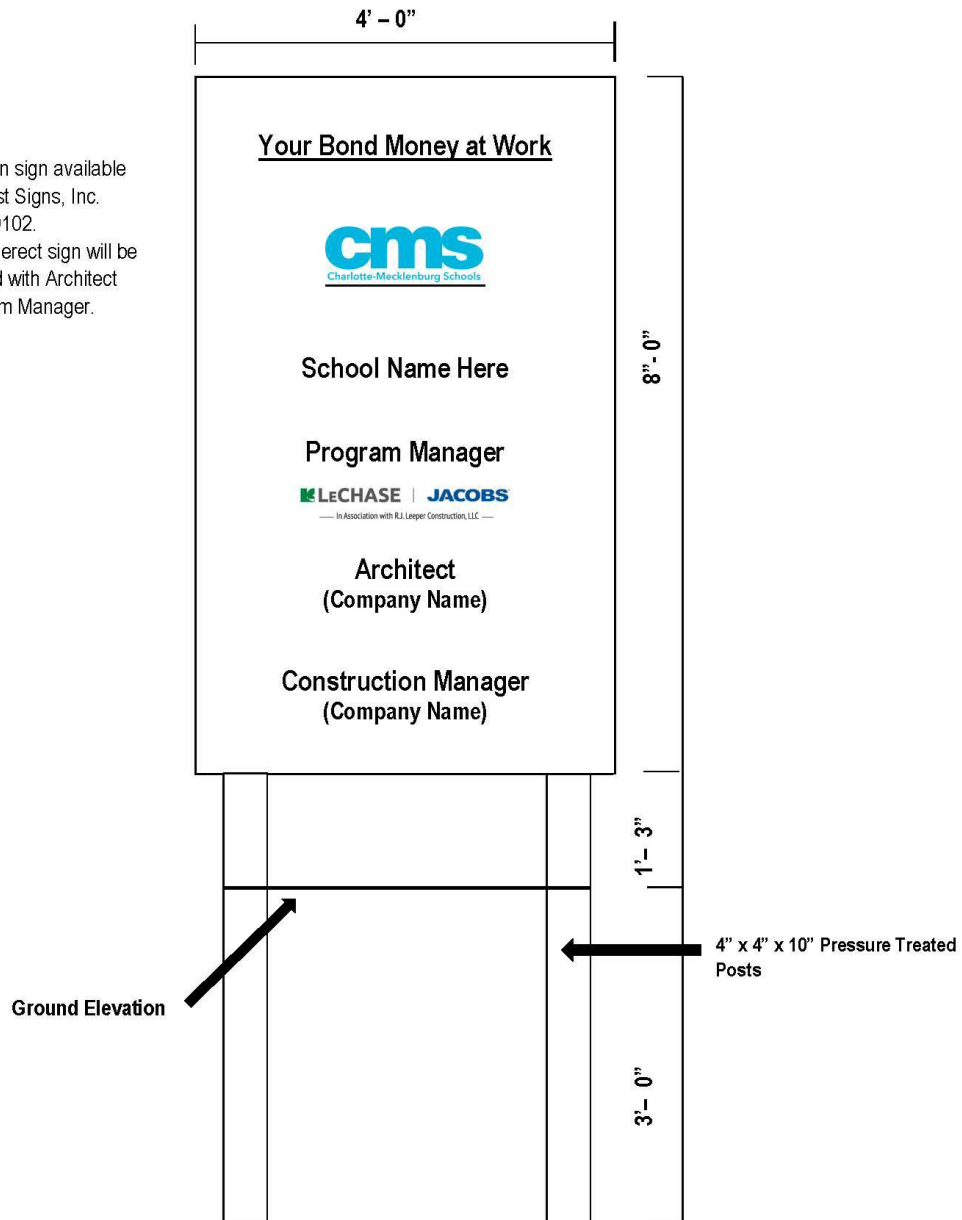


10.10.7 Construction Sign

Construction Sign Detail

Notes:

1. Construction sign available through Fast Signs, Inc. (704) 527-9102.
2. Location to erect sign will be coordinated with Architect and Program Manager.



January 22, 2019

David Geiser, Director of Inspections
Mecklenburg County Code Enforcement
2145 Suttle Avenue
Charlotte, NC 28208

Re: Modified Restroom – Deviation of ANSI A-117

Dear Mr. Geiser,

Charlotte Mecklenburg Schools utilizes a typical design in our facilities known as the Modified Restroom. These spaces serve students enrolled in the Exceptional Students Program who are disabled and require specialized care. Trained staff members provide this specialized care for the purpose of transferring students for the use of the water closet and bathing purposes. The water closet design of the typical modified restroom does not comply with ANSI A-117 in educational environments. These requirements would inhibit the delivery of care and place the student and staff in unsafe situations.

The modified restroom is designed with a water closet centered on a wall having dual swing away grab bars. This alternative method is provided for the following reasons:

- To assist staff members when they are needed on each side of the water closet to provide transferring assistance of the student from their motorized chair, Hoyer lift or adjustable dressing table to the water closet or back to their specific mode of ancillary transportation.
- To provide the staff member and the disabled student the ability to use a single grab bar (right or left side) when the disabled student has partial use of either arm when transferring onto the water closet or back to their specific mode of ancillary transportation.

We request approval to deviate from the ANSI A-117 requirements only for the modified restroom. It is important to note that the lavatory, shower and water closet are plumbing fixtures that are not part of the required plumbing fixtures for the facility.

Respectfully,

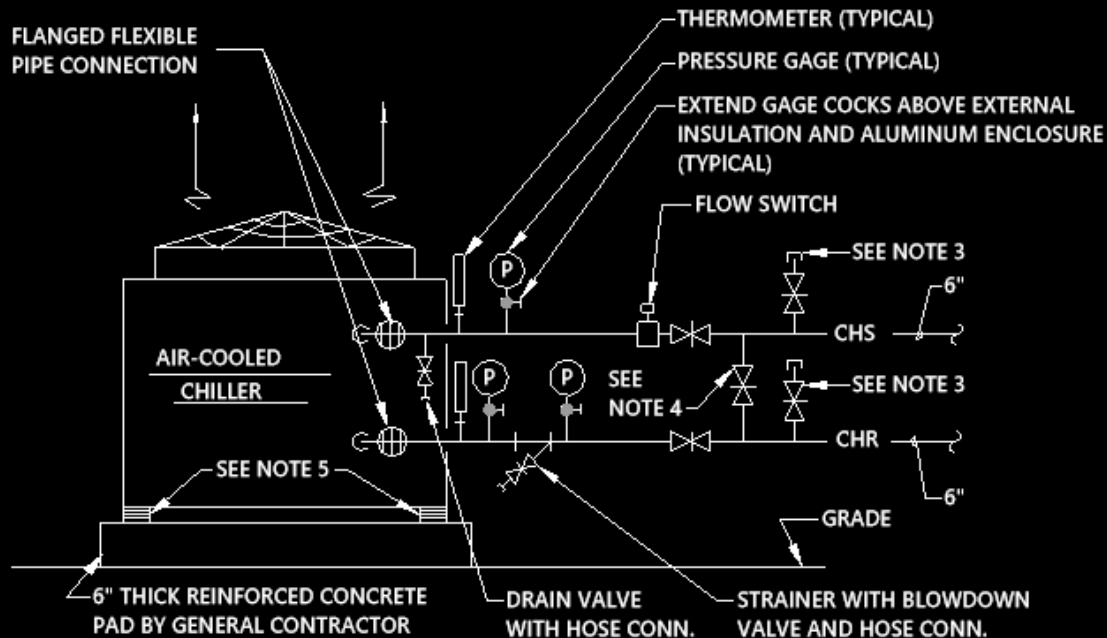

Gary Adams

Director of Architecture AIA, CCA, LEED AP BD+C, NCARB

CC: Jeff Vernon, Building Code Administrator
Andy Herring, Code Enforcement Manager
Tommy Rowland, Mechanical/Plumbing Code Administrator

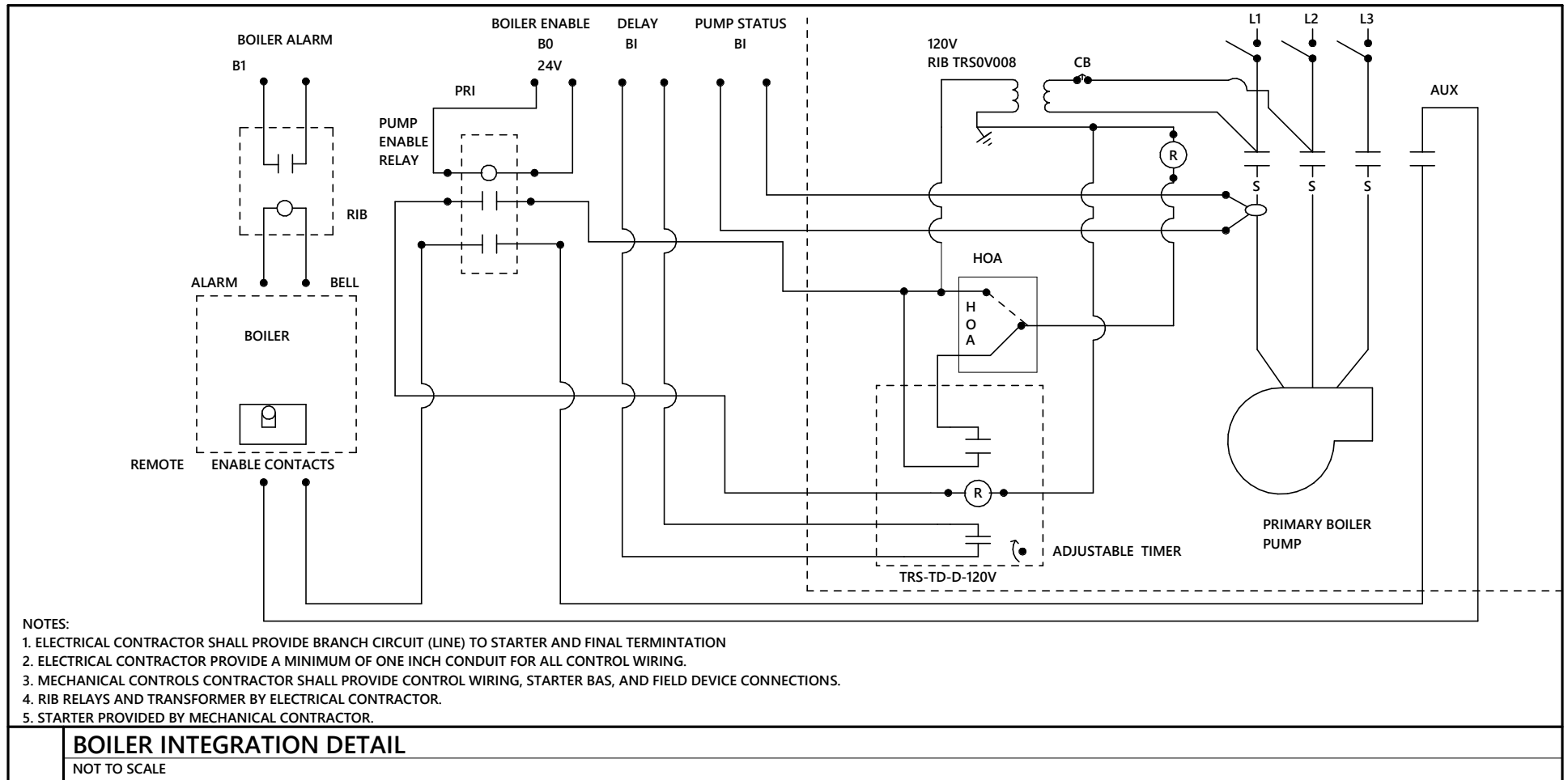
NOTES:

1. ALL PIPING EXPOSED ABOVE GRADE SHALL HAVE ELECTRIC HEAT TAPE WITH THERMOSTAT INSTALLED. HEAT TAPE SHALL BE 120V-1Ø WITH A CAPACITY OF 10 WATTS PER LINEAR FOOT. HEAT TAPE SHALL BE INSTALLED PRIOR TO INSTALLATION OF INSULATION.
2. INSULATION EXPOSED ABOVE GRADE SHALL BE COVERED WITH AN ALUMINUM OUTER JACKET, ELBOWS AND FITTINGS SHALL BE COVERED WITH PVC FITTING COVERS. ALUMINUM ENCLOSURE SHALL BE SEALED WATER TIGHT.
3. PROVIDE CONNECTIONS AT EACH CHILLER TO ALLOW TEMPORARY CHILLER TO BE CONNECTED DURING TIMES WHEN PERMANENT CHILLER IS DOWN FOR MAINTENANCE. PROVIDE ALL NECESSARY VALVING AND FLANGING FOR THIS TO OCCUR WITHOUT DRAINING SYSTEM.
4. PROVIDE FULL SIZE BYPASS WITH BUTTERFLY VALVE FOR SYSTEM FLUSHING. ISOLATION VALVES SHALL REMAIN CLOSED UNTIL SYSTEM HAS BEEN FLUSHED AND VERIFIED "CLEAN" BY THE CHEMICAL TREATMENT SUPPLIER. UPON UNIT START-UP, FOLLOWING CLEANING, BYPASS VALVE SHALL BE PERMANENTLY CLOSED.
5. INSTALL VIBRATION ISOLATOR PADS (2-1/2") PROVIDED BY UNIT MANUFACTURER OR MECHANICAL CONTRACTOR.

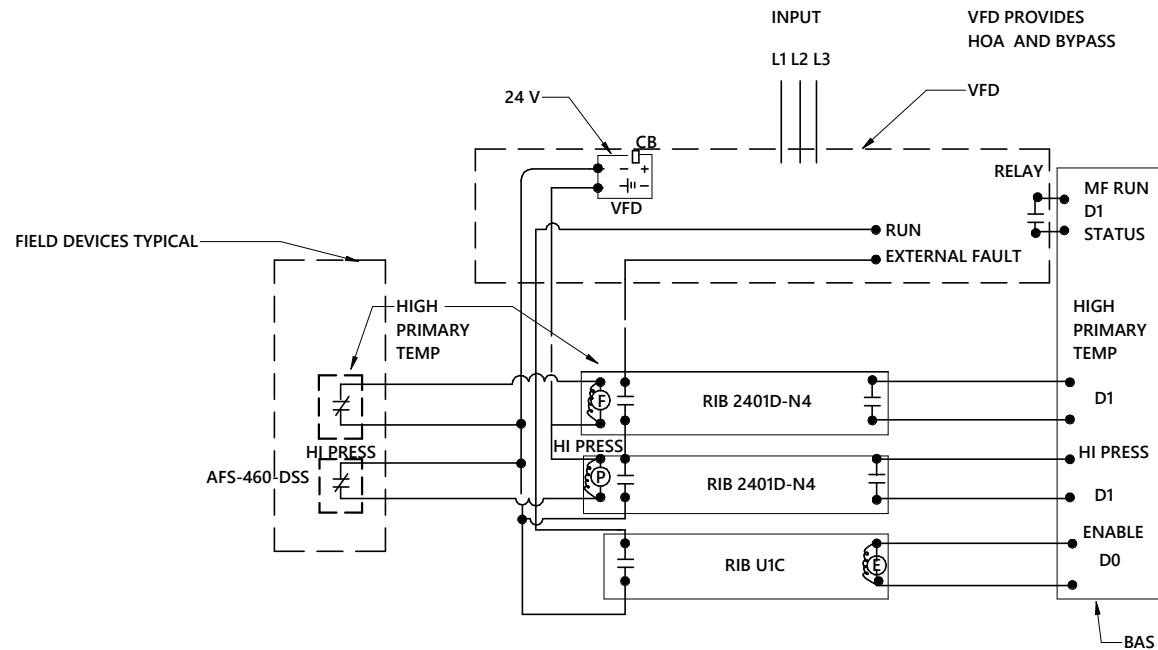
**2****AIR-COOLED CHILLER DETAIL**

NO SCALE

23.4.2.2 - Typical BAS Interface - Boiler Integration



23.4.3.2 - Typical VFD BAS Interface - Pump



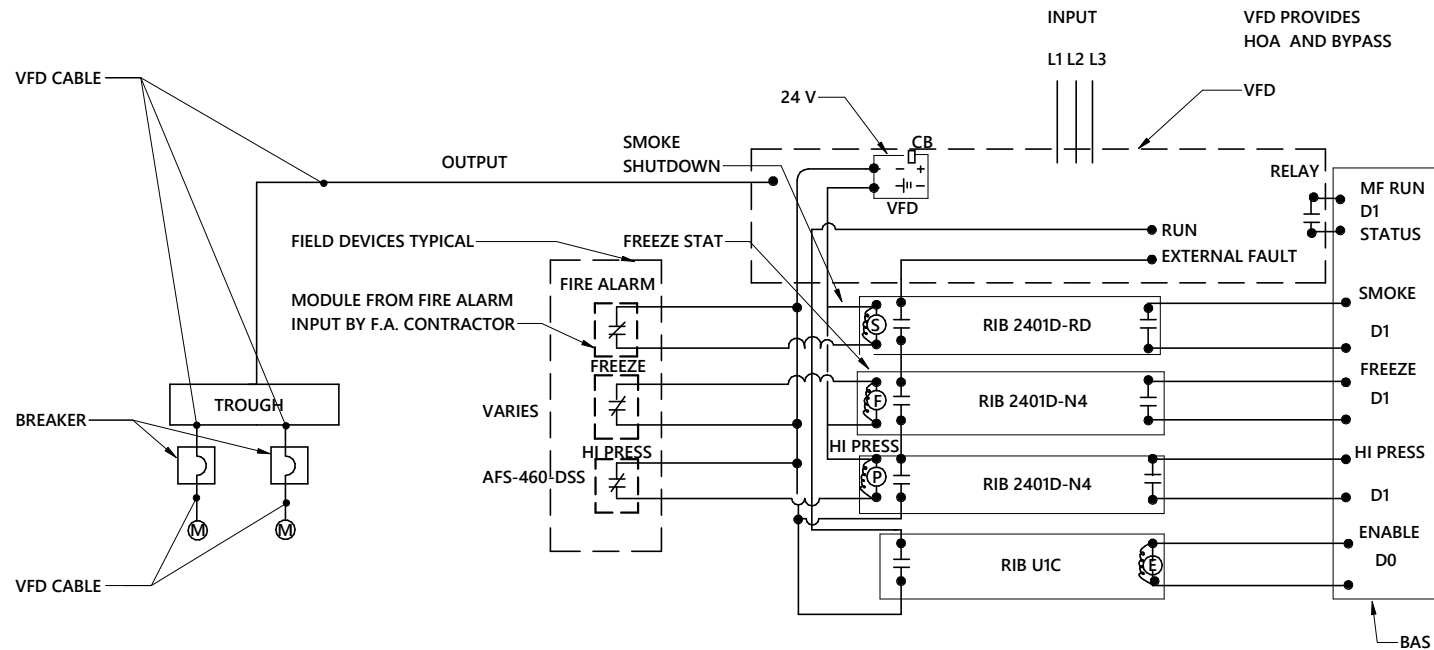
NOTES:

1. ELECTRICAL CONTRACTOR SHALL PROVIDE BRANCH CIRCUIT (LINE) TO VFD AND OUTPUT WIRING. TO MOTOR(S).
2. ELECTRICAL CONTRACTOR SHALL PROVIDE A MINIMUM OF ONE INCH CONDUIT FOR ALL CONTROL WIRING.
3. MECHANICAL CONTROLS CONTRACTOR SHALL PROVIDE CONTROL WIRING, BAS, AND FIELD DEVICE CONNECTIONS.
4. RIB RELAYS BY ELECTRICAL CONTRACTOR.
5. VFD PROVIDED BY MECHANICAL CONTRACTOR.

CMS TYPICAL MOTOR VFD BAS INTERFACE - PUMP

NOT TO SCALE

23.4.4.1 - Typical VFD BAS Interface - AHU



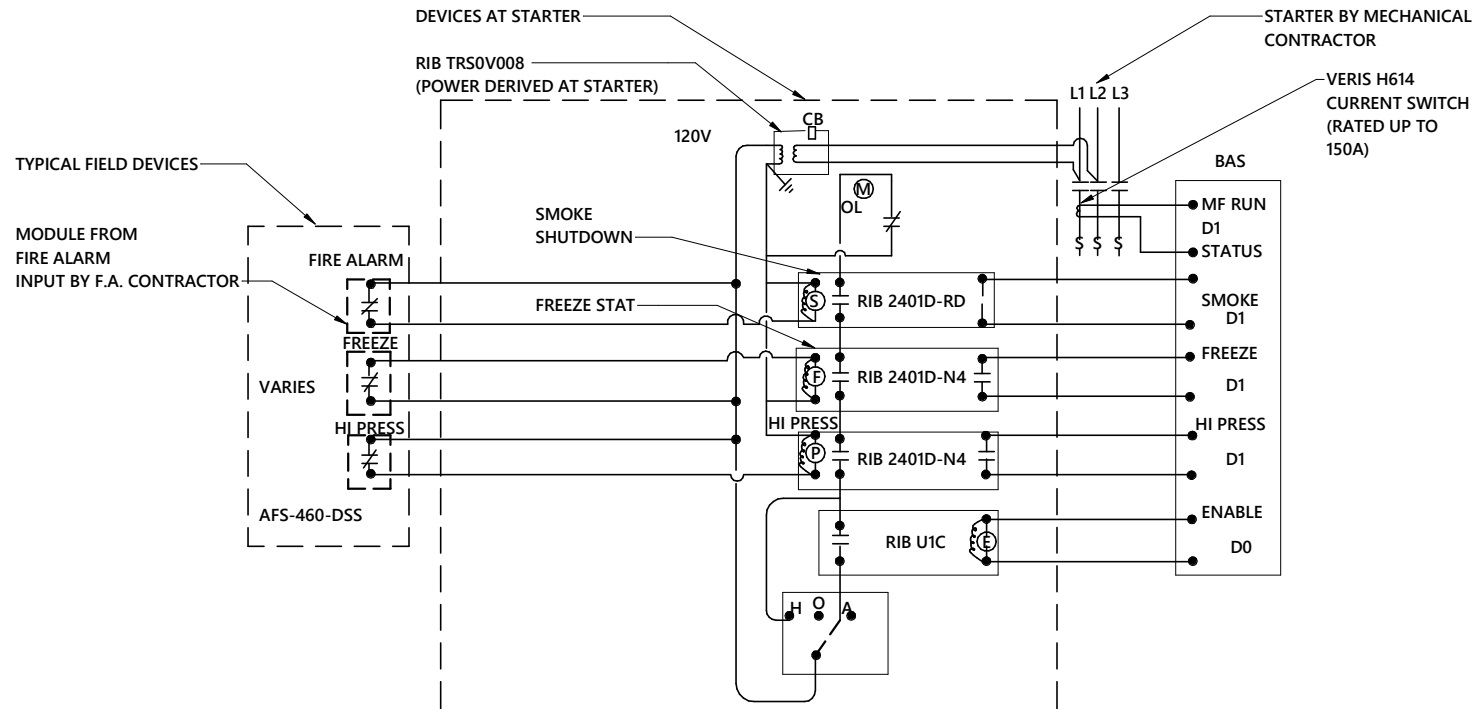
NOTES:

1. ELECTRICAL CONTRACTOR SHALL PROVIDE BRANCH CIRCUIT (LINE) TO VFD AND OUTPUT WIRING. TO MOTOR(S).
2. FIRE ALARM CONTRACTOR SHALL PROVIDE FIRE ALARM MODULES (FIELD DEVICES).
3. ELECTRICAL CONTRACTOR SHALL PROVIDE A MINIMUM OF ONE INCH CONDUIT FOR ALL CONTROL WIRING.
4. MECHANICAL CONTROLS CONTRACTOR SHALL PROVIDE CONTROL WIRING, BAS, AND FIELD DEVICE CONNECTIONS.
5. RIB RELAYS BY ELECTRICAL CONTRACTOR.
6. VFD PROVIDED BY MECHANICAL CONTRACTOR.
7. ELECTRICAL CONTRACTOR SHALL PROVIDE A BREAKER SIZED FOR EACH MOTOR WHERE MULTIPLE MOTORS ARE SERVED BY A SINGLE VFD.

CMS TYPICAL MOTOR VFD BAS INTERFACE - AHU

NOT TO SCALE

23.4.13.2 - Typical BAS Interface - AHU



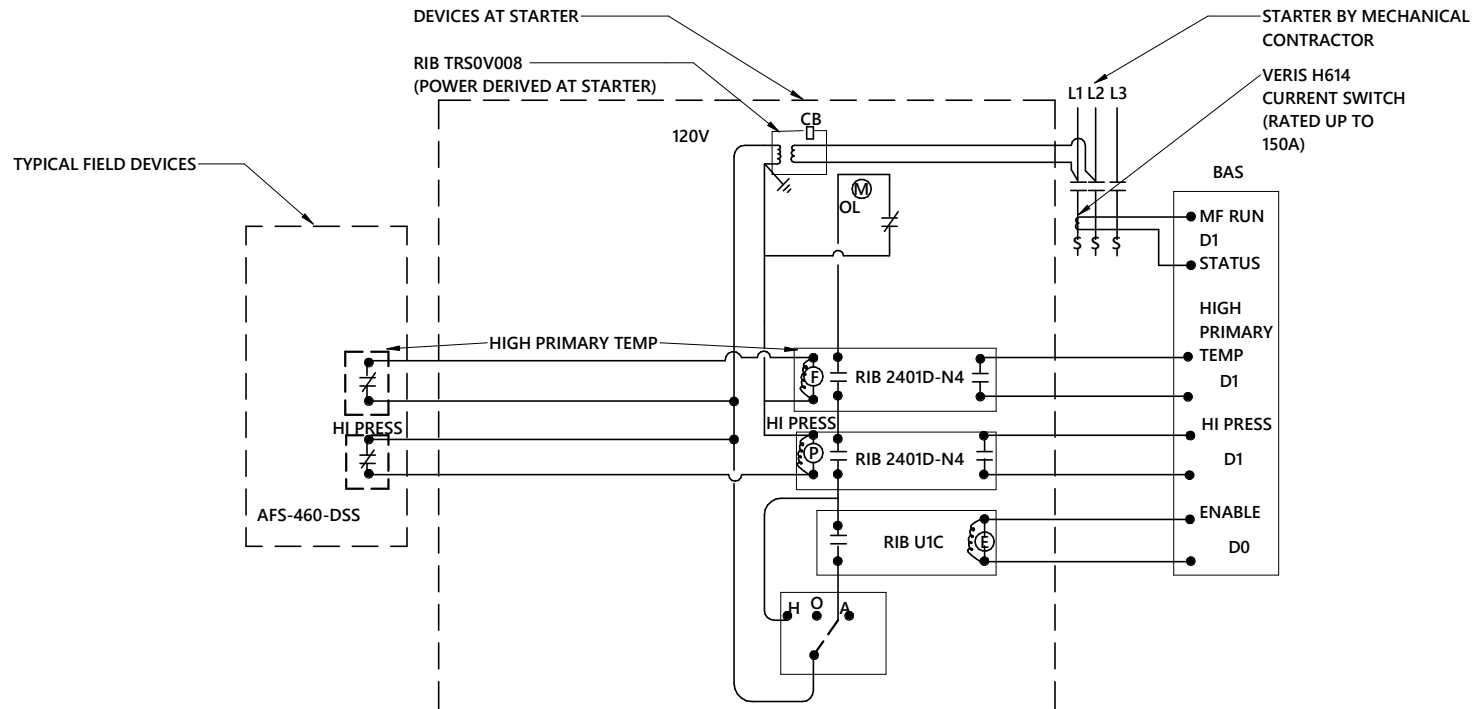
NOTES:

1. ELECTRICAL CONTRACTOR SHALL PROVIDE BRANCH CIRCUIT (LINE) TO STARTER AND FINAL TERMINATION.
2. FIRE ALARM CONTRACTOR SHALL PROVIDE FIRE ALARM MODULES (FIELD DEVICES).
3. ELECTRICAL CONTRACTOR SHALL PROVIDE A MINIMUM OF ONE INCH CONDUIT FOR ALL CONTROL WIRING.
4. MECHANICAL CONTROLS CONTRACTOR SHALL PROVIDE CONTROL WIRING, STARTER, BAS, AND FIELD DEVICE CONNECTIONS.
5. RIB RELAYS, CT'S, AND TRANSFORMER BY ELECTRICAL CONTRACTOR.
6. STARTER PROVIDED BY MECHANICAL CONTRACTOR.

CMS TYPICAL MOTOR STARTER BAS INTERFACE - AHU

NOT TO SCALE

23.4.13.2 - Typical BAS Interface - Pump

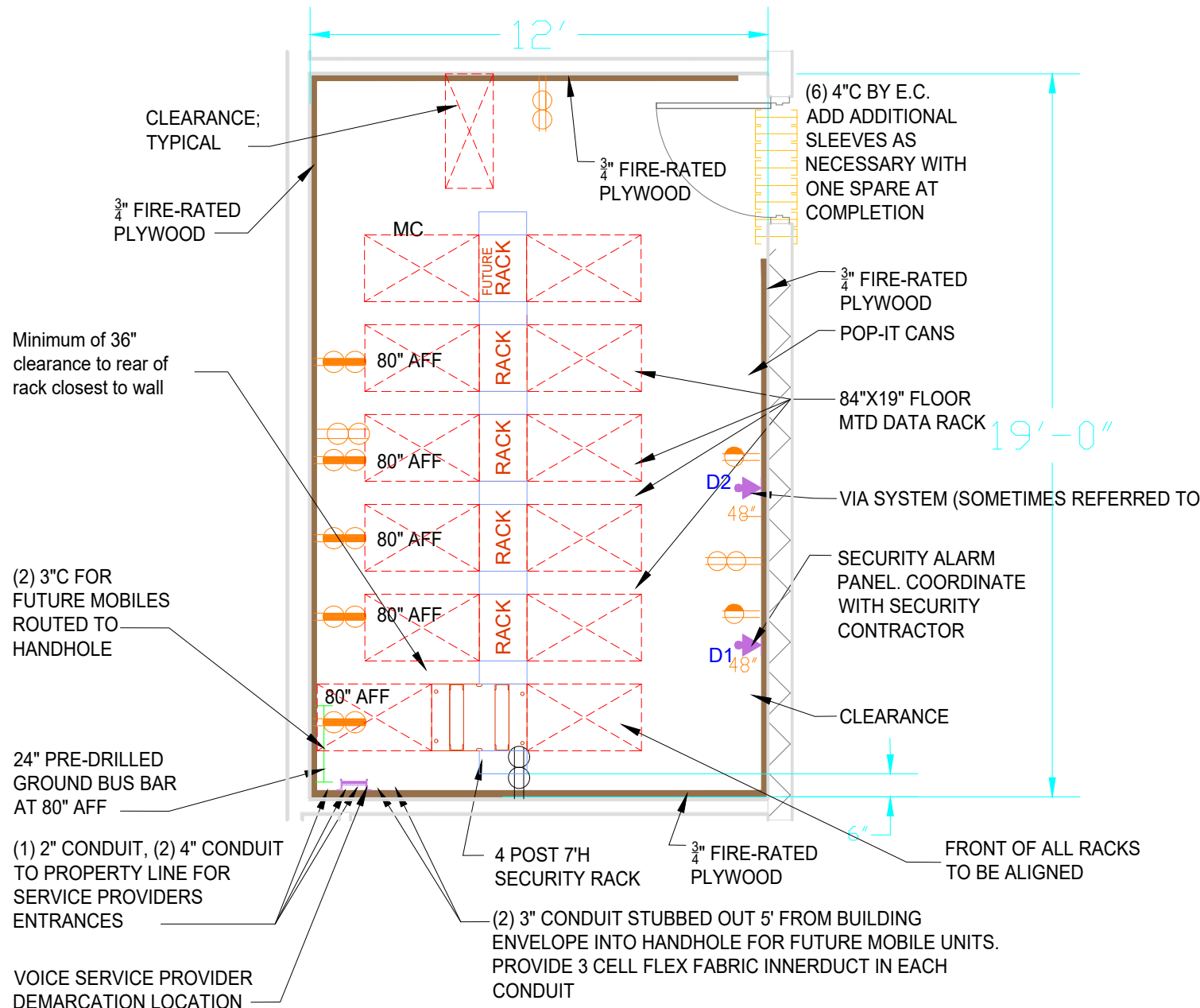


NOTES:

1. ELECTRICAL CONTRACTOR SHALL PROVIDE BRANCH CIRCUIT (LINE) TO STARTER AND FINAL TERMINATION.
2. ELECTRICAL CONTRACTOR SHALL PROVIDE A MINIMUM OF ONE INCH CONDUIT FOR ALL CONTROL WIRING.
3. MECHANICAL CONTROLS CONTRACTOR SHALL PROVIDE CONTROL WIRING, STARTER, BAS, AND FIELD DEVICE CONNECTIONS.
4. RIB RELAYS, CT'S, AND TRANSFORMER BY ELECTRICAL CONTRACTOR.
5. STARTER PROVIDED BY MECHANICAL CONTRACTOR.

CMS TYPICAL MOTOR STARTER BAS INTERFACE - PUMP

NOT TO SCALE



REVISIONS	
DATE	DESCRIPTION

DATE:
DRAWN BY:
CHECKED BY:
ISSUE DATE:

SCALE:	1/4" = 1'
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EQUIPMENT ROOM DETAIL

ER-1

REVISIONS

DATE	DESCRIPTION

DATE:

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ISSUE DATE:

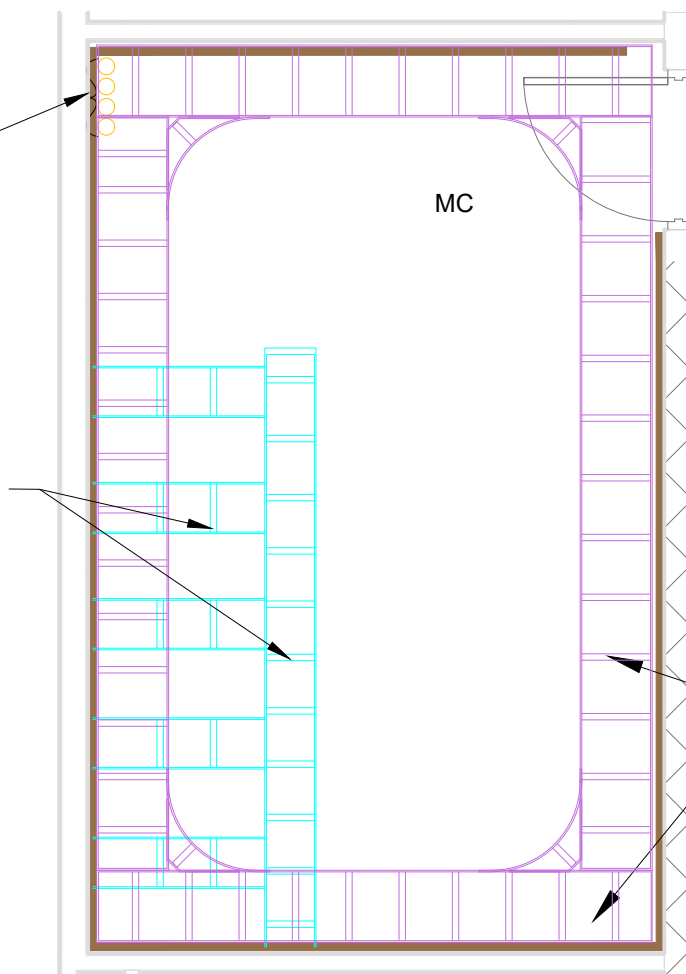
SCALE: $\frac{1}{4}" = 1'$

**EQUIPMENT
 ROOM LADDER
 RACK
 DETAIL**

ER-2

(4) 4"C TO IDF ON FLOOR
 ABOVE. PROVIDE 12"
 VERTICAL LADDER RACKING
 AS A SUPPORT FOR THE
 CABLES BETWEEN THE
 CONDUITS

12" LADDER RACK MOUNTED
 AT 7'-6" AFF. MOUNT FLUSH
 TO TOP OF DATA RACKS
 UTILIZING 6" RUNWAY
 ELEVATION KITS.



COORDINATE WITH
 MECHANICAL
 CONTRACTOR THE
 LOCATION OF THE MINI
 SPLIT SYSTEM.
 MECHANICAL SYSTEM
 NOT TO INTERFERE WITH
 THE LADDER RACKING.

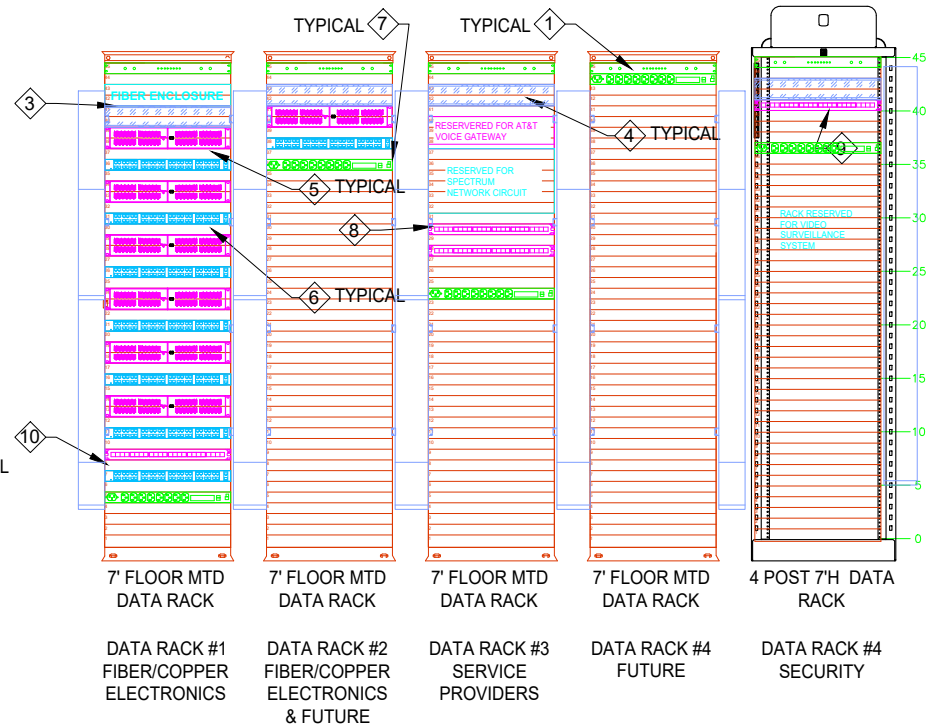
18" LADDER RACK AT 8'-6" AFF.
 PROVIDE WIDE SWEEPING
 TURNS. PROVIDE AND UTILIZE
 WATERFALL DEVICES TO
 TRANSITION FROM THE LADDER
 RACK ABOVE TO THE LADDER
 RACKS BELOW.

GENERAL NOTES:

1. FEED ALL CABLES INTO RACKS FROM ABOVE.
2. LEAVE ONE RACK UNIT SPACE FREE ABOVE AND BELOW EACH PATCH PANEL, WIRE MANAGER AND OWNER PROVIDED NETWORK ELECTRONICS. FILL THESE SPACES WITH BLANK PANELS.
3. DESIGNATED SECURITY RACK WILL ALWAYS BE THE RACK INSTALLED AGAINST OR CLOSEST TO THE ADJACENT WALL

KEYED NOTES:

- 1 HORIZONTAL GROUND BUS BAR, 1 RU. TYPICAL
- 2 NOT USED
- 3 FIBER ENCLOSURE, 2-4 RU. TYPICAL
- 4 HORIZONTAL WIRE MANAGER, 2 RU. TYPICAL
- 5 48 PORT FLAT PATCH PANEL-DATA, 2 RU. TYPICAL
- 6 NETWORK SWITCH PROVIDED AND INSTALLED BY OWNER, 1 RU. TYPICAL
- 7 POWER STRIP 20A, 1 RU. TO BE INSTALLED 8 RMU (RACK MOUNT UNITS) BELOW LAST PATCH PANEL
- 8 24 PORT TELCO PATCH PANEL WITH BLUE JACKS. TERMINATE TWO (2) CATEGORY 6A CABLES, BLUE, FROM ER TO EACH TR.
- 9 24 PORT FLAT MODULAR PATCH PANEL WITH WHITE JACKS FOR SECURITY TERMINATIONS, 1 RU. TYPICAL
- 10 24 PORT FLAT MODULAR PATCH PANEL WITH YELLOW JACKS FOR WIRELESS ACCESS POINTS TERMINATIONS, 1 RU. TYPICAL



REVISIONS

DATE	DESCRIPTION

DATE:

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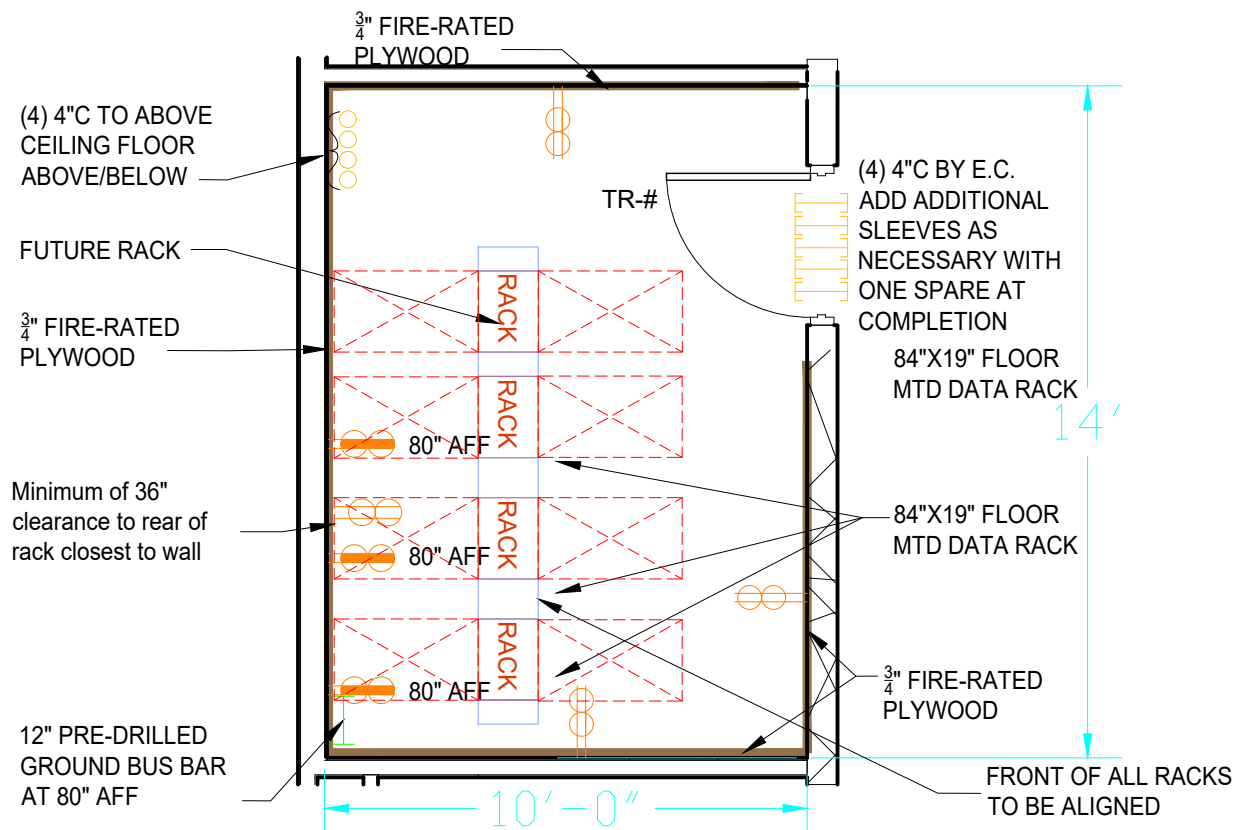
CHECKED BY:

ISSUE DATE:

SCALE: 3/32" = 1'

**EQUIPMENT
ROOM RACK
DETAIL**

ER-3



TELECOM ROOMS TO BE SIZED PER PROJECT. DESIGNER SHALL ADD OR REDUCE RACKS, THUS REDUCING THE ROOM SIZE OR INCREASING AS THE PARTICULAR PROJECT DICTATES. THE DESIGNER SHALL DESIGN THE ROOM TO INCLUDE SPACE FOR ONE FUTURE RACK. THE 12' WIDTH OF THE ROOM SHALL BE ENFORCED WHEN THE SECURITY HEAD END IS LOCATED IN THAT ROOM. OTHERWISE, 10' MINIMUM WIDTH OF A ROOM IS REQUIRED.

REVISIONS
DATE DESCRIPTION

DATE	DESCRIPTION

DATE:

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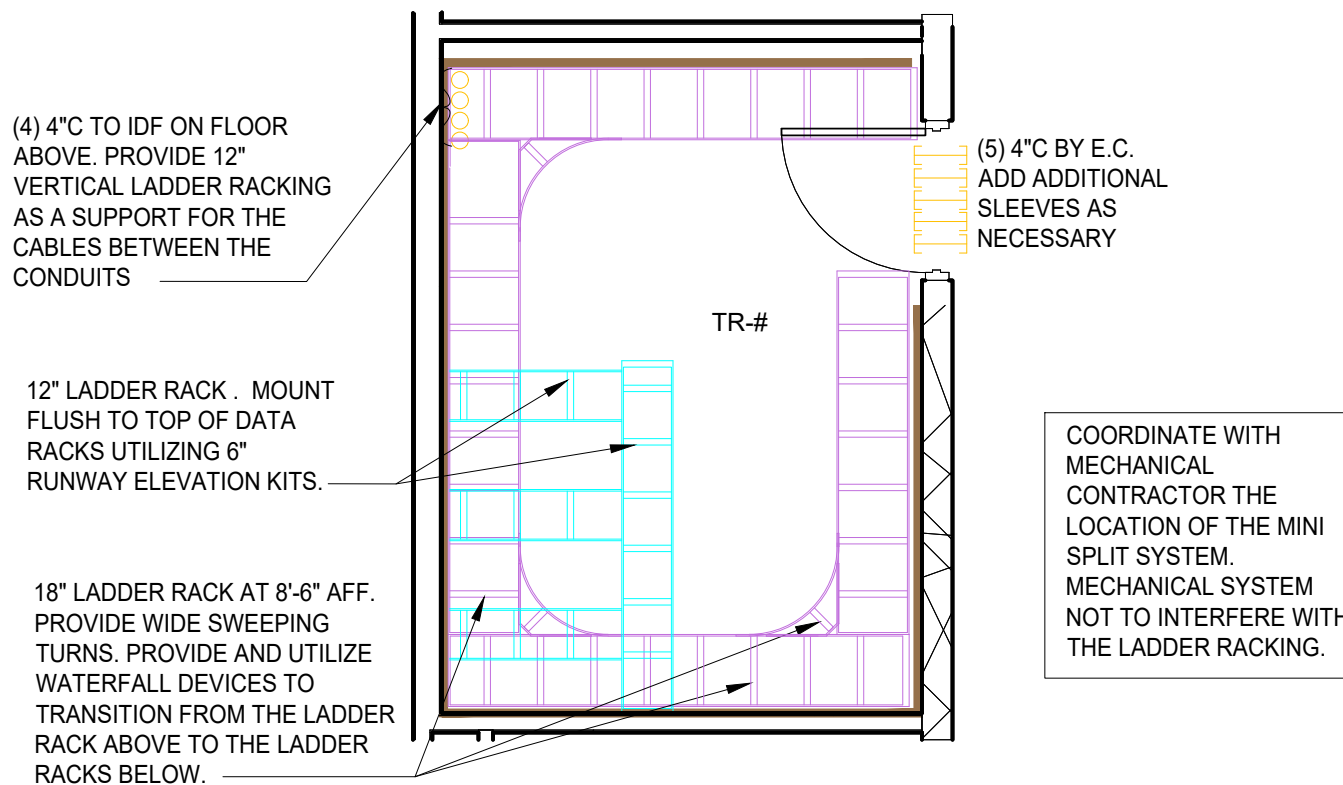
CHECKED BY:

ISSUE DATE:

SCALE: 1/4" = 1'

TELECOM ROOM DETAIL

TR-1



REVISIONS	
DATE	DESCRIPTION

DATE: _____

DRAWN BY: _____

CHECKED BY: _____

ISSUE DATE: _____

SCALE: $\frac{1}{4}" = 1'$

**TELECOM
 ROOM LADDER
 RACK
 DETAIL**

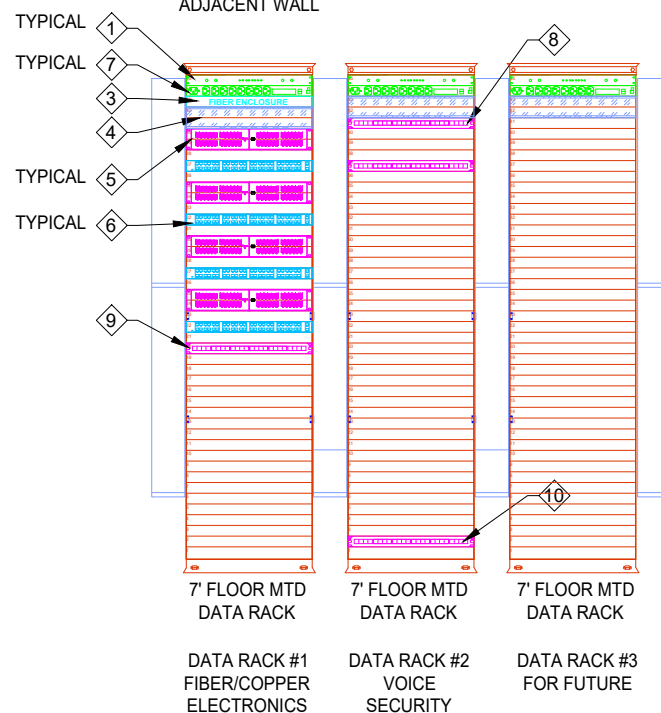
TR-2

GENERAL NOTES:

1. FEED ALL CABLES INTO RACKS FROM ABOVE.
2. LEAVE ONE RACK UNIT SPACE FREE ABOVE AND BELOW EACH PATCH PANEL, WIRE MANAGER AND OWNER PROVIDED NETWORK ELECTRONICS. FILL THESE SPACES WITH BLANK PANELS.
3. DESIGNATED SECURITY RACK WILL ALWAYS BE THE RACK INSTALLED AGAINST OR CLOSEST TO THE ADJACENT WALL

KEYED NOTES:

- 1 HORIZONTAL GROUND BUS BAR, 1 RU. TYPICAL
- 2 NOT USED
- 3 FIBER ENCLOSURE, 1 RU.
- 4 HORIZONTAL WIRE MANAGER, 2 RU. TYPICAL
- 5 48 PORT FLAT PATCH PANEL-DATA, 2 RU. TYPICAL
- 6 NETWORK SWITCH PROVIDED AND INSTALLED BY OWNER, 1 RU. TYPICAL
- 7 POWER STRIP 20A, 1 RU. TO BE INSTALLED 8 RMU (RACK MOUNT UNITS) BELOW LAST PATCH PANEL
- 8 24 PORT FLAT MODULAR PATCH PANEL WITH BLUE JACKS FOR COPPER BACKBONE, 1 RU. TERMINATE TWO (2) CATEGORY 6A CABLES FROM MC TO EACH TR.
- 9 24 PORT FLAT MODULAR PATCH PANEL WITH YELLOW JACKS FOR WIRELESS ACCESS POINTS TERMINATIONS, 1 RU. TYPICAL
- 10 24 PORT FLAT MODULAR PATCH PANEL WITH WHITE JACKS FOR SECURITY TERMINATIONS, 1 RU. TYPICAL



REVISIONS

DATE	DESCRIPTION

DATE:

DRAWN BY:

CHECKED BY:

ISSUE DATE:

SCALE: 3/32" = 1'

**TELECOM
ROOM RACK
DETAIL**

TR-3

SHEET NOTES:

1. 16 AWG GREEN INSULATED COPPER CONDUCTOR WITH 2 HOLE LONG BARREL, IRREVERSIBLE LUGS. TERMINATE TO BUS BARS.
2. FEED ALL CABLES INTO RACK FROM ABOVE.
3. PROVIDE 13 STRAND PLENUM ARMORED SINGLE-MODE FIBER FROM MC TO EACH TR ROOM (WITH EXCEPTION OF THE FIELD HOUSE). TERMINATE IN FIBER ENCLOSURES WITH CASSETTES WITH LC CONNECTORS.
4. LEAVE ONE (1) RACK UNIT (RU) SPACE BETWEEN WIRE MANAGERS, PATCH PANELS, AND THE FUTURE SPACE FOR OWNER SWITCHES.
5. PROVIDE BLANK PANELS IN ALL UNUSED RACK UNITS ABOVE & BELOW EACH PATCH PANEL & OWNER SWITCHES.
6. 12" PRE-DRILLED GROUND BUS BAR BY E.C., MOUNTED AT 8" AFF.
7. PROVIDE 6 STRAND SINGLE-MODE FIBER FROM MC, UNDERGROUND TO FIELD HOUSE ENCLOSURE. TERMINATE WITH CASSETTES WITH LC CONNECTORS.
8. PROVIDE 2 CATEGORY 6A OSP UTP CABLES FROM MC TO FIELD HOUSE. PROVIDE LIGHTNING PROTECTION ON EACH END AND TERMINATE TO MODULAR PATCH PANEL IN THE ENCLOSURE.
9. PROVIDE 2 CATEGORY 6A PLENUM UTP CABLES FROM MC TO EACH TR ROOM (WITH THE EXCEPTION OF THE FIELD HOUSE). TERMINATE TO MODULAR PATCH PANEL, DEDICATED FOR COPPER BACKBONE.

10. VERTICAL WIRE MANAGER. PROVIDE 6" WIDE DOUBLE-SEED ON OUTSIDE OF RACK ROW AND 10" WIDE DOUBLE-SEED IN THE MIDDLE OF THE RACKS.
11. 20A SURGED POWER STRIP. 1 RU.
12. 24 PORT MODULAR PATCH PANEL FOR IP SERVICE USE.
13. (6) 4"X6" BY E.C.
14. HORIZONTAL GROUND BUS BAR RACK MOUNTED. 1 RU.
15. 48 PORT MODULAR PATCH PANEL FOR WIRELESS ACCESS POINTS. 2 RU. POPULATE WITH YELLOW CATEGORY 6 JACKS.
16. FIBER ENCLOSURE, 24-36 PORT CAPACITY. 1 RU. TERMINATE EACH FIBER STRAND TO LC ADAPTER PANELS.
17. HORIZONTAL WIRE MANAGER. 2 RU.
18. 48 PORT CATEGORY 6A PATCH PANEL FOR DATA TERMINATIONS. TERMINATE WITH BLUE JACKS. 3 RU.
19. 48 PORT NETWORK SWITCH BY OWNER. 1 RU.
20. 24 PORT MODULAR PATCH PANEL WITH YELLOW JACKS, FOR WIRELESS ACCESS POINTS. 1 RU.
21. 24" PRE-DRILLED GROUND BUS BAR, BY E.C., MOUNTED AT 8" AFF.

22. 24 PORT MODULAR PATCH PANEL WITH GREEN JACKS FOR COPPER BACKBONE. 1 RU. TERMINATE 2 CATEGORY 6A UTP FEEDERS FROM MC TO EACH TR.
23. NETWORK SERVICE PROVIDER FIBER ENTERS FACILITY. LAND FIBER INTO NETWORK PROVIDER OWNED FIBER DISTRIBUTION PANEL. FDP TO BE MOUNTED IN DATA RACK.
24. FIBER ENCLOSURE, 144 PORT CAPACITY. 4 RU. TERMINATE EACH FIBER STRAND TO LC ADAPTER PANELS.
25. 48 PORT MODULAR PATCH PANEL FOR SECURITY TERMINATIONS. 2 RU. SECURITY CONTRACTOR TO POPULATE WITH GREEN CATEGORY 6A JACKS.

REVISIONS

DATE DESCRIPTION

DATE:

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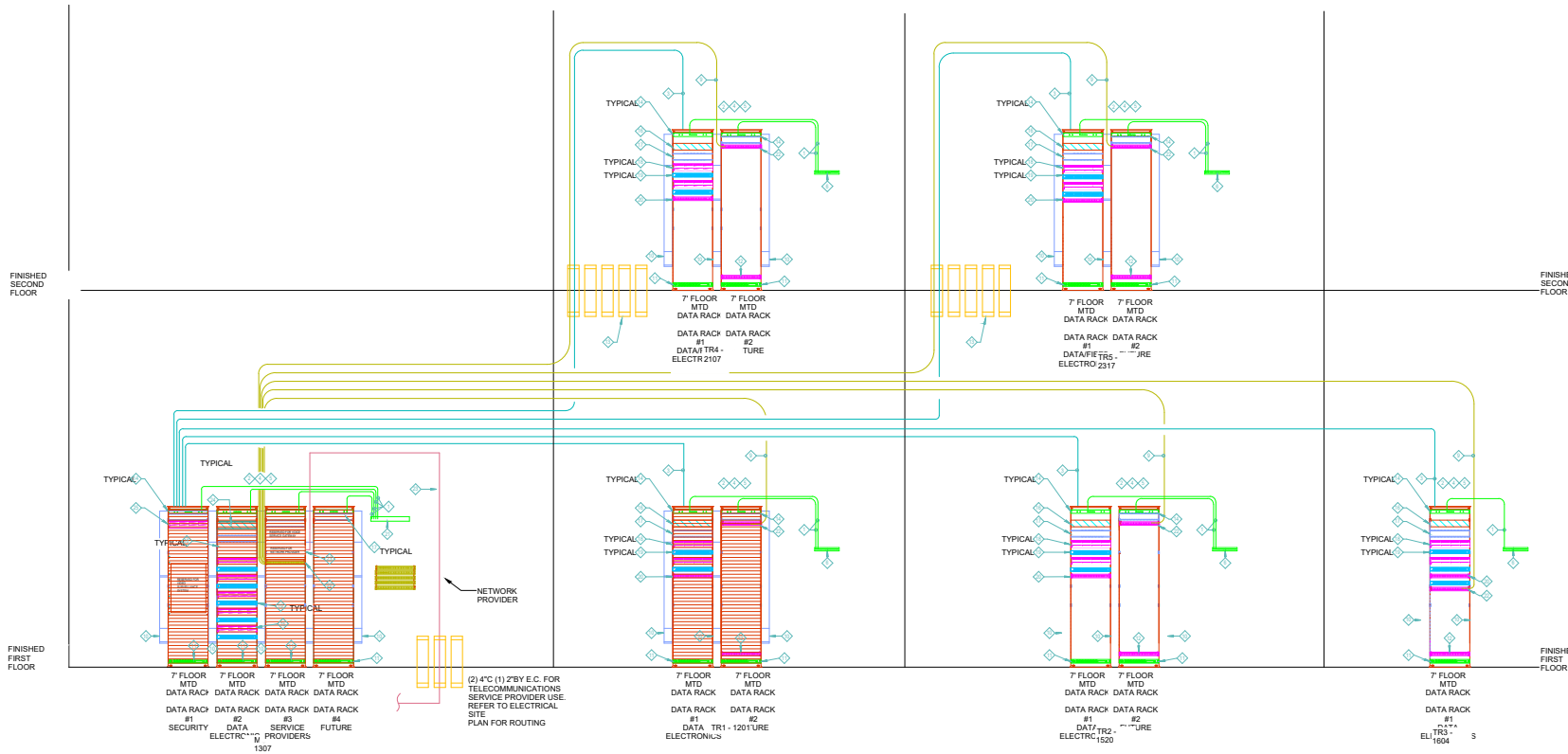
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ISSUE DATE:

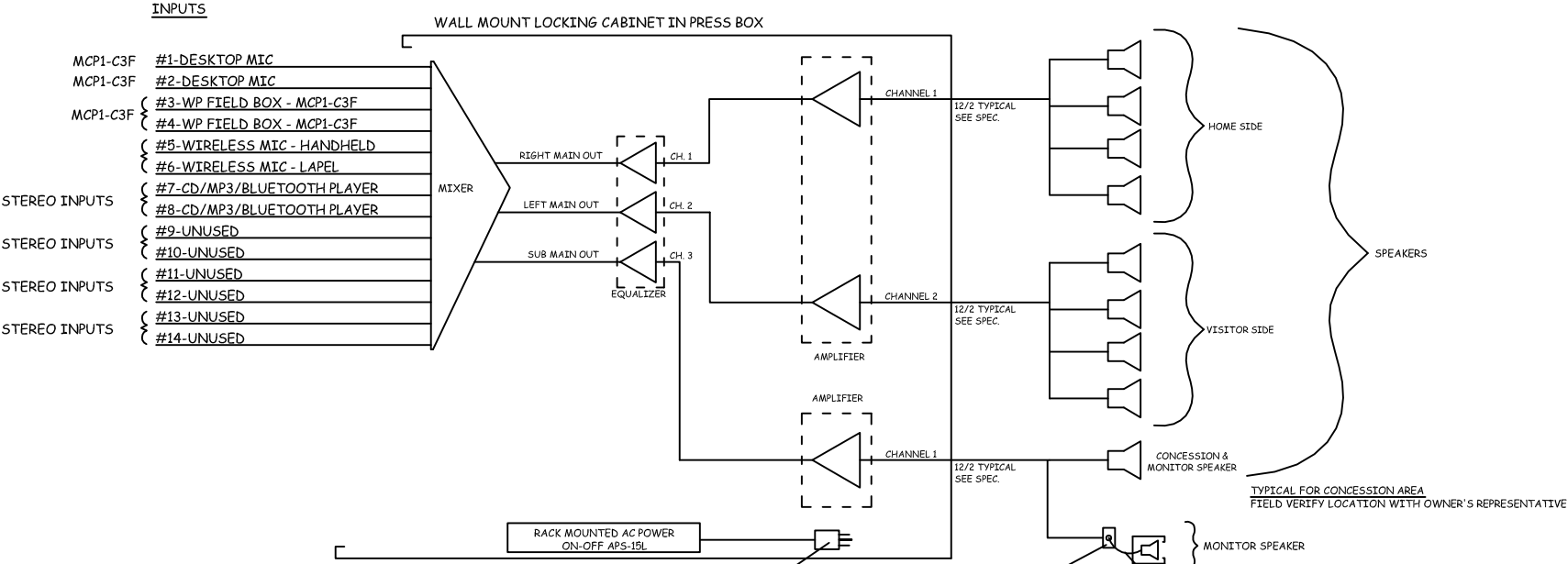
SCALE: 1/32" = 1'

TELECOM
RISER
DIAGRAM

RD-1



GENERAL NOTES



NOTE 1:
ALL MIC CABLE WILL BE WEST PENN AQ-C-375. ALL SPEAKER CABLE WILL BE WEST PENN AQ-C-227

NOTE 2:
TOA, OR EQUAL BY SHURE, WIRELESS MIC RECEIVER IS MOUNTED IN THE TOP SECTION OF THE RACK. THE WIRELESS MIC LAVALIER SYSTEM WILL BE UHF DESIGN - DIVERSITY STYLE WITH ANTENNAS MOUNTED TO THE EXTERIOR OF THE PRESS BOX SOFIT. FAR LEFT AND FAR RIGHT FOR OPTIMUM COVERAGE OF THE ATHLETIC FACILITY.

NOTE 3:
EACH SIDE OF ALL SPEAKER LINES ARE FUSED - 5 AMP 300V

NOTE 4:
MIC OUTLETS MCP1-C3F (LOWELL) SWITCHCRAFT SHALL BE INSTALLED IN SINGLE GANG DEEP WIRE MOLD SURFACE BOX. THE CABLE WILL BE INSTALLED IN A WIRE MOLD #500 RACEWAY SURFACE MOUNTED, INSTALLED COMPLETE TO SOUND CABINET

NOTE 5:
THIS CONTRACTOR WILL PROVIDE 1 EACH HOFFMAN W.P. BOX 12" X 12" X 4" INSTALLED AS DIRECTED BY THE OWNER'S REPRESENTATIVE. THIS BOX SHALL CONTAIN 1 EACH SWITCHCRAFT 1/4" N-111 INSULATED JACK FOR MONITOR SPEAKER AND ONE EACH MCP1-C3F (LOWELL) DUAL MICROPHONE OUTLET.

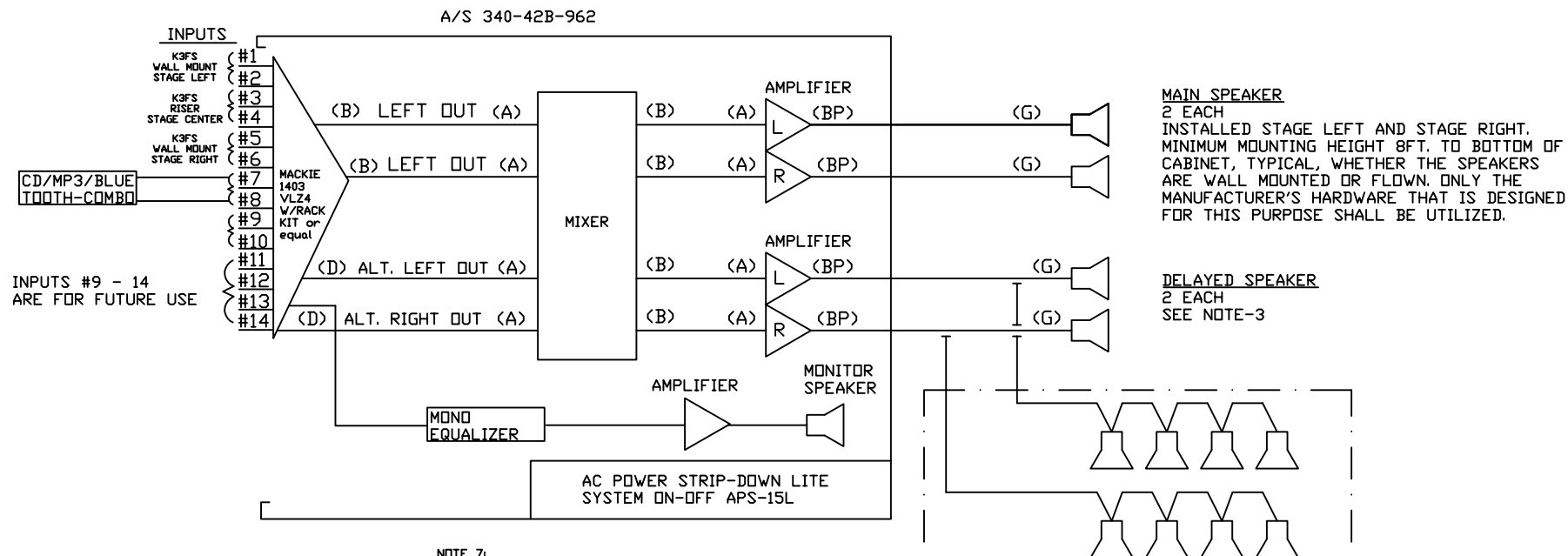
NOTE 6:
RIGHT ANGLE CONNECTORS ARE REQUIRED FOR THE MACKIE 1403VLZ4 MIXER

NOTE 7:
2 EACH - 20A 120VAC DEDICATED CIRCUITS REQUIRED FOR AC POWER

NOTE 8:
8 - 25' GALVANIZED POLES, SET 3' IN CONCRETE. TRENCHING WITH PVC PIPING WILL BE INCLUDED IN PRICING.

NOTE 9:
SEE SPECIFICATION FOR SPECIFIC MIXER, AMPLIFIER, AND SPEAKER MODELS

PROJECT NAME	
CMS	
TYPE SYSTEM	
STADIUM SOUND SYSTEM - TYPICAL 1 OF 2	
REV. 07/05/18	SHEET NO. SSS-1



NOTE 1:
PROVIDE THE FOLLOWING EQUIPMENT:
A - 2 EACH HANDHELD MICROPHONES WITH ON/OFF SWITCH (SHURE SM-58S)
B - 4 EACH 25 FT. XLR (S-J-25) MIC CABLES
C - 2 EACH MICROPHONE FLOOR STANDS (MS12CE) A/S

NOTE 2:
PROVIDE WALL MOUNT LOCKING CABINET A/S 340-42B-962. FILL IN ALL UNUSED SPACES WITH BLANK PANELS, MAKE USE OF VENT PANELS AS REQUIRED.

NOTE 3:
DELAYED SPEAKERS ARE ONLY REQUIRED WHEN THE DISTANCE FROM THE FRONT OF THE STAGE EXCEEDS 60 FT. TO THE BACK WALL OF THE ROOM.

NOTE 4:
SHOULD THE DELAYED SPEAKERS BE REQUIRED TO BE RECESSED CEILING TYPE, INSTALL COMMUNITY D8 W/MOUNTING ACCESSORIES. DO NOT EXCEED 4 EACH SPEAKER ASSEMBLY PER AMPLIFIER CHANNEL (OUTPUT).

NOTE 5:
PART # K3FS IS SWITCHCRAFT DUAL XLR MIC INPUT / SINGLE GANG / STAINLESS STEEL PLATE OUTLET.

NOTE 6:
TDA UHF DIVERSITY TYPE WIRELESS LAVALIER AND HANDHELD MICROPHONE SYSTEM 64 CHANNEL AGILE OR EQUAL BY SHURE.

NOTE 7:
THIS SYSTEM SHALL BE TUNED AND BALANCED BY UTILIZING A FULL AUDIO SPECTRUM PINK NOISE GENERATOR FED THROUGH THE 1403 MACKIE MIXER AT UNITY GAIN. ADJUSTED TO AN OUTPUT REFERENCE OF 90db SOUND PRESSURE LEVEL THROUGHOUT THE LISTENING AREA. UTILIZING A COMPUTER BASED AUDIO ANALYZER (G) SIX RANDOM SOUND PRESSURE LEVEL READINGS ARE TO BE OBTAINED IN LISTENING AREA AT DIFFERENT LOCATIONS, RECORDED AND PRINTED OUT, THEN TURNED OVER TO AN AUTHORIZED REPRESENTATIVE FROM THE CMS-ELECTRONICS DEPT. THIS SYSTEM IS TO BE ADJUSTED SO THAT SOUND SYSTEM'S PROGRAM LEVEL, WHEN MEASURED AS LISTED PREVIOUSLY, WILL REMAIN SMOOTH AND EVEN THROUGHOUT THE LISTENING AREA WITH SOUND PRESSURE OF NOT LESS THAN (+) OR (-) 2db AT ANY LISTENER'S SEAT.

NOTE 8:
GOOD SYSTEM PERFORMANCE IS BASED UPON SPEAKER CABLES AND MICROPHONE CABLES BEING RUN IN TOTALLY SEPERATE RACEWAYS. UNDER NO CIRCUMSTANCES SHOULD THE TWO BE RUN IN THE SAME CONDUIT.

NOTE 9:
SYSTEM REQUIRES (1) ONE 15AMP 120VAC DEDICATED CIRCUITS INSTALLED IN THE BACK PAN OF THE WALL MOUNT CABINET.

NOTE 10:
SEE SPECIFICATION FOR SPECIFIC MIXER, AMPLIFIER, AND SPEAKER MODELS

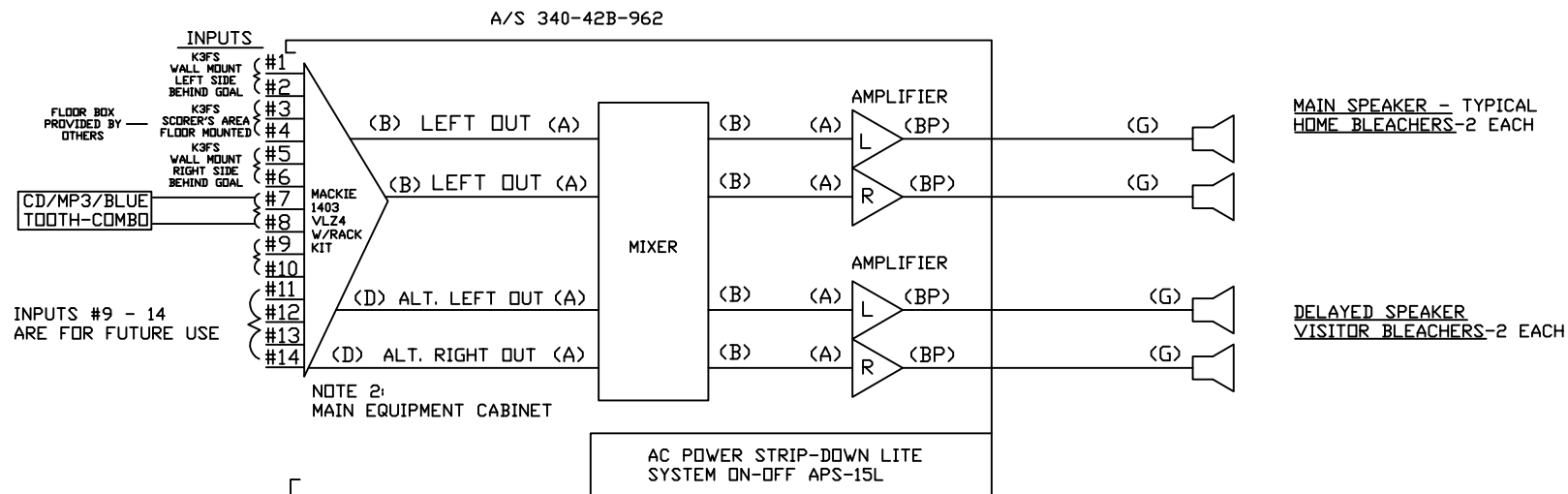
ALTERNATE TO USE DELAYED CEILING SPEAKERS IN LIEU OF WALL MOUNT SPEAKERS. SEE NOTE-3 AND NOTE-4. PROVIDE MATCHING NETWORK AS REQUIRED TO LOAD AMPLIFIER OUTPUT CHANNELS AS TO PROVIDE A PROPER IMPEDANCE LOAD AT ALL TIMES.

CONNECTOR SCHEDULE
ALL PARTS #'S ARE SWITCHCRAFT

TYPE A=A3M
TYPE B=A3F
TYPE C=280
TYPE D=297
TYPE E=L12B
TYPE F=N-111
TYPE G=184L
TYPE H=D3F
TYPE I=D3M
TYPE K=C3M
TYPE L=3502L
TYPE M=3051FP
SC= SCREW TERMINALS
BP= BINDING POST

REVISED - 07/05/18 - GLW

PROJECT NAME	
CMS	
TYPE SYSTEM	
MULTIPURPOSE / DINING ROOM SOUND SYSTEM - TYPICAL	
SYSTEM DRAWN BY:	SHEET NO.
SYSTEM DESIGNED BY:	DATE



CONNECTOR SCHEDULE ALL PARTS #'S ARE SWITCHCRAFT

TYPE A=A3M
TYPE B=A3F
TYPE C=280
TYPE D=297
TYPE E=L12B
TYPE F=N-111
TYPE G=184L
TYPE H=D3F
TYPE I=D3M
TYPE K=C3M
TYPE L=3502L
TYPE M=3051FP
SC= SCREW TERMINALS
BP= BINDING POST

NOTE 8:
WHETHER THE SPEAKERS ARE JOIST MOUNTED OR FLOWN, ONLY THE MANUFACTURER'S HARDWARE THAT IS DESIGNED FOR THIS PURPOSE SHALL BE UTILIZED.

NOTE 9:
SEE SPECIFICATION FOR SPECIFIC MIXER, AMPLIFIER AND SPEAKER MODELS

NOTE 1:
PROVIDE THE FOLLOWING EQUIPMENT:
A - 2 EACH HANDHELD MICROPHONES WITH ON/OFF SWITCH (SHURE SM-58S)
B - 4 EACH 25 FT. XLR (SJ-25) MIC CABLES
C - 2 EACH MICROPHONE FLOOR STANDS (MS12CE) A/S
D - 1 EACH MICROPHONE DESK STAND (DS7E) A/S
E - 1 EACH MICROPHONE, DESK TYPE SHURE #522

NOTE 2:
PROVIDE WALL MOUNT LOCKING CABINET A/S 340-42B-962. FILL IN ALL UNUSED SPACES WITH BLANK PANELS, MAKE USE OF VENT PANELS AS REQUIRED.

NOTE 3:
PART # K3FS IS SWITCHCRAFT DUAL XLR MIC INPUT / SINGLE GANG / STAINLESS STEEL PLATE OUTLET.

NOTE 4:
TDA UHF DIVERSITY TYPE WIRELESS LAVALIER AND HANDHELD MICROPHONE SYSTEM 64 CHANNEL AGILE OR EQUAL BY SHURE.

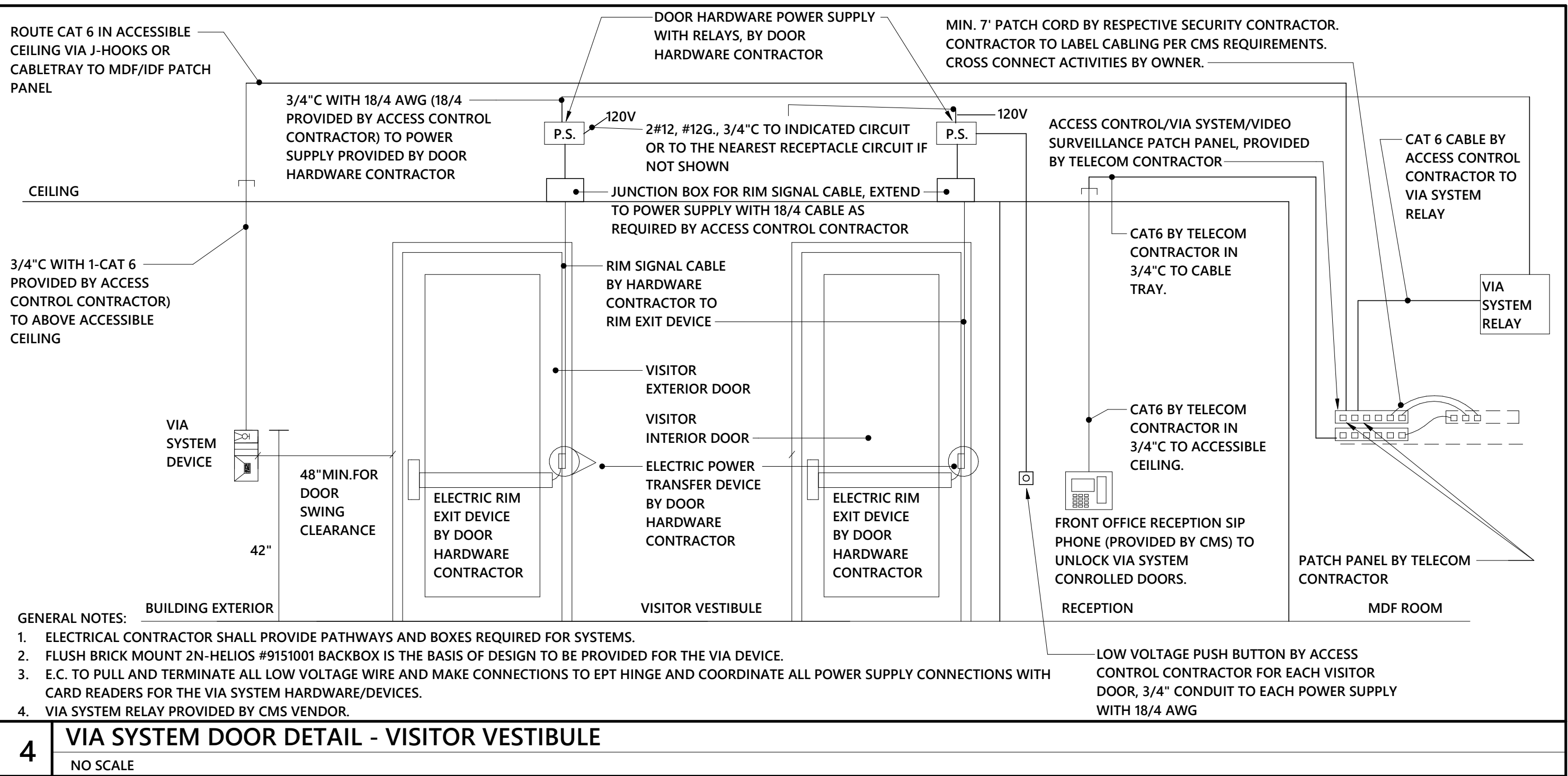
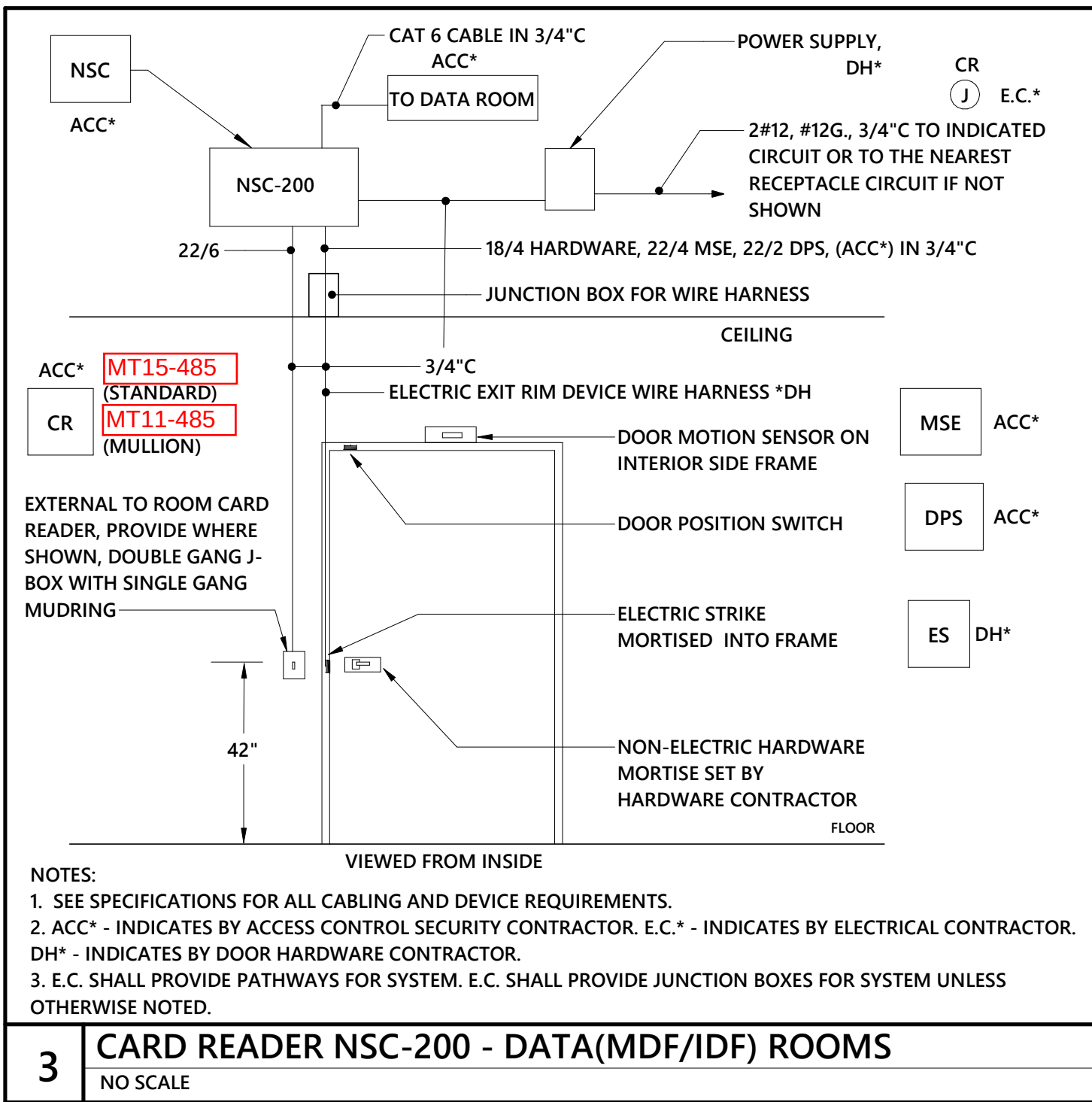
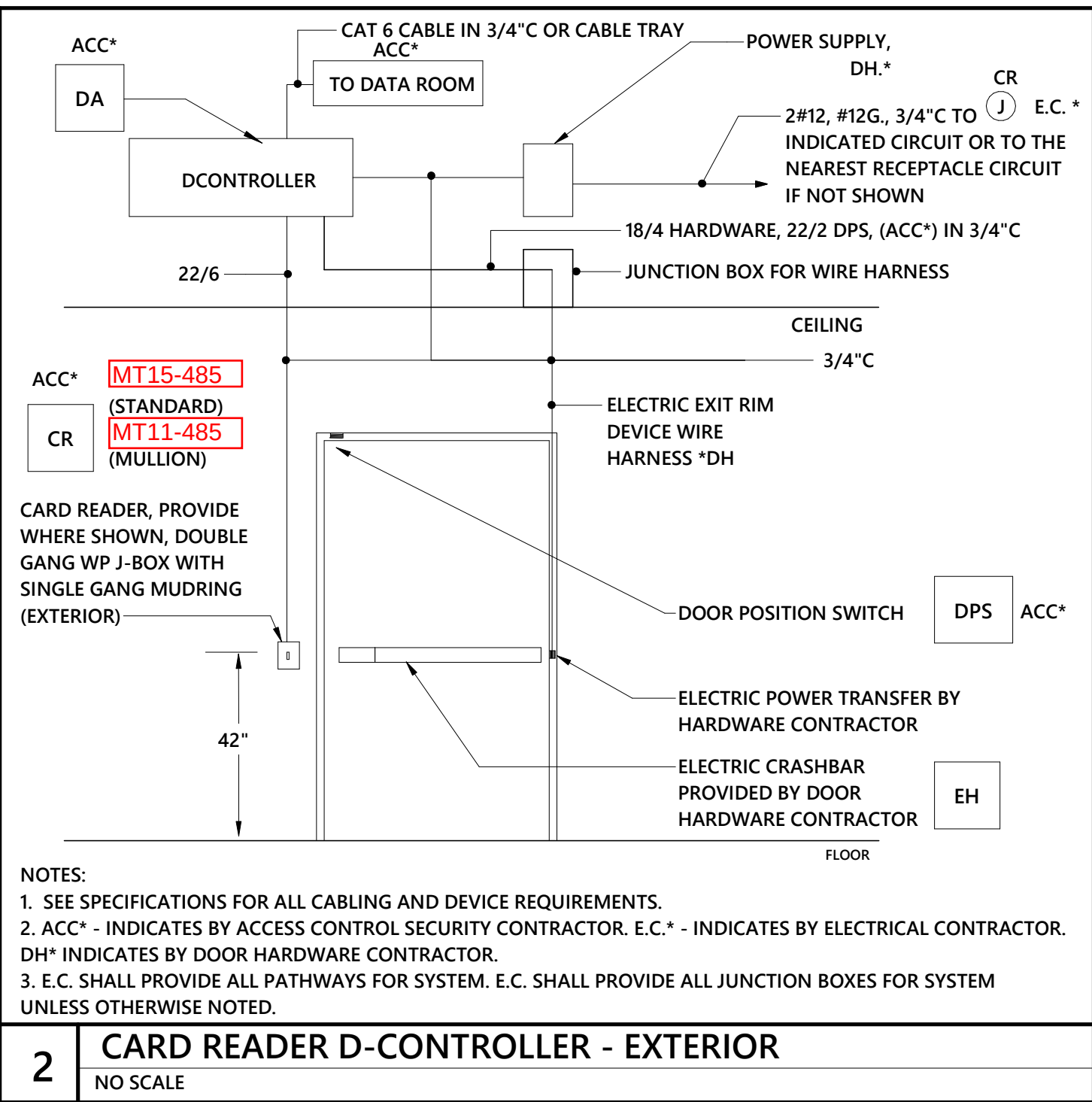
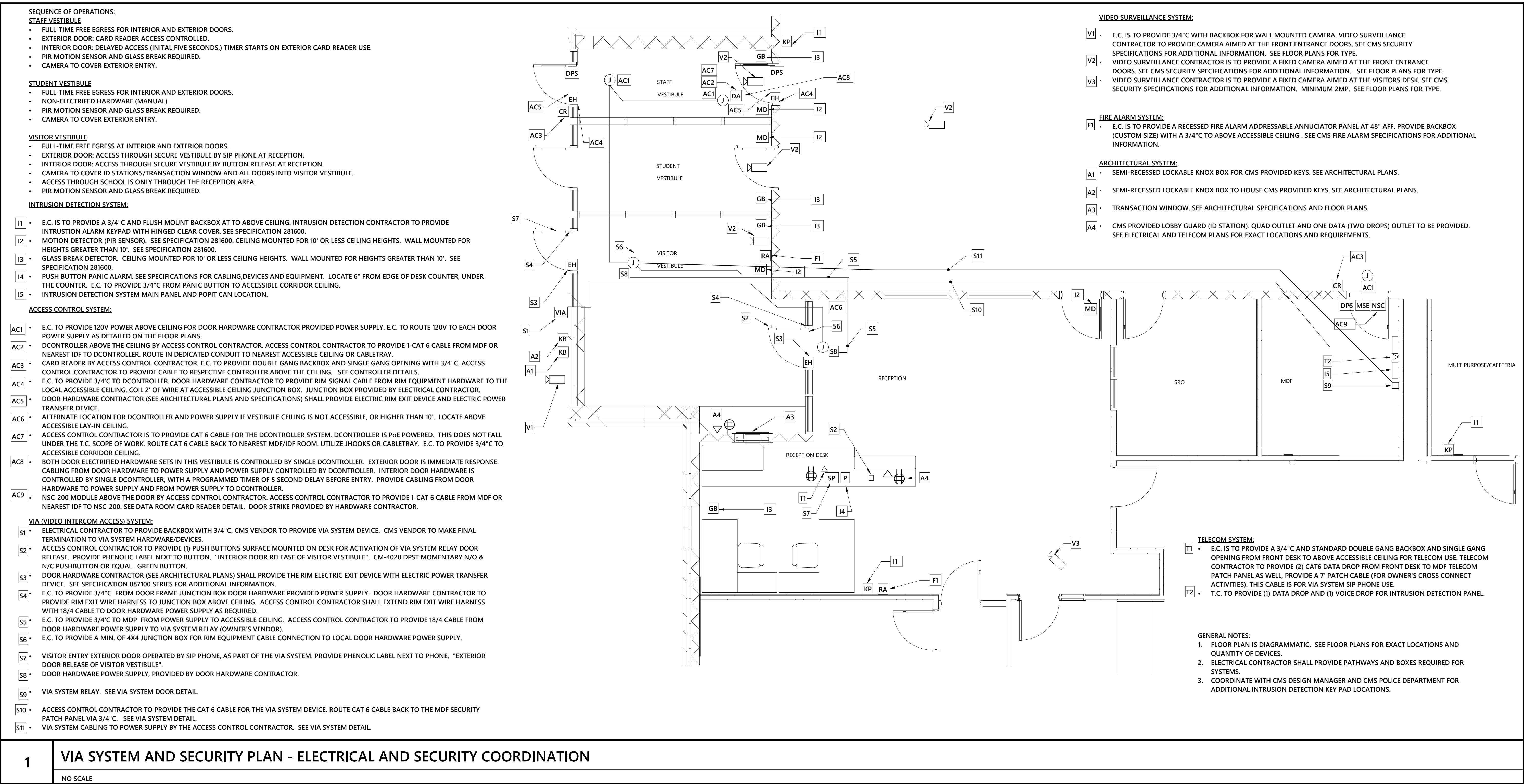
NOTE 5:
THIS SYSTEM SHALL BE TUNED AND BALANCED BY UTILIZING A FULL AUDIO SPECTRUM PINK NOISE GENERATOR FED THROUGH THE 1403 MACKIE MIXER AT UNITY GAIN. ADJUSTED TO AN OUTPUT REFERENCE OF 90db SOUND PRESSURE LEVEL THROUGHOUT THE LISTENING AREA.
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NOTE 6:
MINIMUM CONDUIT SIZE IS 3/4". GOOD SYSTEM PERFORMANCE IS BASED UPON SPEAKER CABLES AND MICROPHONE CABLES BEING RUN IN TOTALLY SEPERATE RACEWAYS. UNDER NO CIRCUMSTANCE SHOULD THE TWO BE RUN IN THE SAME CONDUIT.

NOTE 7:
SYSTEM REQUIRES (1) ONE 15AMP 120VAC DEDICATED CIRCUITS, 2 EACH DUPLEX OUTLETS, INSTALLED IN THE BACK PAN OF THE WALL MOUNT CABINET.

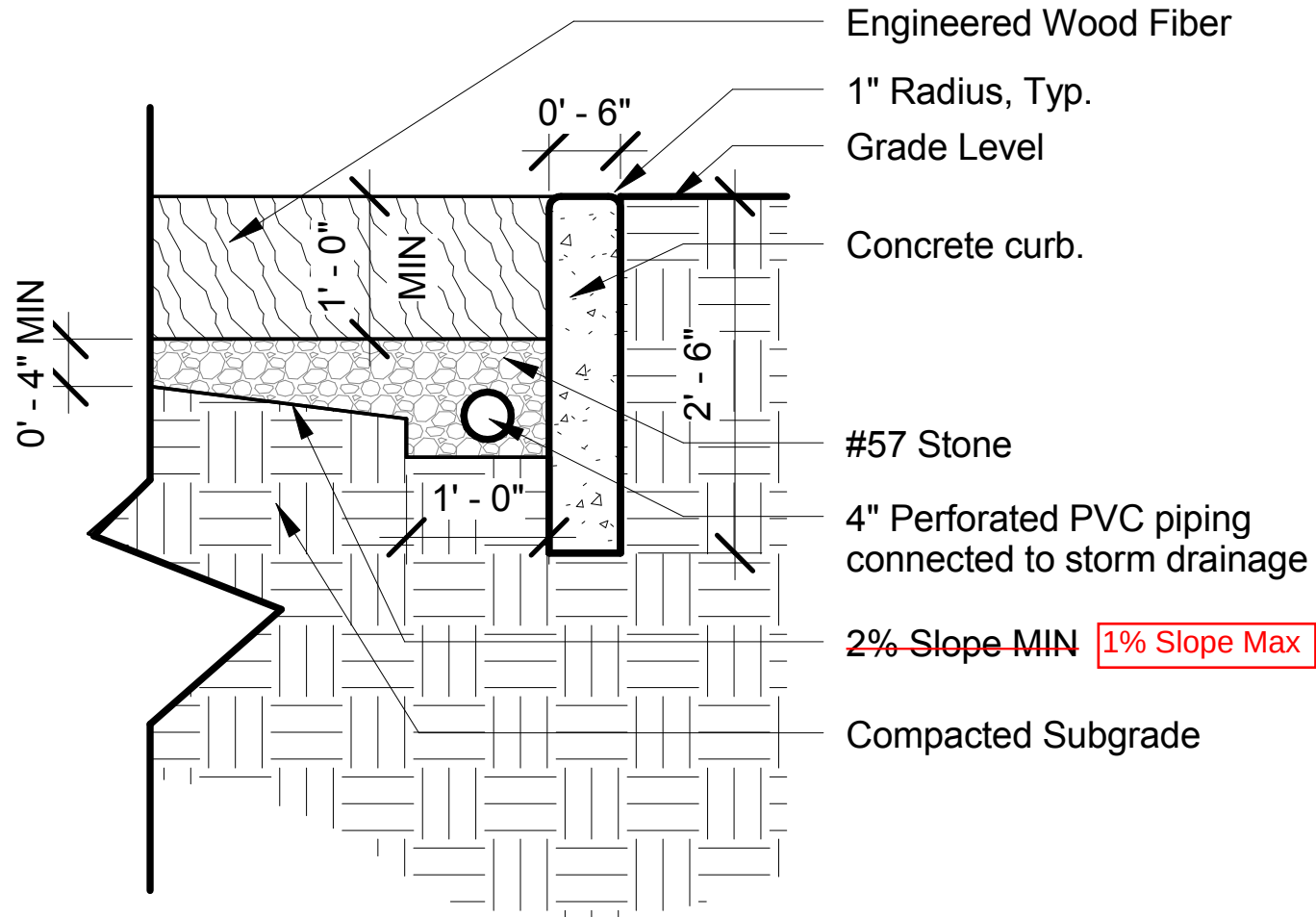
PROJECT NAME		CMS
TYPE SYSTEM		GYMNASIUM SOUND SYSTEM - TYPICAL
SYSTEM DRAWN BY:	SHEET NO.	
SYSTEM DESIGNED BY:	DATE	

REVISED - 7/5/18 - GLW



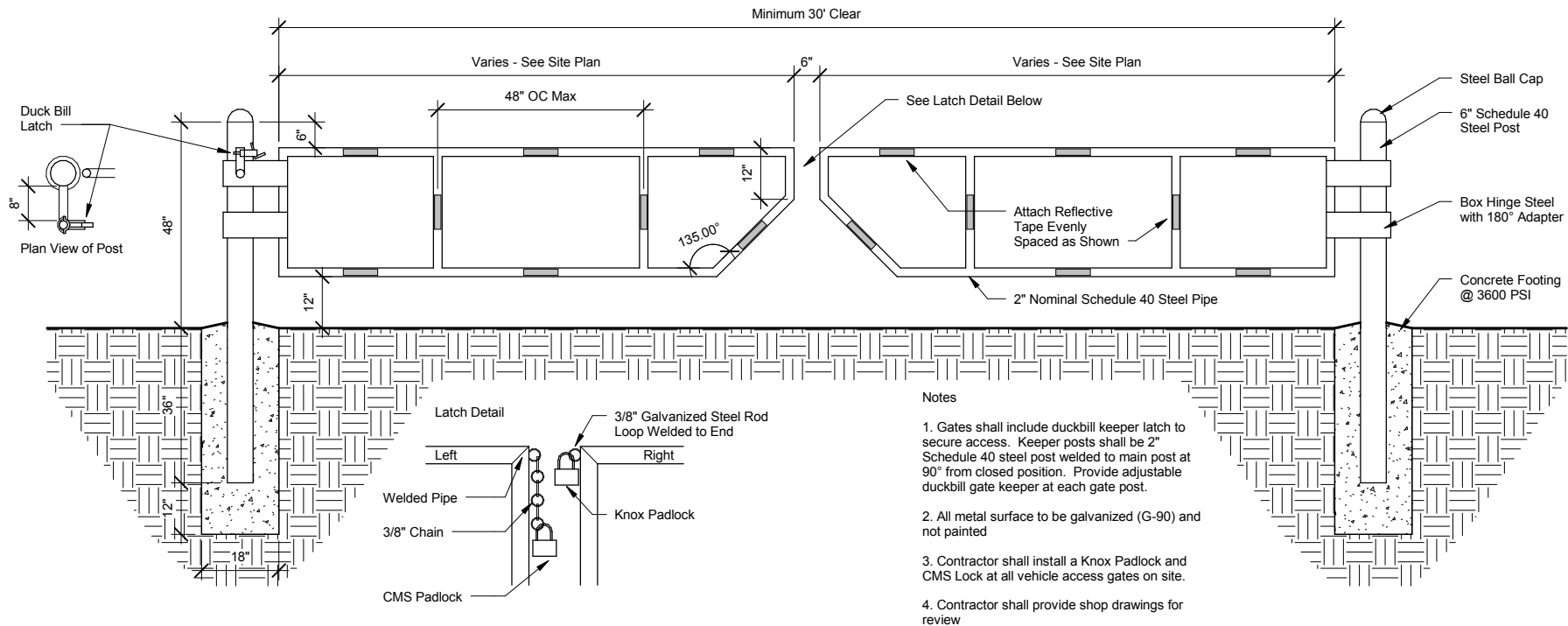
DEVICE ID, CABLING ZONE, READER TYPE, CABLING TYPE, DETAIL, DOOR TAG

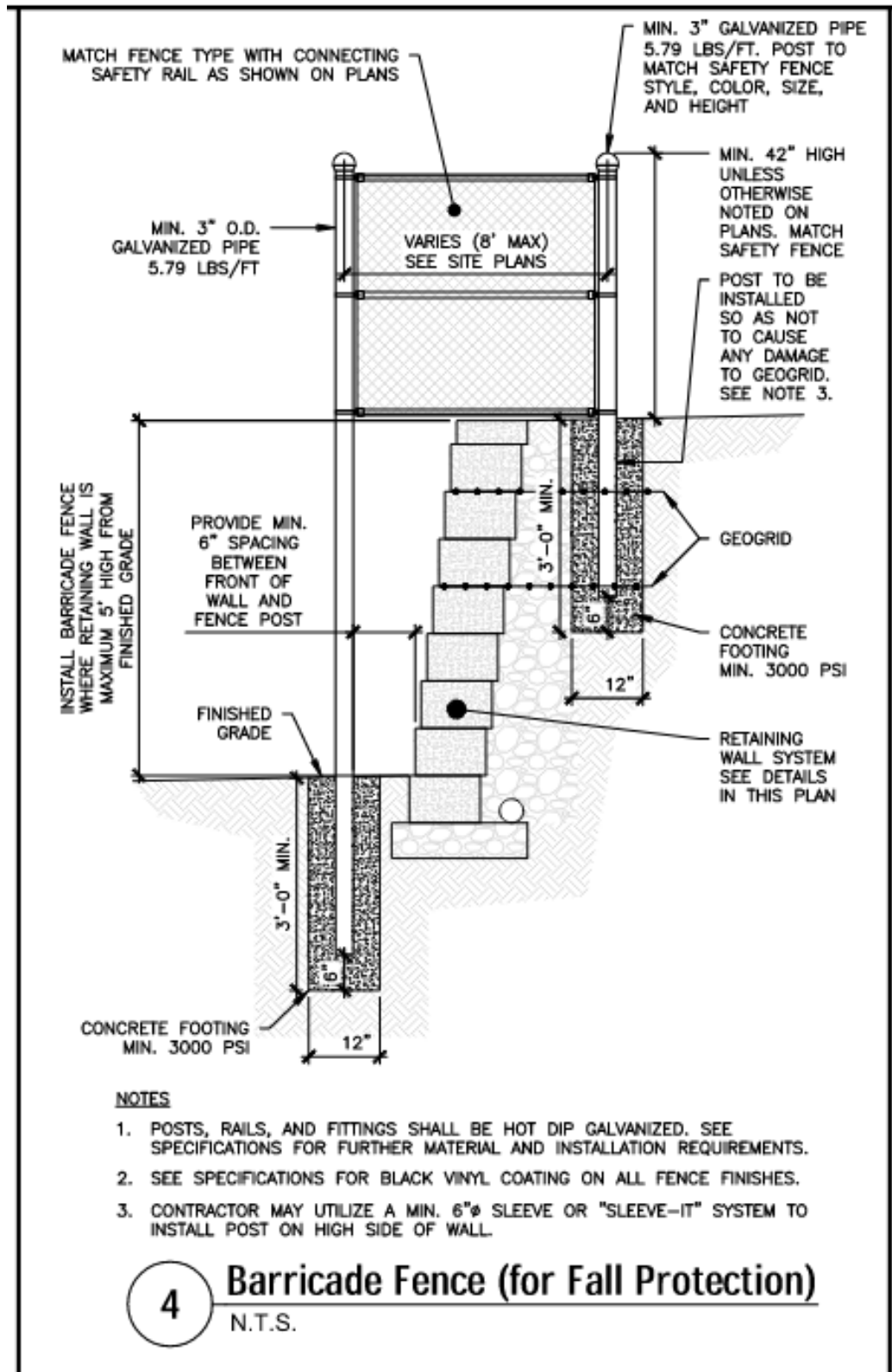
CARD ACCESS SCHEDULE			
DEVICE ID	CABLING ZONE	CAMERA TYPE	DEVICE MOUNT



General Notes

1. Contraction joints shall be spaced at 10' intervals. Contraction joints may be installed by the use of templates or formed by other approved methods. Minimum of 1" depth. Fill contraction joints with joint sealer
2. Expansion Joints shall be spaced at 90' intervals and adjacent to all rigid objects.
3. Concrete shall be at least 3000 PSI.





NOTE: City of Charlotte ordinance requires one recycle bin per each trash bin; verify quantities with AHJ.

