



# Central Falls High School

## 100% Construction Documents

Central Falls, RI  
Ai3 Project #2202.02

### **Addendum #9**

February 6, 2024

The attention of Bidders submitting proposals for Central Falls High School 100% Construction Documents is called to the following changes to the Bidding Contract Documents dated October 13, 2023 as prepared by Ai3 Architects, LLC. The items set forth therein below, whether of revision, omission, addition, substitution or clarification are all to be included as changes to Information to Bidders, the Conditions of the Contract, Specifications and Drawings of the Contract.

**The number of this Addendum (Number 9) must be entered in the appropriate spaces provided on the Bid Form.**

#### **CLARIFICATIONS:**

- ADD 9-001** **Bidder Question:** The stage flooring appears to be specified in two different sections. Finish Carpentry 06 20 00, para 2.2B provides a spec for the stage floor. Spec Section 09 64 53 also provides a spec on the stage flooring system. Spec section 06 20 00 para 2.2b appears to spec a Masonite hardboard sheet. Spec section 09 64 53 has a more complete system outlined. Please confirm we should follow spec 09 64 53. **Response:** Refer to attached specification and drawings for clarification for the stage flooring to be owned under spec section 09 64 53.
- ADD 9-002** **Bidder Question:** Spec Section 099100,2.1,A,5 indicates an Anti-Graffiti Coating not indicated on the exterior elevations of the building. Please clarify where this is required. **Response:** Anti-Graffiti coating to be applied to the exterior finish surface of all exterior ground face CMU.
- ADD 9-003** **Bidder Question:** Spec Section 099100,2.1,A,2 indicates an "Green Screen" Coating not indicated on the

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ADD #9- PAGE 1

exterior elevations of the building. Please clarify where this is required. **Response:** There is no interior or exterior surface requiring this finish.

**ADD 9-004** **Bidder Question:** At Gym, is GWB above Tectum Panels to be painted? If so, please provide specified paint/ finish **Response:** Drywall ceiling is to be painted. Refer to specification section 09 91 23 – INTERIOR PAINTING SCHEDULE for more information.

**ADD 9-005** **Bidder Question:** Is the intent to use an Aliphatic Acrylic Urethane Coating (from HP Spec) for interior steel stair parts (exposed risers, treads, stringers, and railings)? **Response:** Refer to section 09 91 23 for Interior METAL, RAILINGS to be used for all exposed interior metal stair components.

**ADD 9-006** **Bidder Question:** At the Auditorium. 3/A10.68, The exposed structure is indicating a cementitious fireproofing. It does not indicate to paint. Is the intent to fireproof only? Looks to be mostly covered by ceiling clouds/panels. Please advise. **Response:** The ceiling does require painting. Refer to attached specifications for clarification on painting requirements for the Auditorium ceiling above the clouds/panels.

**ADD 9-007** **Bidder Question:** In Addendum #7 there was a note added on Drawing E1.12C in the center of the Gym that says “Provide wireguards over all electrical equipment and devices located in Gymnasium”. The note does not mention light fixtures but the Type LR light fixtures in the gym are 3” wide recessed fixtures with regressed diffusers in rows of 74 & 66. Please specify if this note pertains to the Type LR66 & LR74 fixtures and if it does, please specify which wire guards we are to provide. **Response:** Specified Gymnasium lighting fixtures are recessed with regressed lenses therefore do not require wireguards. Refer to attached drawings.

**ADD 9-008** **Bidder Question:** The Alternate #9 narrative 1/2 found on page 3 of Alternate Section 01 23 00 in the bid documents says to replace a total of 22 sports lighting heads. There are three Notes shown around the track that direct us to replace a total of 13 heads on Drawing ES.01 & another 11 on Drawing ES.02 for a total of 24. Please clarify whether electrical contractor is to carry 22 or 24 or some other value. **Response:** EC to carry total of 24.

**ADD 9-009** **Bidder Question:** Drawings TH13 and TH14 show custom AV plates but no sizes are shown and section read not to scale. Please provide plate information and AV rack elevations as

applicable. **Response:** Plates sizes are to be drawn out as part of the submittal process. Depending on the connector involved or equipment being installed in the plate, sizes can vary and are left to the Installing contractor to determine the actual size required. Plate details on TH13 and 14 provide layout patterns and show connectors required. Box sizes and final plate design are part of the submittal process. Additionally, the Installing Contractor shall submit rack layouts to be approved during the submittal process.

**ADD 9-010** **Bidder Question:** Operable window detail A6.21/7 and Window elevations A6.20D/ SF29.1, SF28.1, SF27.2, SF27.1, SF26.4, SF26.3 conflict with SPEC 084313-44. Details and elevations clearly show a 3-1/4" aluminum frame, however, the BOD shown in SPEC 084313-44 is an EFFCO WV-43 window which is zero-sightline, meaning there is no aluminum frame. If specified BOD is correct, please revise details and elevations to match. If not, please clarify intended operable window. **Response:** The operable window Basis of Design (BOD) is EFECO Series "WV-430".

**ADD 9-011** **Bidder Question:** 2 of the 3 acceptable manufacturers (Kawneer and Old Castle) for the specified "Operable Windows" 084313 are not able to provide glazing that meets the specified seismic design category C requirements and fits the specified dimensions. To meet specified design category C requirements their products have a sash height limitation of 72", a sash width limitation of 36", and a maximum sash square footage limitation of 15 sf, meeting these limitations would require changing the dimensions/aesthetic of the of the sash/frame as they are drawn. We are waiting to hear back from the remaining acceptable manufacturer but it seems likely they will also be unable to provide an operable window as specified. Please advise on how to proceed, or please provide an alternative operable window sized within above mentioned parameters to meet Design Category C glazing. **Response:** To be answered in a subsequent Addendum.

**ADD 9-012** **Bidder Question:** Traffic control – can we shut down the streets to the limits of the LOW? Or do these need to stay open and utilize traffic control to work in the street? **Response:** Any proposed road closures are subject to 'The City' (DPW, Police and Fire) review. If road closures are proposed for construction activities 'The City' will require the selected contractor to submit a plan to 'The City' that allows for emergency personnel access

and minimizes the impact on the street and surrounding community.

- ADD 9-013** **Bidder Question:** L1.22A the shot put pad concrete area is a circle but then on Sheet L3.13 section 3, it indicates the circle to be aluminum and the pad surrounding it to be concrete? Please clarify which configuration is correct. **Response:** The shot put circle and area surrounding it are to be concrete. The aluminum ring is depressed and embedded into the concrete. Refer to specification 11 68 00 for more information. The materials on the attached sheet L1.22A are updated to show correctly - the bid set showed the pad around the circle as bituminous where it should be concrete.
- ADD 9-014** **Bidder Question:** Is a SESC Plan available for location and sizing of temporary stormwater controls? **Response:** The project's SESC Plan is currently under RIDEM review. A draft of the SESC Plan submitted to RIDEM will be provided in a subsequent addendum.
- ADD 9-015** **Bidder Question:** L1.22A - Please provide storage container pad depth/detail **Response:** Concrete pad detail for the storage has been added to C6.5.
- ADD 9-016** **Bidder Question:** L3.03 section 3, concrete bleachers with wall. Please clarify what is intended at 'cont. concrete bleacher' in the shaded area above the concrete bleachers? Is this concrete or something else. **Response:** The section is cut through the middle of the concrete bleachers parallel with the cheek wall (as seen in the plan on sheet L3.03). Because the concrete bleachers angle from the center where the section was cut, the shaded areas represent that angled portion as viewed from the section cut line - therefore we show the continuation of the concrete bleacher as it angles and meets the cheek wall.
- ADD 9-017** **Bidder Question:** L1.21 - Please provide detail for concrete pad for freezer. **Response:** Concrete pad detail for the freezer has been added to C6.5.
- ADD 9-018** **Bidder Question:** L1.21, symbol 32-33-00B (flag pole), are we to assume to use a sonotube or something similar for this since there are only 2 dimensions shown on detail page L3.11 section 6? Or is it supposed to be square? **Response:** Round (sonotube) footing is acceptable. Stamped shop drawings by a licensed structural engineer will be a required submittal (32 33 00 Section 1.5 F).

- ADD 9-019** **Bidder Question:** L1.21B question is similar to previous question. Is the shade structure footings circle or square? **Response:** Round (sonotube) footing is acceptable. Stamped shop drawings by a licensed structural engineer will be a required submittal (32 33 00 Section 1.5 F).
- ADD 9-020** **Bidder Question:** L1.21C - Please provide detail for farm freight pad **Response:** Concrete pad detail for the freight farm has been added to C6.5.
- ADD 9-021** **Bidder Question:** L1.41, symbol 32-32F (landscape curb) not shown on page. It is shown however on page L3.05 details 5,6,7 atop the walls? Are we to assume that this is just the top of the wall revealing on the sidewalk? If yes, is the grading plan shown on C3.0 accurate for top of wall/ bottom of wall. **Response:** Walls J, K, & L are shown in elevation on sheet L3.05 - the construction detail for the type of wall they are corresponds to Detail 12 on L3.01. They are named individually for layout and the elevations, but they are to be constructed as Landscape Curb which is why that reference note appears on L1.41.
- ADD 9-022** **Bidder Question:** Asphalt Sections - Civil pavement drawings & Landscape pavement drawings conflict, please clarify which is correct. **Response:** Civil plans take precedent over LA plans for asphalt sections. Refer to Sheet L3.12 for bituminous paving for basketball courts.
- ADD 9-023** **Bidder Question:** Detail 3 on L3.13 shows "subgrade under track and field shall be deep dynamically densified" – looks like this applies to the javelin alternate – please confirm. **Response:** The Detail with that note is Detail 2 on sheet L3.13. The note 'SUBGRADE UNDER TRACK AND FIELD SHALL BE DEEP DYNAMICALLY DENSIFIED' can be omitted as it is intended for use in unstable subgrade conditions - considering this project will have a cap and new soils, it is unnecessary. Refer to attached drawings.
- ADD 9-024** **Bidder Question:** Landscape drawings sectional detail for concrete paving (sidewalks are called out as that on hardscape drawings). Civil also provides a sidewalk detail that does not match the landscape drawings – which one is correct? **Response:** LA Plans will take precedent over Civil for concrete sidewalks; refer to Civil Plans for concrete pads.
- ADD 9-025** **Bidder Question:** Can existing asphalt be reclaimed and reused on-site as subbase gravel? **Response:** To be answered in a subsequent Addendum.

- ADD 9-026** **Bidder Question:** Per the RAWP, there is some proposed capping outside the LOW shown on the drawing, mostly on the northeastern side of the track. Can you confirm that is intended to be part of the base scope? **Response:** The RAWP Proposed Capping Plan provides an approximate location of proposed capping requirements. The Civil and Landscape Plans indicate additional area beyond that shown on the RAWP Capping Plan which shall be capped in accordance with the capping methods described in the RAWP. This discrepancy is generally noted between the existing ballfield and the eastern property line. The Scope of Work shall include capping to the extents shown in the Civil and Landscape Plans.
- ADD 9-027** **Bidder Question:** Exterior stair railings and retaining wall guardrails indicate galvanized. Is the intent to leave these galvanized, or are they to be painted? If so, is the intent to use specified Aliphatic Acrylic Polyurethane from Section 099600. **Response:** All exterior railings and guardrails are to be left as galvanized with no paint.
- ADD 9-028** **Bidder Question:** The Geotech Report provided in the documents determined that the existing soils are unsuitable for supporting foundations with existing fill, peat and organic soils extending deeper than 20 ft. This report suggests the existing soils to be improved through ground improvements (aggregate piers and/or rigid inclusions). Addendum #6 issued a specification for Ground Improvements as well as a revised Earthwork Section. Earthwork 31 00 00/3.1/B.1 calls for the removal of all unsuitable materials up to the depths shown in the geo tech report as part of the base bid and states it will not be considered an unanticipated soil condition. Please confirm that the contractor is not required to remove all unsuitable materials to the depths shown in the Geotech and the existing soils are to be improved via ground improvements. Additionally, para 3.3/A also calls for removal of all “surficial organic soil” within the prosed building footprint Please confirm the GC will not be required to remove organic soils within the building footprint up to depths shown in the Geotech Report. **Response:** To be answered in a subsequent Addendum.
- ADD 9-029** **Bidder Question:** Addendum #6 Earthwork section 31 00 00 para 1.23 calls for a 1'-0" strip over the existing site. This section goes on to then call for a registered land surveyor to perform an unsuitable soils survey in 20' grid increments at the bottom of this 1' strip and goes on to call for removal of unsuitable soils as

*shown in the contract documents or as directed in field by Geotech Engineer. The Geotech report calls for the existing unsuitable soils to be improved via ground improvements, please confirm that the 20' grid survey for unsuitable and the removal of such unsuitable material is not required and existing soils are to be improved via ground improvements.*

**Response:** *To be answered in a subsequent Addendum.*

**ADD 9-030** **Bidder Question:** *Addendum #6 Earthwork section 31 00 00 para 1.2A.4 calls for pre-trenching to remove obstructions prior to the start of ground improvements. Please provide more detail as to the extents of this pre-trenching. **Response:** To be answered in a subsequent Addendum.*

**ADD 9-031** **Bidder Question:** *Addendum 6 issued a new Earthwork section and Unit Price Form. There is conflicting information between the two as to the quantity required to be carried in the Rock Allowance. Unit Price Form calls for 100 cy of Excavation of Open Rock Removal, Earthwork Section 3.8/D calls for 20 cy of open rock removal and 20 cy of trench rock removal. Please clarify. **Response:** To be answered in a subsequent Addendum.*

**ADD 9-032** **Bidder Question:** *Would the following information be able to be provided? In order to verify that settlement will meet the required performance criteria for the project the actual service loading information will be required. Unfortunately we cannot simply utilize the footing size multiplied by the design bearing pressure. Utilizing only the bearing pressure would not be accurate with respect to the actual sustained service loading seen by the footing. That sustained service loading is what is required for settlement evaluation and the accuracy of that information is critical when settlement tolerances are measured in tenths of an inch. Without a breakdown of the actual service loads settlement estimates will be inaccurate and we would not be able to properly evaluate differential settlement which is a critical design component.*

*1.) At column locations, final column service (unfactored) base plate loads (in kips).*

*2.) A breakdown of the column service base plate loads (dead, live, and transient loads).*

*3.) Along walls, final wall footings service loads (in klf) at the top of the footing.*

*4.) Bearing pressure distributions where loads under footings are not uniform. These could include mat foundations, retaining walls, and connected column footings with multiple*

column loads.

**Response:** Foundation analysis reports for sustained load will be released in Addendum #10. However, the ground improvements design shall be based on 3ksf (3ksf multiplied by the footing area) as indicated on S0.01.

**ADD 9-033** **Bidder Question:** Spray-On Sound Absorption (SSA) is listed on Abbreviations/ Finish Legend (A7.01) is not indicated anywhere in Finish Schedule, please indicate if/where Spray Sound Absorption is required. **Response:** There is no scope of Spray-on Sound Absorption in the project. Refer to the attached specification revisions.

**ADD 9-034** **Bidder Question:** For the NBC combined system work – can you provide the average and maximum daily flow? Can you provide more of a system-wide site plan of the existing NBC system? Looking for upstream and downstream manholes for bypass work. **Response:** To be answered in a subsequent Addendum.

#### **SPECIFICATIONS:**

**ADD 9-035** SECTION 26 00 00 “Electrical”, Article 2.16, Paragraph C; Replace with the following:  
Furnish complete, install and leave in good running condition a 500 KW diesel fueled engine driven generating set continuously rated for standby service. The KW rating shall be continuously available during any power outage. The unit shall be as hereinafter described and as shown on the Drawings, complete with all controls, attachments, accessories, fuel and exhaust systems.

**ADD 9-036** SECTION 26 00 00 “Electrical”, Article 2.16, Paragraph I, subparagraph 1; Replace with the following:  
Rating - 500 KW, 625 KVA, 0.8 P.F., 3 phase, 60 cycle, 480/277 volts

**ADD 9-037** Document 00 01 10 “Table of Contents”; REMOVE in entirety and REPLACE with new Document 00 01 10, dated February 6, 2024, Addendum #9.

**ADD 9-038** Section 06 20 00 “Finish Carpentry”; Article 2.2, REMOVE Paragraph B “Stage Flooring” in entirety. Clarification: Refer to Section 09 64 53 “Resilient Wood Flooring Assemblies” for stage flooring details.

**ADD 9-039** REMOVE Section 07 21 29 “Spray-On Sound Absorption” in entirety; scope of section not in Project.



- ADD 9-040** Section 08 43 15 "Bullet-Resistant Aluminum Storefront Framing System"; REMOVE in entirety and REPLACE with new Section 08 43 15, dated February 6, 2024, Addendum #9.
- ADD 9-041** Section 08 80 00 "Glazing"; REMOVE in entirety and REPLACE with new Section 08 80 00, dated February 6, 2024, Addendum #9.
- ADD 9-042** Section 09 64 53 "Resilient Wood Flooring Assemblies"; Article 2.1; DELETE Paragraph A and REPLACE with the following:
- A. Stage flooring: Double (service) tempered hardboard fabricated from inter-felted lingo-cellulosic fibers consolidated under heat and pressure complying with ANSI A135.4, minimum ¼ inch thick fabricated in sheets 4 feet by 4 feet factory primed and finished.
    - 1. Provide products complying with the following minimum characteristics:
      - a. Density: 58 lbs./ft<sup>3</sup> when testing in accordance with ASTM D1037.
      - b. Modulus of rupture: 5,000 lbs./in<sup>2</sup> when testing in accordance with ASTM D1037.
      - c. Water absorption: 28 percent when testing in accordance with ASTM D1037.
    - 2. Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      - a. Georgia Pacific Building Products, Atlanta, GA.
      - b. Decorative Panels International, Toledo, OH.
      - c. Stagem, Mississauga, Ontario, Canada.
    - 3. Vapor retarder: 6 mil thick black polyethylene sheeting and 2 inch wide waterproof sealing tape for joints.
- ADD 9-043** Section 09 91 00 "Painting"; Article 1.1, Paragraph B; ADD the following subparagraph 14:
- 14. At Auditorium and where designated: Dry-fall painting of overhead metal decking, exposed to view joists, overhead steel, sprinkler piping, conduits, ducts and similar items, including spray-on fireproofing.
- ADD 9-044** Document 09 91 23 "Interior Painting Schedule", Article 1.3; ADD new Paragraph C as follows:
- C. Interior underside of Metal decking, exposed to view joists, overhead steel, sprinkler piping, conduits, ducts and similar items:
    - 1. Two coats waterborne acrylic dry fall finish:
      - a. California: "Economy Latex Dry Fall Spray Flat", N°. 3701.
      - b. Moore: "Coronado Late Dry Fall Flat N110.
      - c. PPG: "Speedhide Latex Dry Fog Spray Paint", 6-714/715 Series.
      - d. Sherwin-Williams: "Pro Industrial Waterborne Acrylic Dryfall, Flat", B42 Series.

**DRAWINGS:**

ADD 9-045	C6.5 – SITE DETAILS
ADD 9-046	L1.22A – HARDSCAPE PLAN ALTERNATE 6
ADD 9-047	L3.01 – DETAILS
ADD 9-048	L3.13 – DETAILS
ADD 9-049	A0.02 – MASTER KEYNOTE LIST
ADD 9-050	A0.33 – THIRD FLOOR SLAB CONTROL PLAN – ZONE C
ADD 9-051	A4.36 – WALL SECTIONS
ADD 9-052	A5.51 – EXPANSION JOINT DETAILS
ADD 9-053	A10.61 – AUDITORIUM ENLARGED PLAN
ADD 9-054	10.66 – AUDITORIUM DETAILS
ADD 9-055	10.71 – AUDITORIUM STAIR & GUARDRAIL DETAILS
ADD 9-056	S0.21 – TYPICAL DETAILS – 1
ADD 9-057	S0.22 – TYPICAL DETAILS – 2
ADD 9-058	S1.22 – SECOND FLOOR FRAMING PLAN – ZONE B
ADD 9-059	S1.33 – THIRD FLOOR FRAMING PLAN – ZONE C
ADD 9-060	S3.12 – STEEL SECTIONS AND DETAILS – 3
ADD 9-061	FP1.11C – FIRE PROTECTION FIRST FLOOR PLAN – ZONE C
ADD 9-062	FP1.12C – FIRE PROTECTION SECOND FLOOR PLAN – ZONE C
ADD 9-063	FP1.13C – FIRE PROTECTION THIRD FLOOR PLAN – ZONE C
ADD 9-064	FP1.14C – FIRE PROTECTION FOURTH FLOOR PLAN – ZONE C
ADD 9-065	ES.05 – ELECTRICAL SITE DETAILS
ADD 9-066	E1.11A – ELECTRICAL FIRST FLOOR LIGHTING PLAN – ZONE A
ADD 9-067	E1.11C – ELECTRICAL FIRST FLOOR LIGHTING PLAN – ZONE C
ADD 9-068	E1.13C – ELECTRICAL THIRD FLOOR LIGHTING PLAN – ZONE C
ADD 9-069	E2.11C – ELECTRICAL FIRST FLOOR POWER PLAN – ZONE C
ADD 9-070	E2.12B – ELECTRICAL SECOND FLOOR POWER PLAN – ZONE B
ADD 9-071	E2.12C – ELECTRICAL SECOND FLOOR POWER PLAN – ZONE C
ADD 9-072	E2.13C – ELECTRICAL THIRD FLOOR POWER PLAN – ZONE C
ADD 9-073	E2.15C – ELECTRICAL ROOF POWER PLAN – ZONE C
ADD 9-074	E3.02 – ELECTRICAL KITCHEN PART PLAN
ADD 9-075	E4.01 – ELECTRICAL POWER RISER DIAGRAM
ADD 9-076	E5.01 – ELECTRICAL LIGHTING FIXTURE SCHEDULE

<a href="#">ADD 9-077</a>	<i>E5.02 – ELECTRICAL SCHEDULES</i>
<a href="#">ADD 9-078</a>	<i>E5.06 – ELECTRICAL PANEL SCHEDULES</i>
<a href="#">ADD 9-079</a>	<i>E5.07 – ELECTRICAL PANEL SCHEDULES</i>
<a href="#">ADD 9-080</a>	<i>E5.08 – ELECTRICAL PANEL SCHEDULES</i>
<a href="#">ADD 9-081</a>	<i>E5.10 – ELECTRICAL PANEL SCHEDULES</i>
<a href="#">ADD 9-082</a>	<i>EF3.11A – ELECTRICAL FIRST FLOOR FIRE ALARM PLAN – ZONE A</i>
<a href="#">ADD 9-083</a>	<i>EF3.11C – ELECTRICAL FIRST FLOOR FIRE ALARM PLAN – ZONE C</i>
<a href="#">ADD 9-084</a>	<i>EF3.13A – ELECTRICAL THIRD FLOOR FIRE ALARM PLAN – ZONE A</i>
<a href="#">ADD 9-085</a>	<i>EF3.13C – ELECTRICAL THIRD FLOOR FIRE ALARM PLAN – ZONE C</i>
<a href="#">ADD 9-086</a>	<i>EF3.14B – ELECTRICAL FOURTH FLOOR FIRE ALARM PLAN – ZONE B</i>
<a href="#">ADD 9-087</a>	<i>EF3.15C – ELECTRICAL ROOF FIRE ALARM PLAN – ZONE C</i>

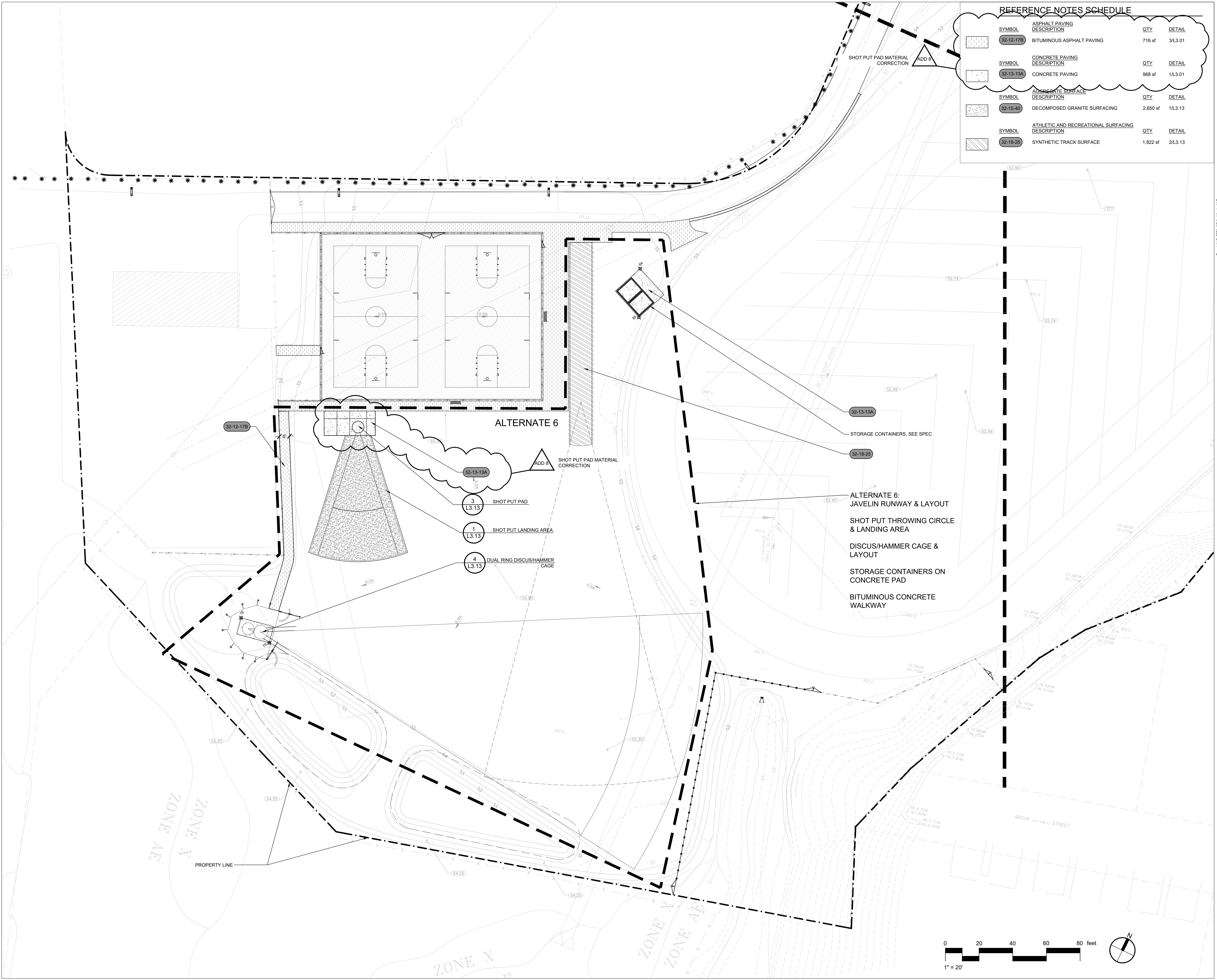
**ATTACHMENTS:**

<a href="#">ADD 9-088</a>	<i>SECTION 00 01 10 – TABLE OF CONTENTS</i>
<a href="#">ADD 9-089</a>	<i>SECTION 08 43 15 – BULLET RESISTANT ALUMINUM STOREFRONT FRAMING SYSTEM</i>
<a href="#">ADD 9-090</a>	<i>SECTION 08 80 00 – GLAZING</i>



REFERENCE NOTES SCHEDULE

SYMBOL	ASPHALT PAVING DESCRIPTION	QTY	DETAIL
	32-12-17B BITUMINOUS ASPHALT PAVING	716 sf	3/L3.01
SYMBOL	CONCRETE PAVING DESCRIPTION	QTY	DETAIL
	32-13-13A CONCRETE PAVING	968 sf	1/L3.01
SYMBOL	ADDITIONAL SURFACE DESCRIPTION	QTY	DETAIL
	32-15-40 DECOMPOSED GRANITE SURFACING	2,650 sf	1/L3.13
SYMBOL	ATHLETIC AND RECREATIONAL SURFACING DESCRIPTION	QTY	DETAIL
	32-18-25 SYNTHETIC TRACK SURFACE	1,822 sf	2/L3.13



LOGO.jpg

CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

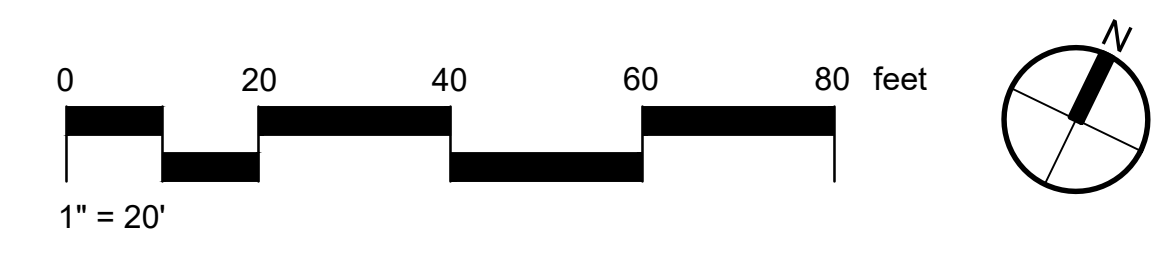
ADD 8	01/30/2024
ADD 7	01/26/2024
<b>100% CONSTRUCTION DOCUMENTS</b>	
KEY PLAN NORTH ARROW	
KEYPLAN	

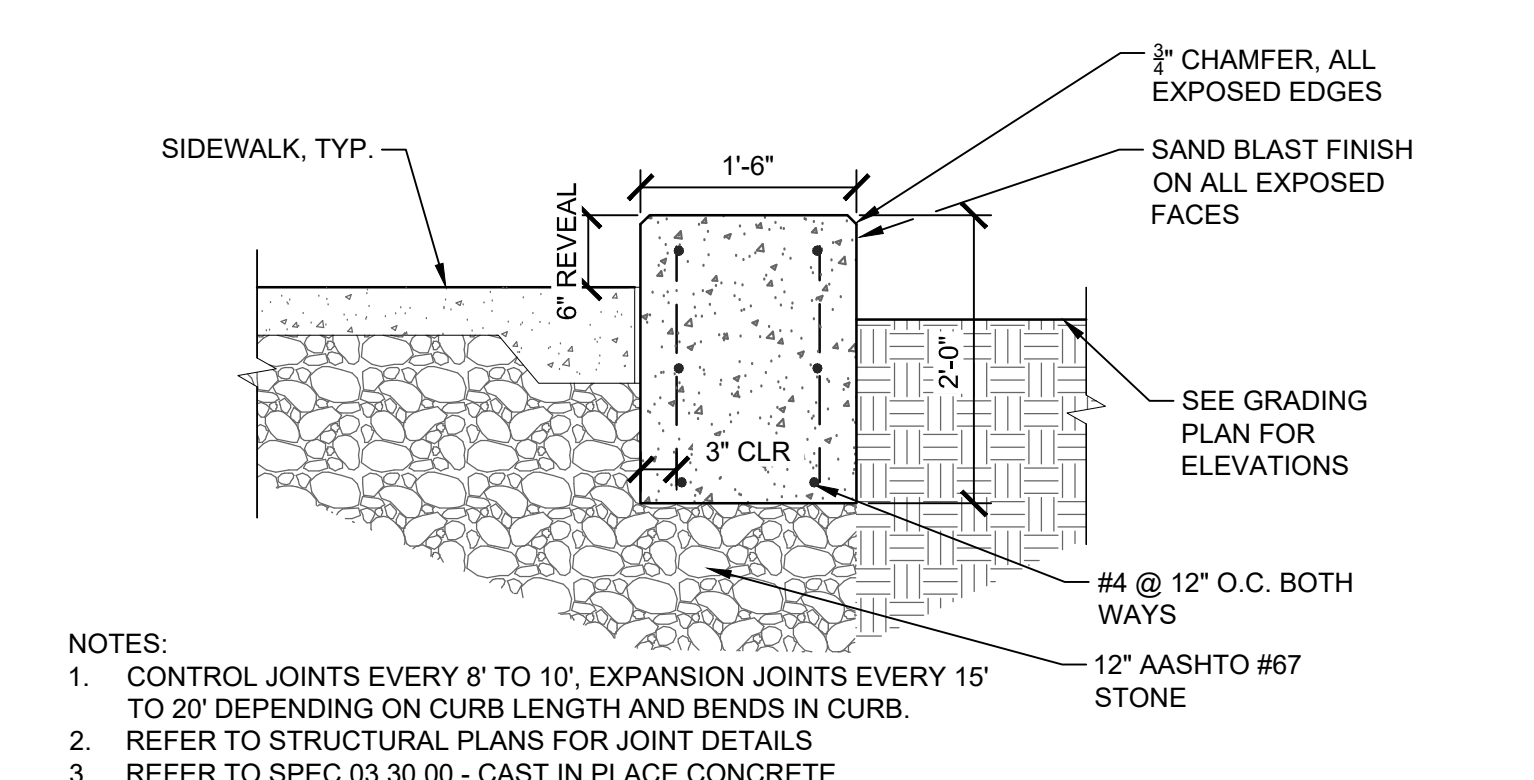
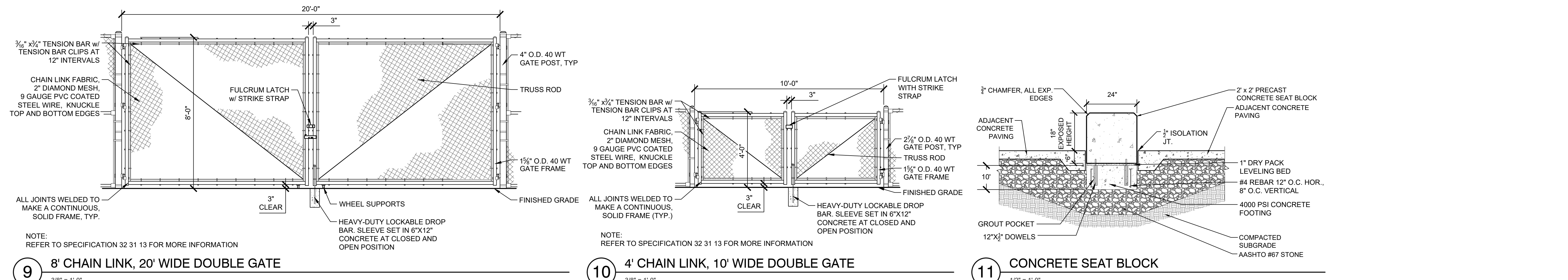
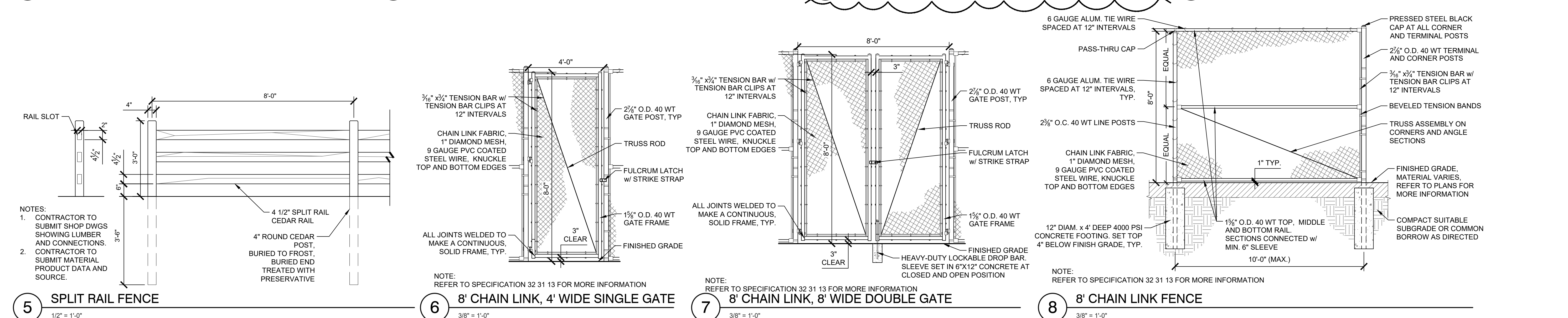
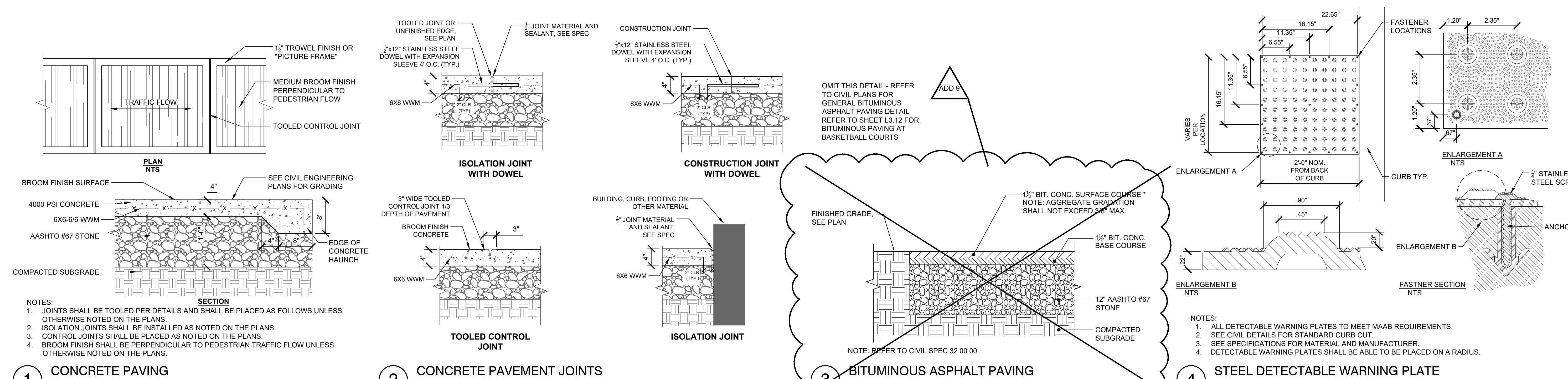
KEYPLAN

DRAWING NAME:

**HARDSCAPE PLAN  
ALTERNATE 6**

DRAWN BY: J. FIGLIOZZI, E. LIMON  
REVIEWED BY: S. D'AMBROSIA, J. ROBERTSHAW  
SCALE: 1"=20'-0" DRAWING NUMBER:  
JOB NO.: K1031  
DATE: OCTOBER 13, 2023 **L1.22A**





ADD 9 02/06/2024

ADD 7 01/26/2024

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KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

**DETAILS**

DRAWN BY: J. FIGLIOZZI, E. LIMON

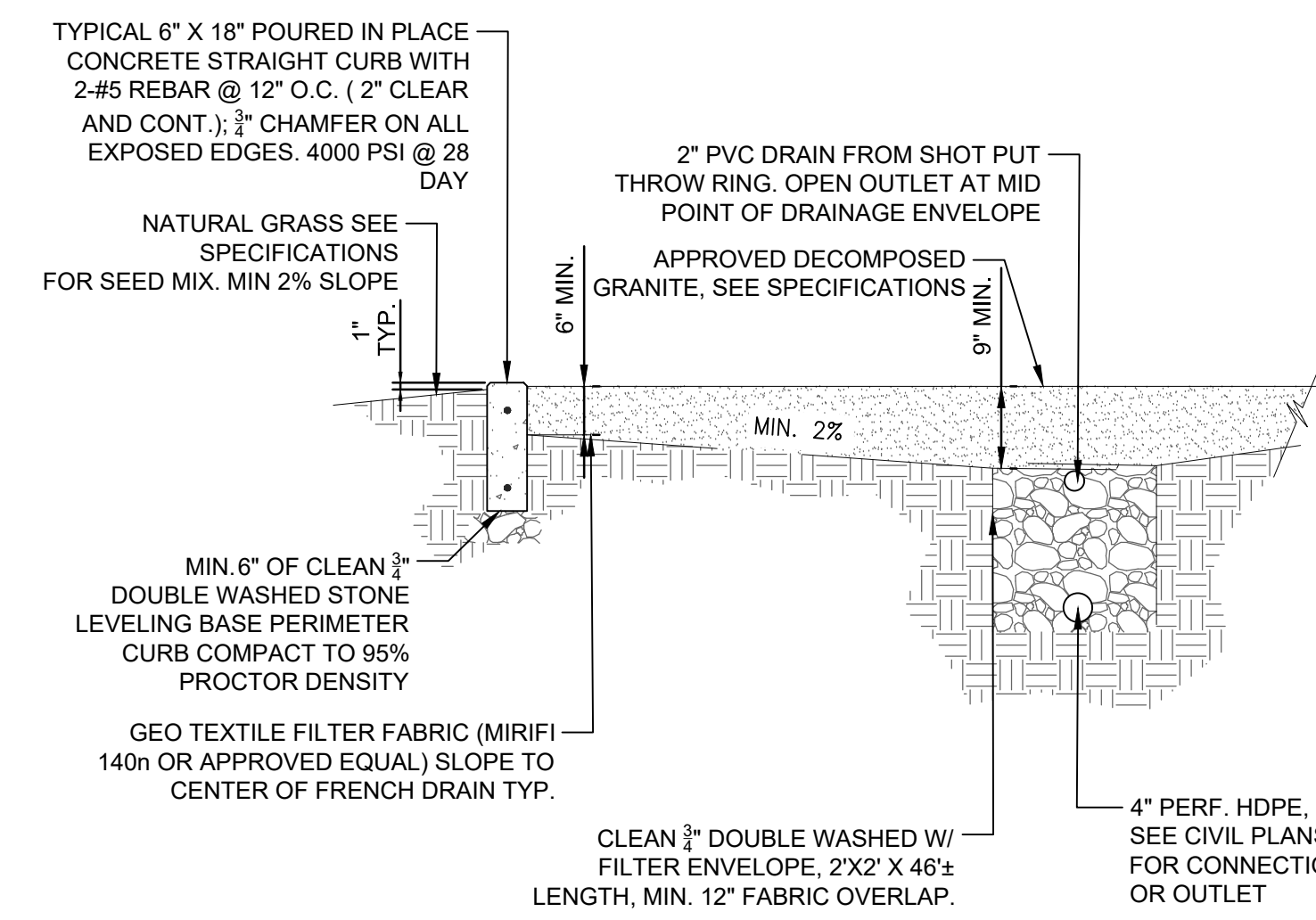
REVIEWED BY: S. D'AMBROSIA, J. ROBERTSHAW

SCALE: AS NOTED DRAWING NUMBER:

JOB NO.: K1031

DATE: OCTOBER 13, 2023

**L3.01**



**1** SHOT PUT LANDING AREA  
1/2" = 1'-0"

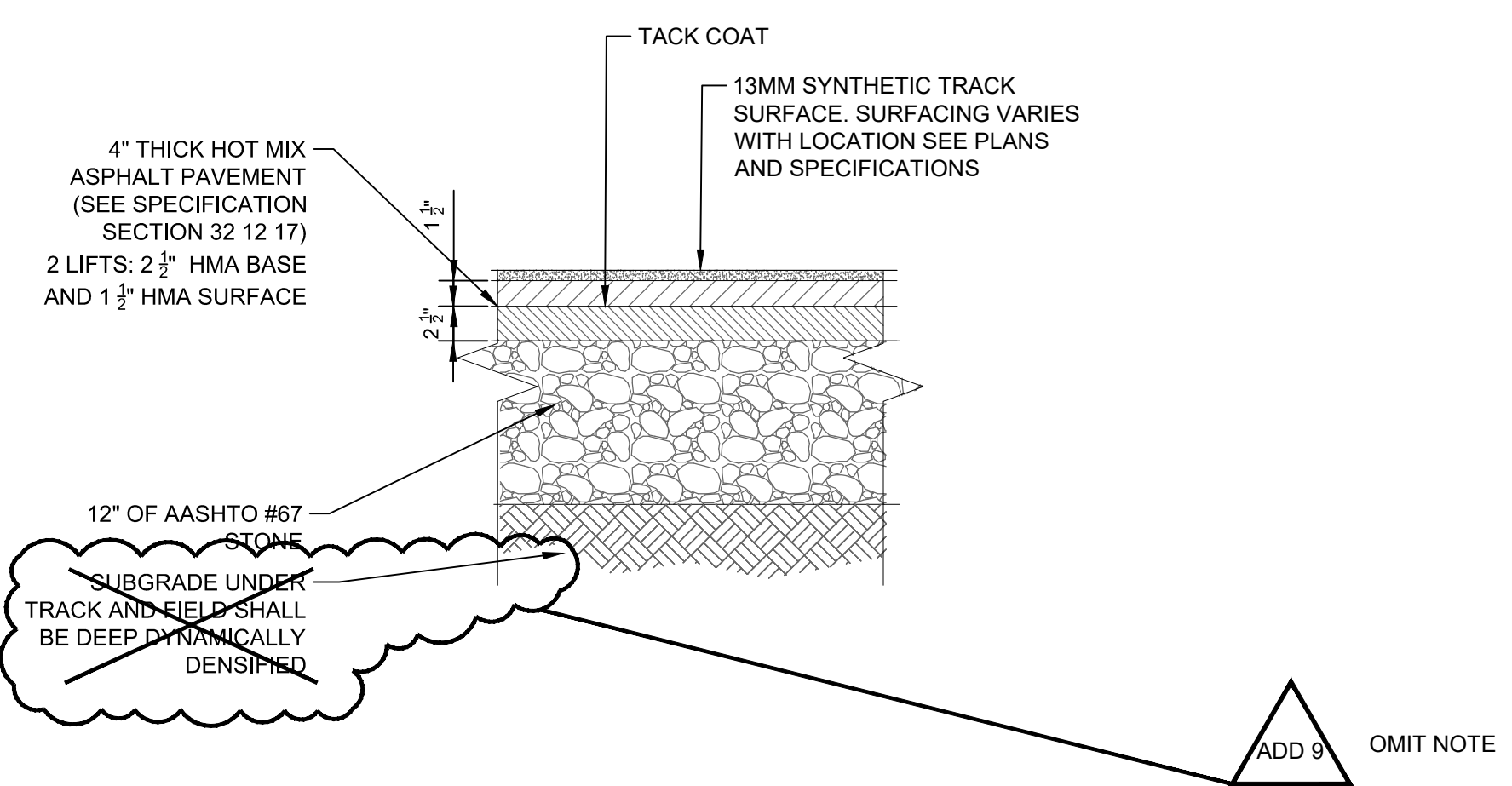
**DECOMPOSED GRANITE (DG) SPECIFICATION:**

1. THE SHOT PUT LANDING AREA SHALL CONSIST OF A DECOMPOSED GRANITE OR SIMILAR MATERIAL THAT MEETS THE APPROVAL OF THE DESIGN PROFESSIONAL, THAT IS FIRMLY COMPACTED, YET POROUS TO ALLOW VERTICAL DRAINAGE.
2. THE CONTRACTOR SHALL PROVIDE A ONE GALLON SAMPLE OF PROPOSED DECOMPOSED GRANITE FOR APPROVAL BY THE OWNER PRIOR TO INSTALLATION. AVAILABLE PRODUCT COLOR TO BE SELECTED AND APPROVED BY THE OWNER.
3. THE MATERIAL SHALL BE COMPACTED TO AT LEAST 90% OF STANDARD DENSITY WITH DISCING, SPRINKLING, AND ROLLING AS NECESSARY. ALL MATERIAL AGGREGATE LARGER THAN ONE-QUARTER (1/4") INCH IN DIAMETER THAT COMES TO THE SURFACE DURING DISCING SHALL BE REMOVED PRIOR TO COMPACTING OPERATIONS.

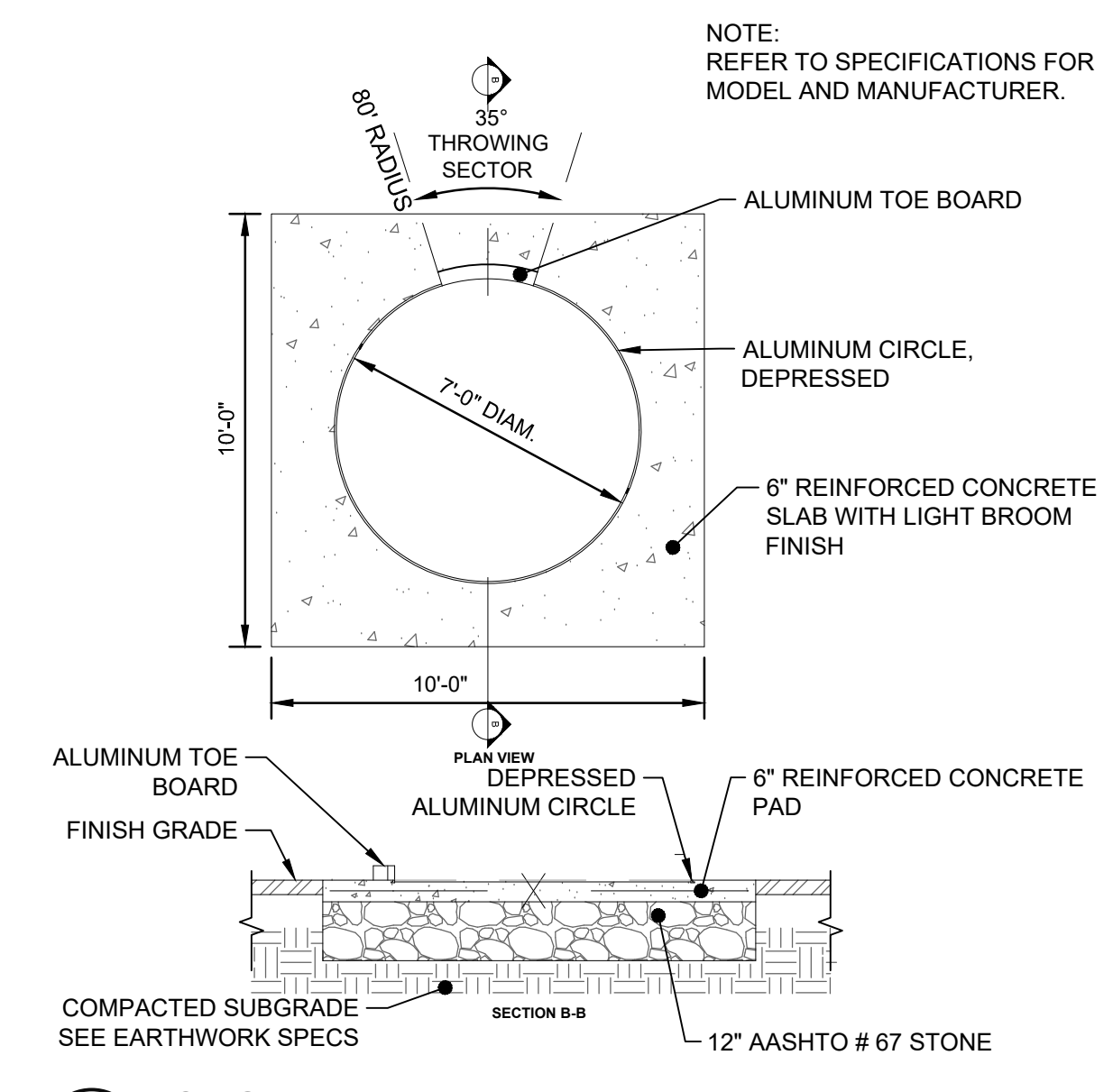
THE PRODUCT SHALL BE SIZED AS FOLLOWS:

SCREEN #	%
3/8	100
4	100
8	96
16	65
30	45
50	35
100	25
200	15

P-EDU-CFH-54

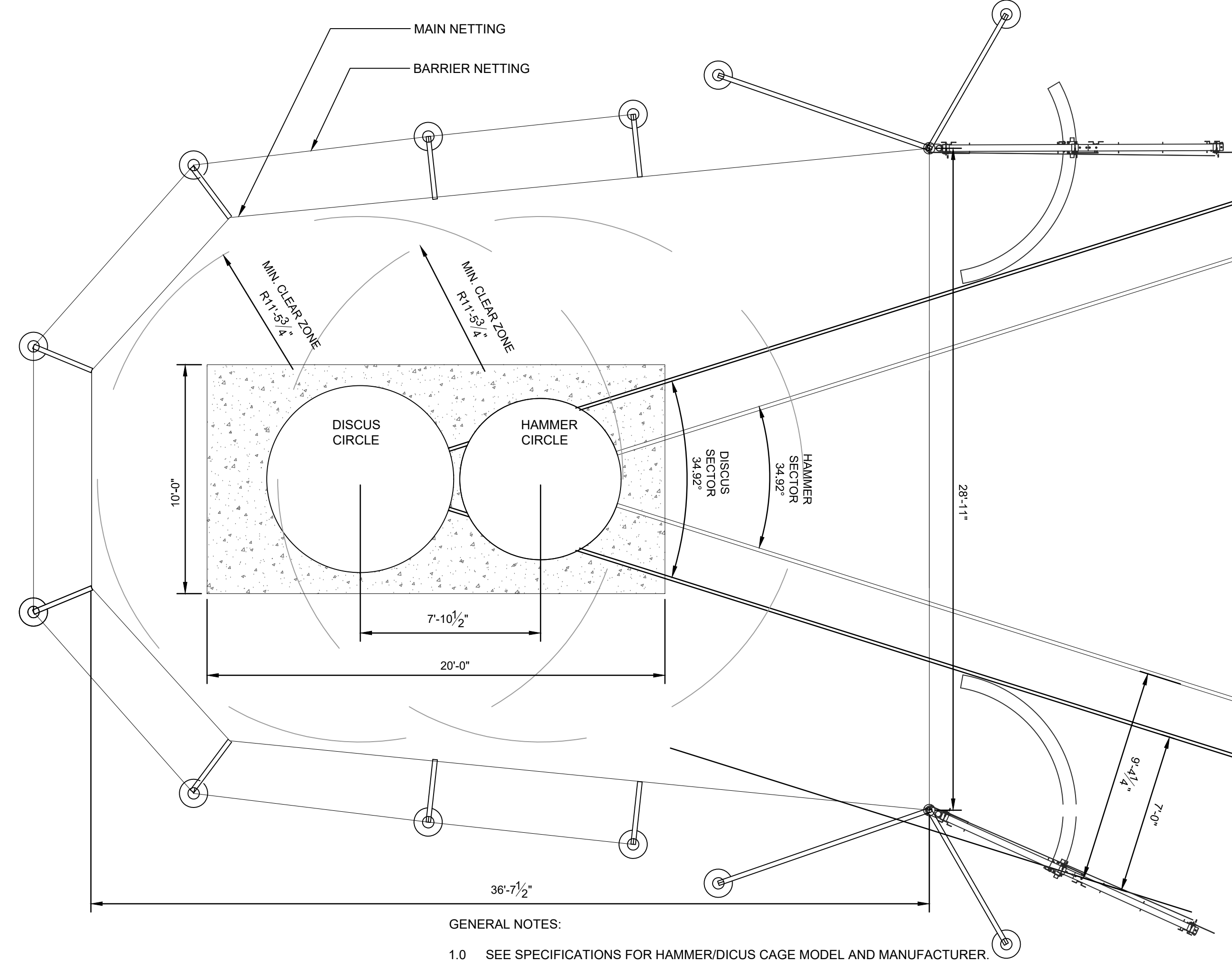


**2** TYPICAL TRACK SURFACING CROSS SECTION  
1 1/2" = 1'-0"



**3** SHOT PUT PAD  
1/4" = 1'-0"

P-EDU-CFH-53



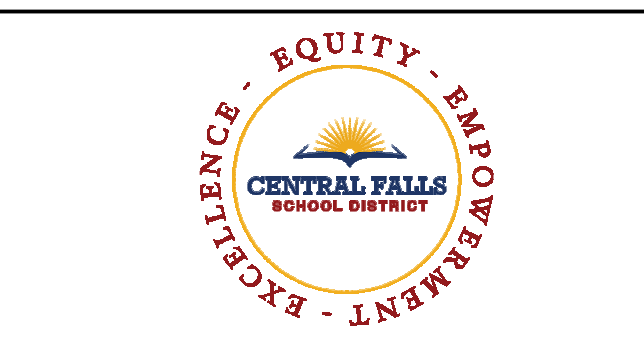
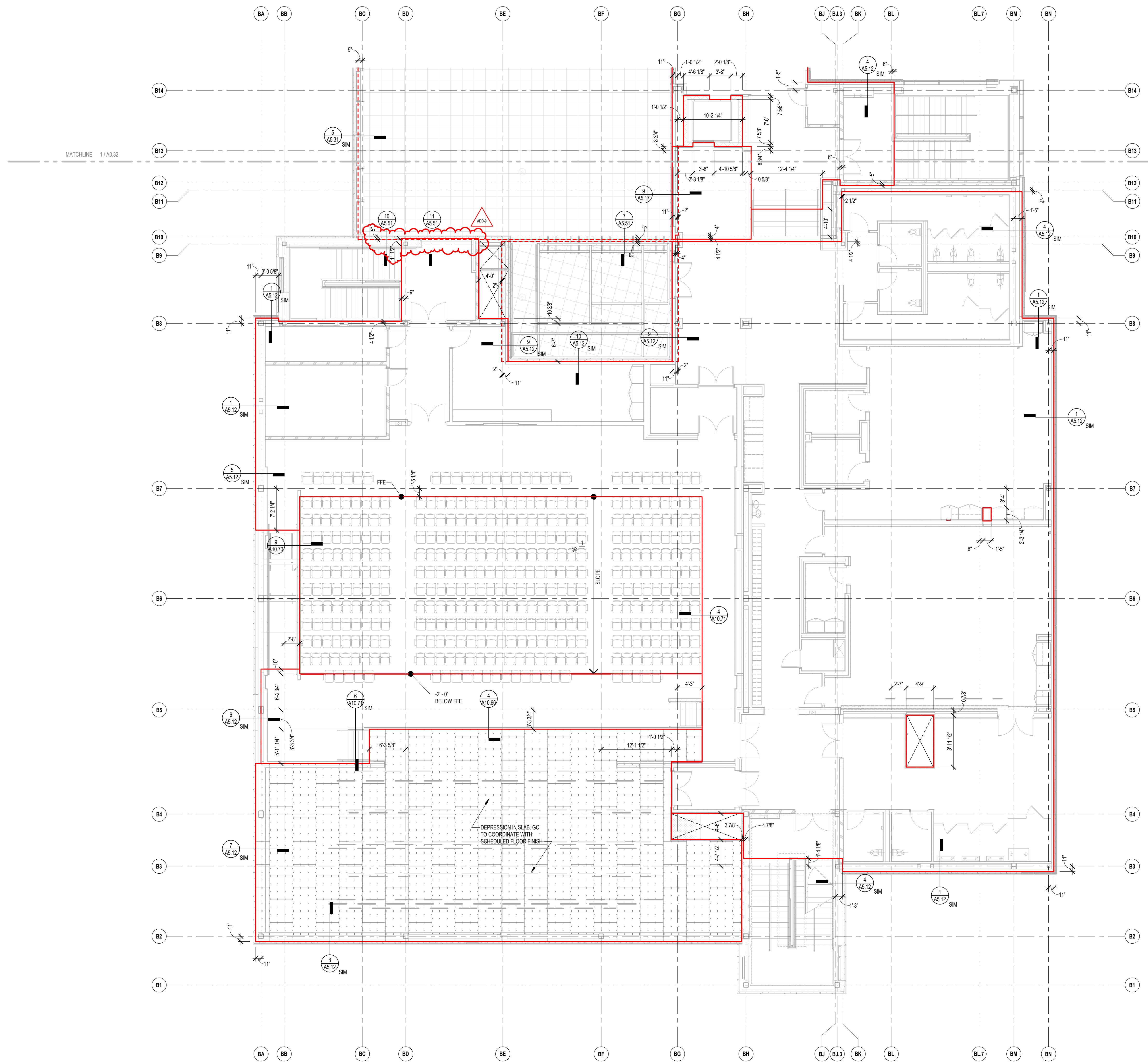
- GENERAL NOTES:
- 1.0 SEE SPECIFICATIONS FOR HAMMER/DICUS CAGE MODEL AND MANUFACTURER.
  - 2.0 CONTRACTOR TO INSTALL PER MANUFACTURERS RECOMMENDATIONS.
  - 3.0 CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR FOUNDATIONS.
  - 4.0 ALL EQUIPMENT, LAYOUT AND INSTALLATION TO MEET NFHS AND RIL RULES AND REGULATIONS.

**4** DUAL RING DISCUS/HAMMER CAGE  
1/4" = 1'-0"

P-EDU-CFH-53







CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

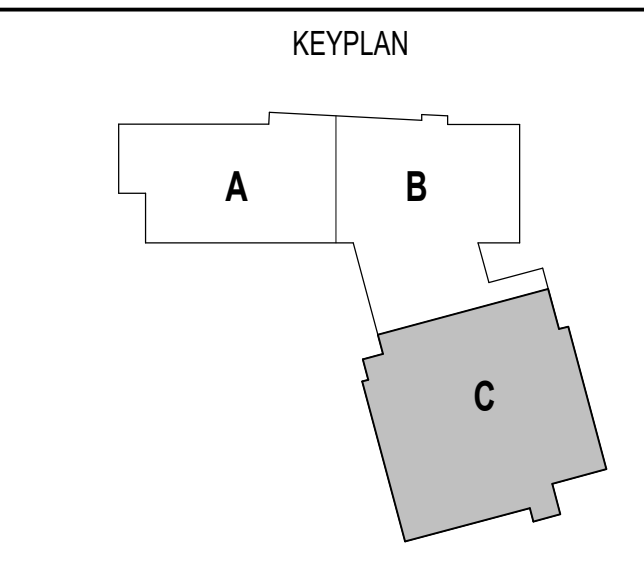
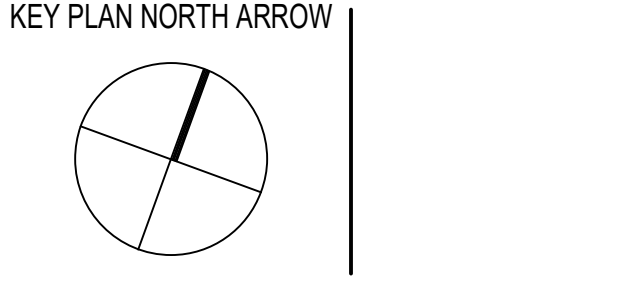
KEYNOTE LEGEND:

**GENERAL NOTES:**  
1. CONSTRUCTION MANAGER TO COORDINATE EXTENT OF SLAB AT DOORS.  
2. CONSTRUCTION MANAGER TO COORDINATE DEPTH OF SLAB DEPRESSIONS.

**CONTROL PLAN LEGEND**  
 - OUTSIDE FACE OF FOUNDATION WALL  
 - EDGE OF ROOF PERIMETER STEEL  
 - EDGE OF CONCRETE SLAB AT RTUS  
 - EDGE OF SLAB ON DECK  
 - EXTENTS OF RTU

ADD-9 ADDENDUM #9 02.06.2024

**100% CONSTRUCTION DOCUMENTS**



DRAWING NAME:

**THIRD FLOOR SLAB CONTROL PLAN - ZONE C**

DRAWN BY: BFC

REVIEWED BY: CHR / KK

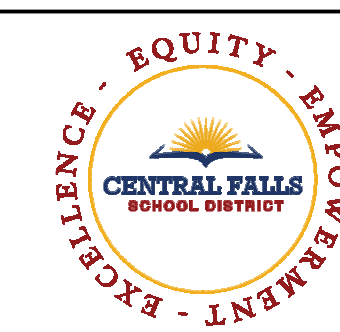
SCALE: AS INDICATED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

**A0.33**

1 THIRD FLOOR SLAB CONTROL PLAN - ZONE C  
1/8" = 1'-0"



CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

- 03 30 00.02 CONCRETE SLAB ON GRADE - SEE STRUCTURAL
- 03 30 00.03 CONCRETE SLAB ON DECK - SEE STRUCTURAL
- 03 30 00.05 CONCRETE FOUNDATION - SEE STRUCTURAL
- 04 20 00.11 CMU TYPE SF1 - GROUND FACE CMU - REFERENCE DRAWINGS FOR BLOCK DEPTH
- 04 20 00.64 SEALANT - TYPE AS REQUIRED
- 05 12 00.01 STEEL BEAM - SEE STRUCTURAL
- 05 12 00.06 STEEL TUBE - SEE STRUCTURAL
- 05 31 00.11 STEEL ROOF DECK - 3 INCH GALVANIZED - SEE STRUCTURAL
- 05 40 00.06 STEEL STUDS - 6 INCH - 16 INCHES O.C. MAX
- 05 40 00.60 STEEL STUD CLIP
- 06 16 00.01 GYPSUM EXTERIOR SHEATHING - 5/8 INCH
- 07 21 00.02 RIGID INSULATION - 2 INCH - UNDER SLAB - HIGH COMPRESSIVE STRENGTH
- 07 21 00.20 GLASS FIBER BLANKET INSULATION - MATCH DEPTH OF STUD - UNFACED
- 07 21 00.50 MINERAL WOOL INSULATION - RIGID - EXTERIOR - 2 INCH
- 07 26 00.01 VAPOR RETARDER - UNDER SLAB
- 07 27 13.01 AIR/VAPOR BARRIER MEMBRANE - SELF-ADHERING
- 07 27 13.10 WATERPROOF MEMBRANE FLASHING
- 07 27 13.20 FLASHING - STAINLESS STEEL
- 07 46 46.01 MINERAL FIBER CEMENT PANEL - REFERENCE ELEVATIONS FOR COLOR
- 07 46 46.11 MINERAL FIBER CEMENT PANEL - COLOR 1
- 07 46 46.12 MINERAL FIBER CEMENT PANEL - COLOR 2
- 07 46 46.13 MINERAL FIBER CEMENT PANEL - COLOR 3
- 07 54 19.01 PVC SINGLE PLY MEMBRANE ROOFING
- 07 54 19.02 HIGH DENSITY POLYISO RECOVERY BOARD
- 07 54 19.03 POLYISO RIGID INSULATION
- 07 54 19.04 POLYISO TAPERED INSULATION
- 07 54 19.09 SHEET VAPOR RETARDER - TAPE SEAMS
- 07 54 19.20 PVC EXPANSION JOINT
- 07 71 00.04 FACTORY FABRICATED PARAPET WALL COPING - CUSTOM COLOR
- 09 64 66.01 WOOD ATHLETIC FLOOR

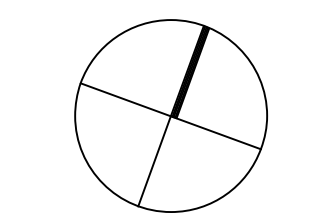
GENERAL NOTES:

1. REFER TO CIVIL DRAWINGS FOR FINAL GRADE ELEVATIONS
2. REFER TO REFLECTED CEILING PLANS FOR CEILING HEIGHTS
3. REFER TO STRUCTURAL DRAWINGS FOR TRUE DIRECTION OF STEEL DECKING
4. REFERENCE EXTERIOR ELEVATIONS FOR VARIATION IN COLORS

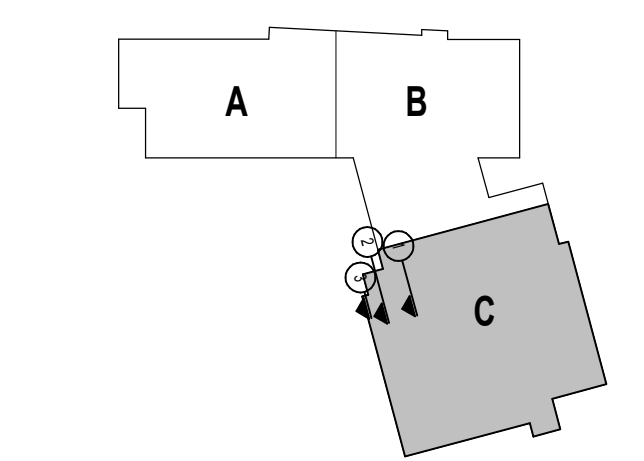
ADD-9 ADDENDUM #9 02.06.2024

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

WALL SECTIONS

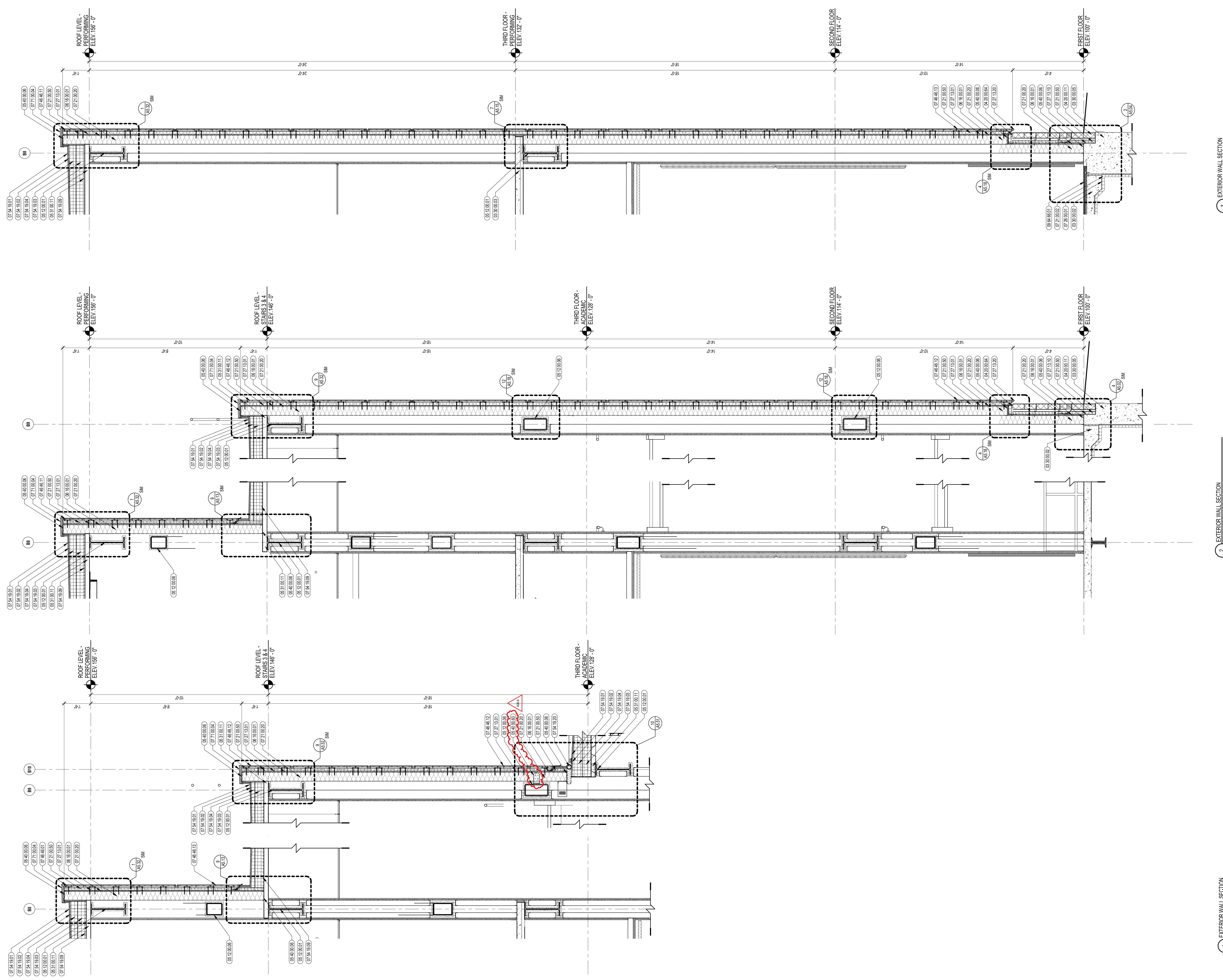
DRAWN BY: CHR / BFC

REVIEWED BY: CHR / KK

SCALE: AS INDICATED DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023 A4.36



3 EXTERIOR WALL SECTION  
1/2" = 1'-0"

2 EXTERIOR WALL SECTION  
1/2" = 1'-0"

1 EXTERIOR WALL SECTION  
1/2" = 1'-0"



CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

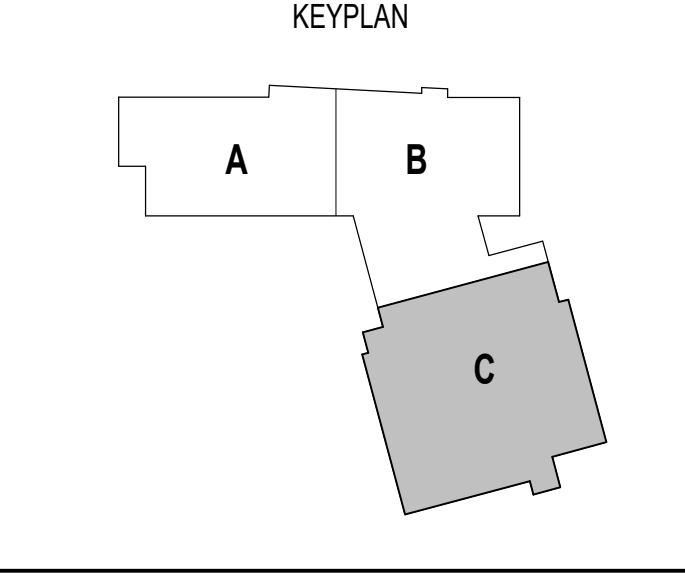
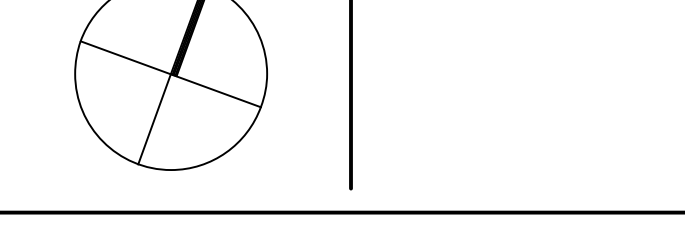
**KEYNOTE LEGEND:**

- 03 30.00.03 CONCRETE SLAB ON DECK - SEE STRUCTURAL
- 04 20.00.10 CMU BASE - GROUND FACE CMU - REFERENCE DETAILS FOR TYPE AND DEPTH
- 04 20.00.50 MASONRY MORTAR
- 04 20.00.61 TYPICAL MASONRY ANCHORTIES - REFERENCE SPECIFICATION FOR SPACING
- 05 12.00.01 STEEL BEAM - SEE STRUCTURAL
- 05 12.00.02 STEEL COLUMN - SEE STRUCTURAL
- 05 12.00.06 STEEL TUBE - SEE STRUCTURAL
- 05 12.00.18 STEEL ANGLE CONTINUOUS - SEE STRUCTURAL
- 05 12.00.21 STEEL EDGE ANGLE - SEE STRUCTURAL
- 05 12.00.33 STEEL STIFFENER - SEE STRUCTURAL
- 05 12.00.36 STEEL PLATE BENT - SEE STRUCTURAL
- 05 31.00.11 STEEL ROOF DECK - 3 INCH GALVANIZED - SEE STRUCTURAL
- 05 40.00.02 STEEL STUDS - 2 1/2 INCH - 16 INCHES O.C. MAX
- 05 40.00.03 STEEL STUDS - 3 5/8 INCH - 16 INCHES O.C. MAX
- 05 40.00.06 STEEL STUDS - 8 INCH - 16 INCHES O.C. MAX
- 05 40.00.19 STEEL Z-CIP - 18 GAGE MIN. - 1 INCH MIN. DEPTH - 16 INCHES O.C. MAX
- 05 40.00.60 STEEL STUD CLIP
- 06 10.00.11 WOOD BLOCKING - (2X) PRESSURE TREATED - SIZE AS NOTED OR DRAWN
- 06 10.00.21 WOOD BLOCKING - (2X) FIRE RETARDANT TREATED - SIZE AS NOTED OR DRAWN
- 06 10.00.43 PLYWOOD PRESSURE TREATED - 5/8 INCH
- 06 18.00.01 GYPSUM EXTERIOR SHEATHING - 5/8 INCH
- 07 21.00.20 GLASS FIBER BLANKET INSULATION - MATCH DEPTH OF STUD - UNFACED
- 07 21.00.22 GLASS FIBER ACOUSTICAL BLANKET INSULATION - MATCH DEPTH OF STUD - UNFACED
- 07 21.00.30 MINERAL WOOL INSULATION
- 07 21.00.32 MINERAL WOOL ACOUSTICAL INSULATION - 3 1/2 INCH
- 07 21.00.50 MINERAL WOOL INSULATION - RIGID - EXTERIOR - 2 INCH
- 07 27.13.01 AIR VAPOR BARRIER MEMBRANE - SELF-ADHERING
- 07 27.13.05 AIR VAPOR BARRIER TRANSITION MEMBRANE - SELF-ADHERING
- 07 27.13.20 FLASHING - STAINLESS STEEL
- 07 48.46.01 MINERAL FIBER CEMENT PANEL - REFERENCE ELEVATIONS FOR COLOR
- 07 48.46.57 J-MOLD TRIM
- 07 48.46.58 DOUBLE HORIZONTAL TRIM
- 07 48.00.11 HORIZONTAL GIRT - REFER TO SHOP DRAWINGS FOR SIZE
- 07 48.00.12 VERTICAL PANEL RAIL - REFER TO SHOP DRAWINGS FOR SIZE
- 07 48.00.22 STAINLESS STEEL SELF-DRILLING SCREW WITH THERMAL ISOLATION
- 07 54.19.01 PVC SINGLE PLY MEMBRANE ROOFING
- 07 54.19.02 HIGH DENSITY POLYISO RECOVERY BOARD
- 07 54.19.03 POLYISO RIGID INSULATION
- 07 54.19.04 POLYISO TAPERED INSULATION
- 07 54.19.05 FLASHING MEMBRANE
- 07 54.19.09 SHEET VAPOR RETARDER - TAPE SEAMS
- 07 54.19.12 BLIND NAILER
- 07 54.19.20 PVC EXPANSION JOINT
- 07 54.19.80 WALKWAY PADS
- 07 54.19.92 HOT AIR WELD
- 07 72.00.81 ROOF PAVEMENT - ADJUSTABLE PEDESTAL
- 07 81.00.01 CEMENTITIOUS FIREPROOFING
- 07 92.00.01 JOINT SEALANT - TYPE AS REQUIRED

**ADD-9 ADDENDUM #9 02.06.2024**

**100% CONSTRUCTION DOCUMENTS**

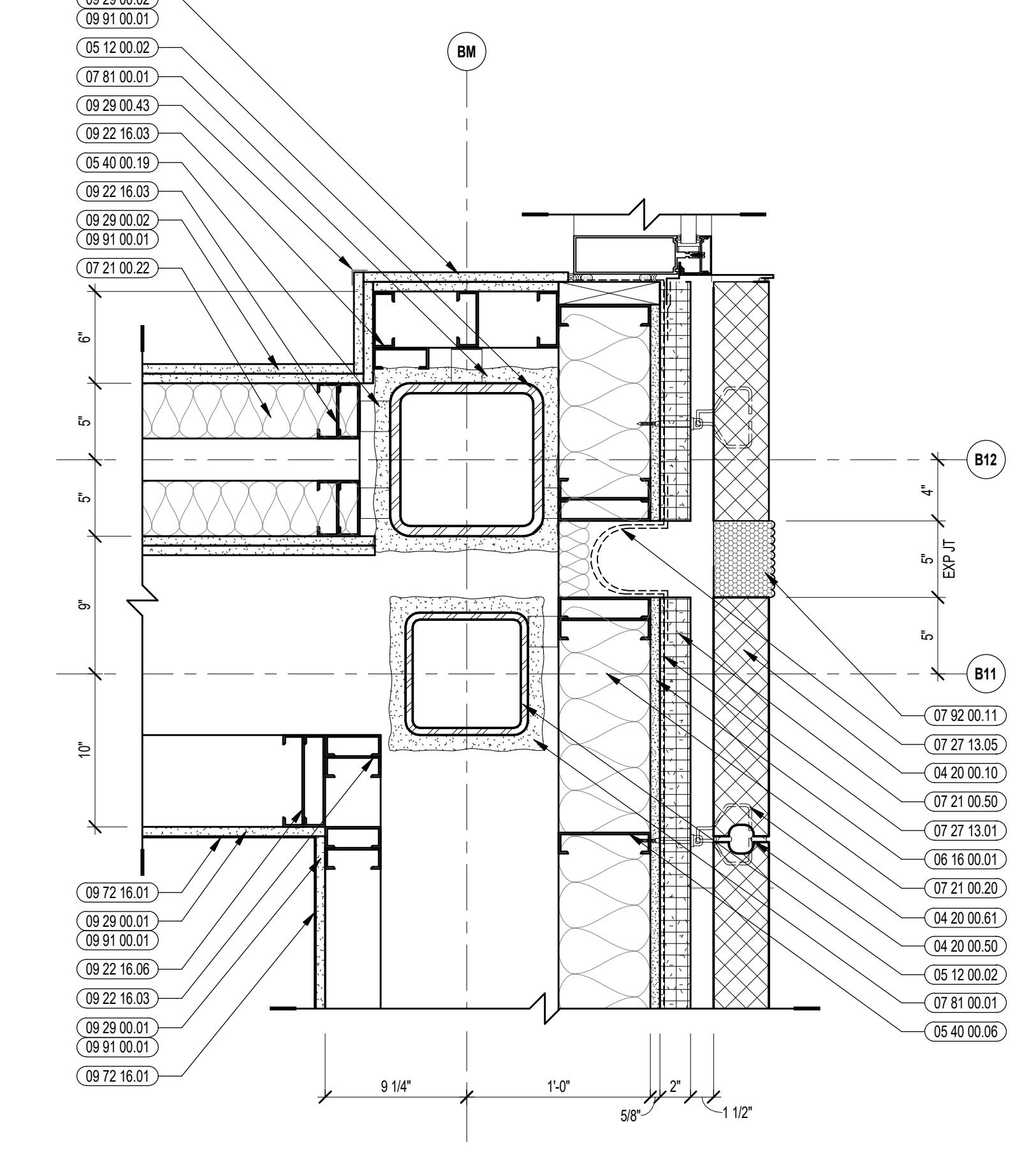
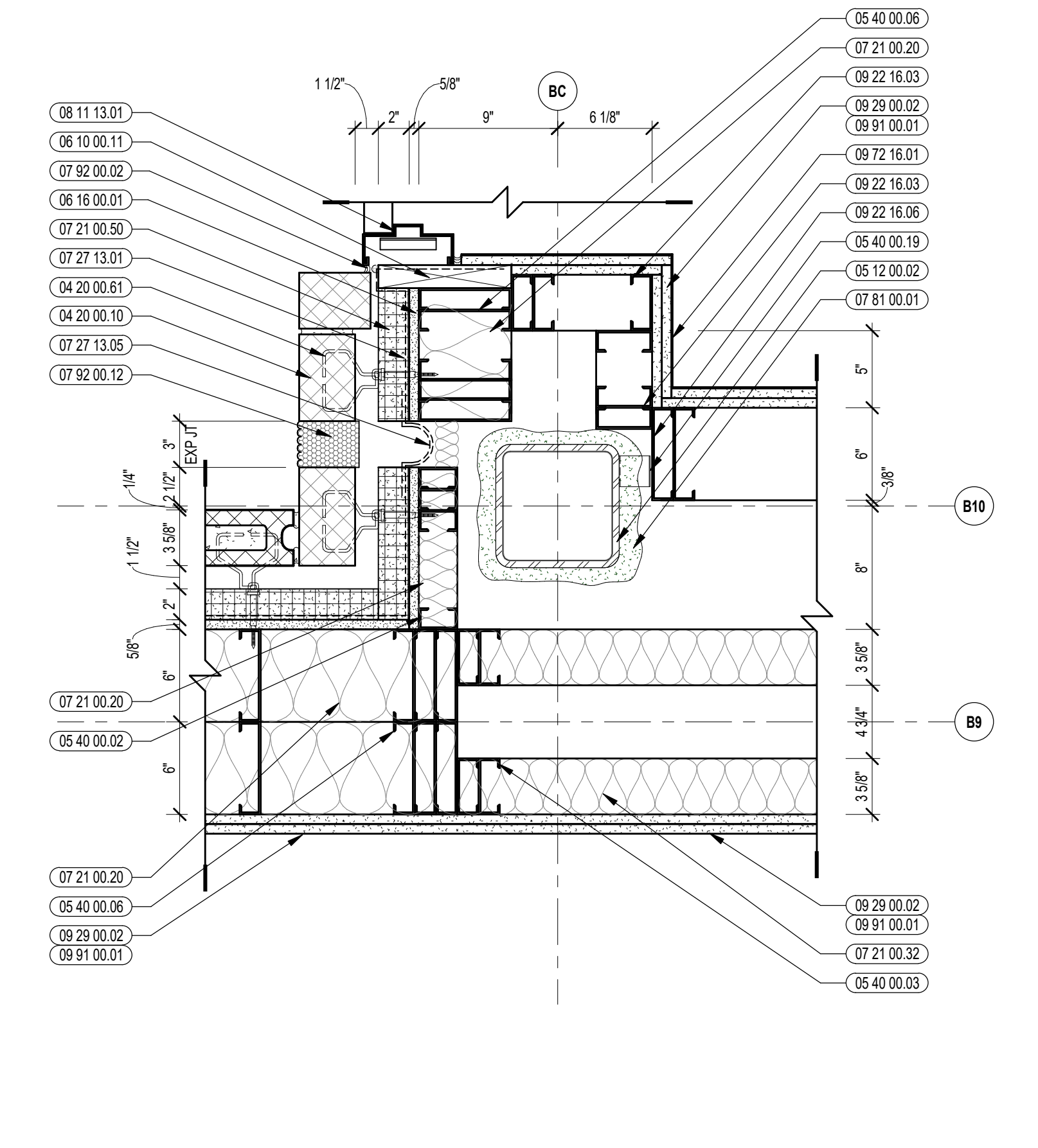
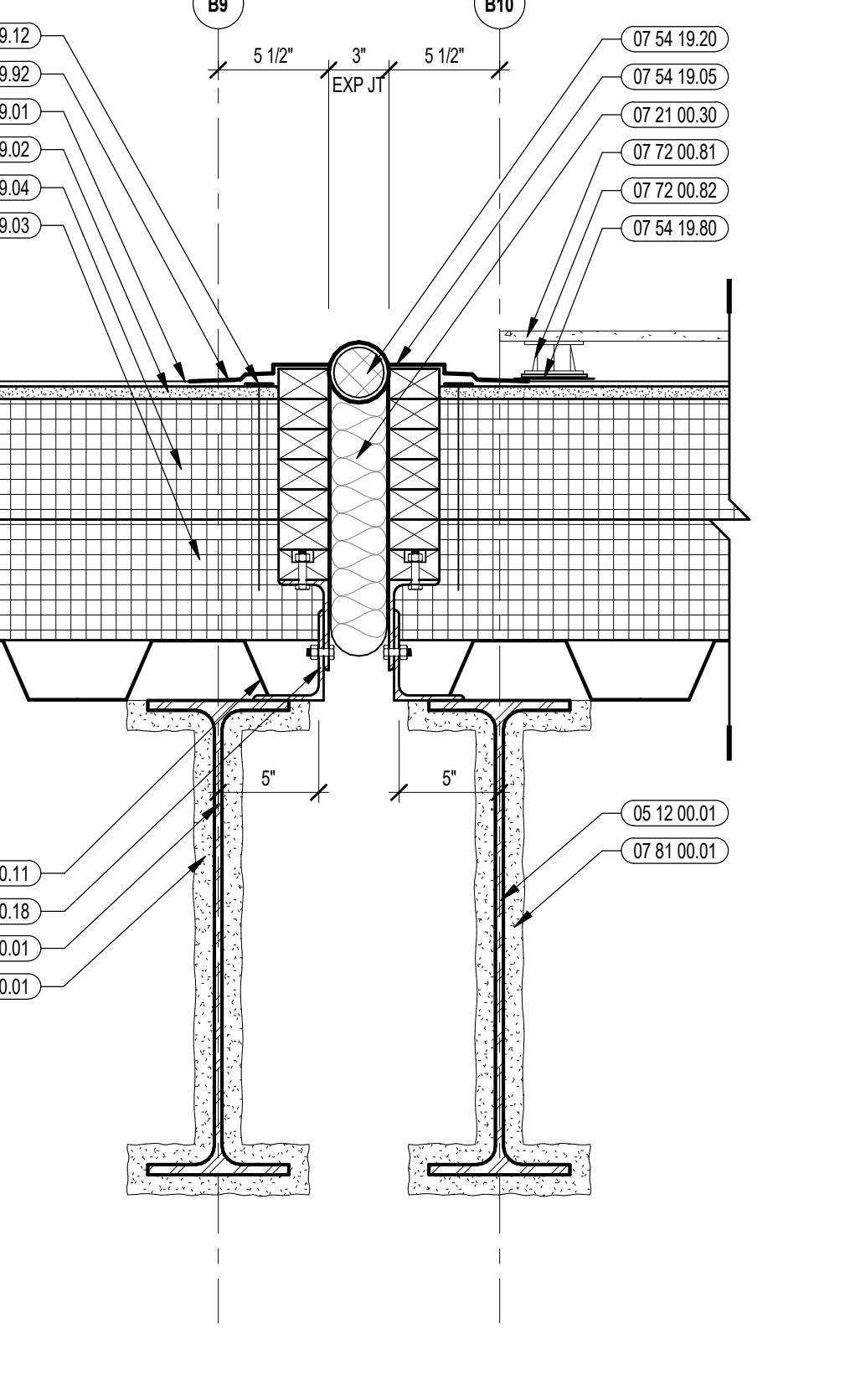
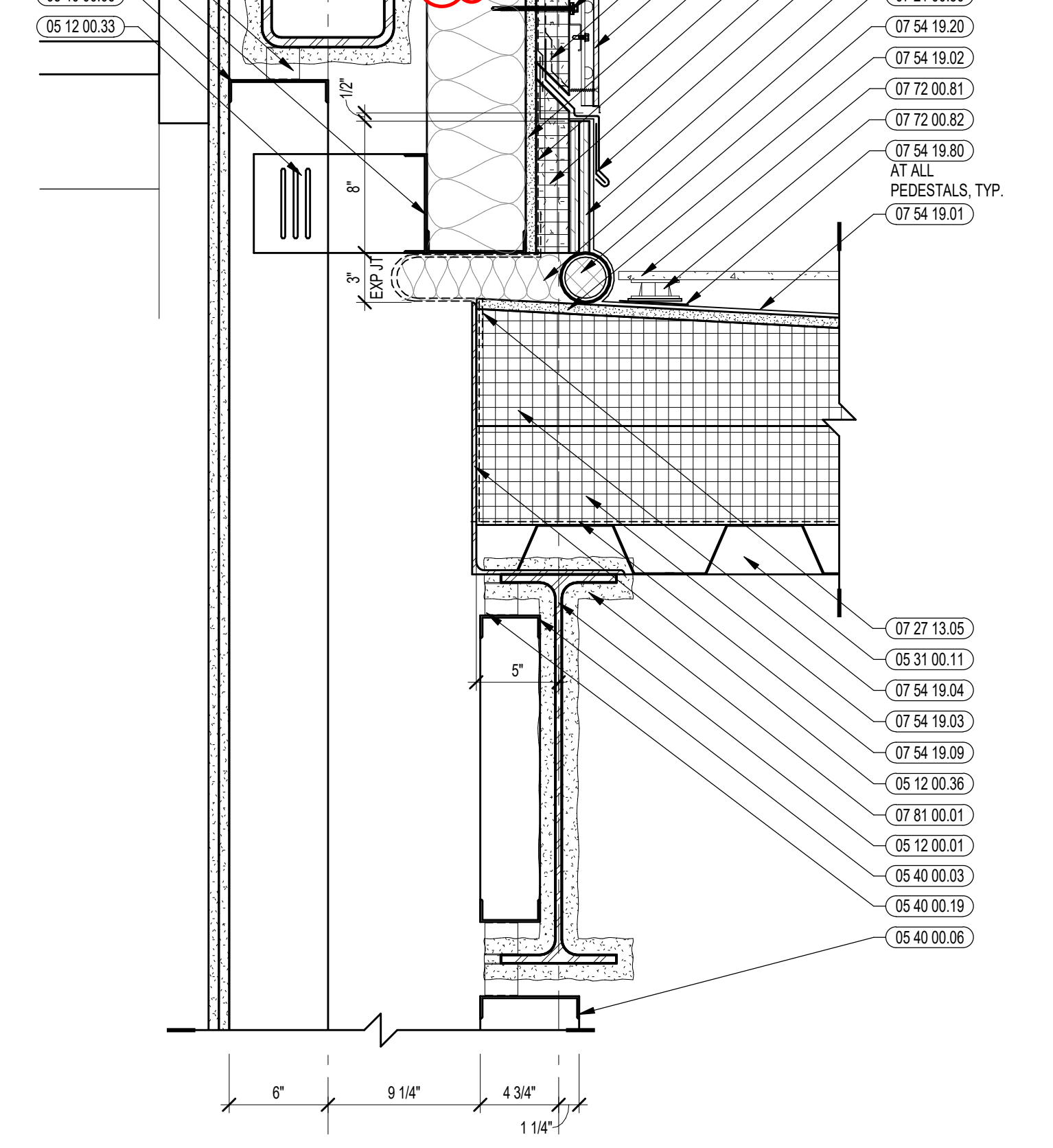
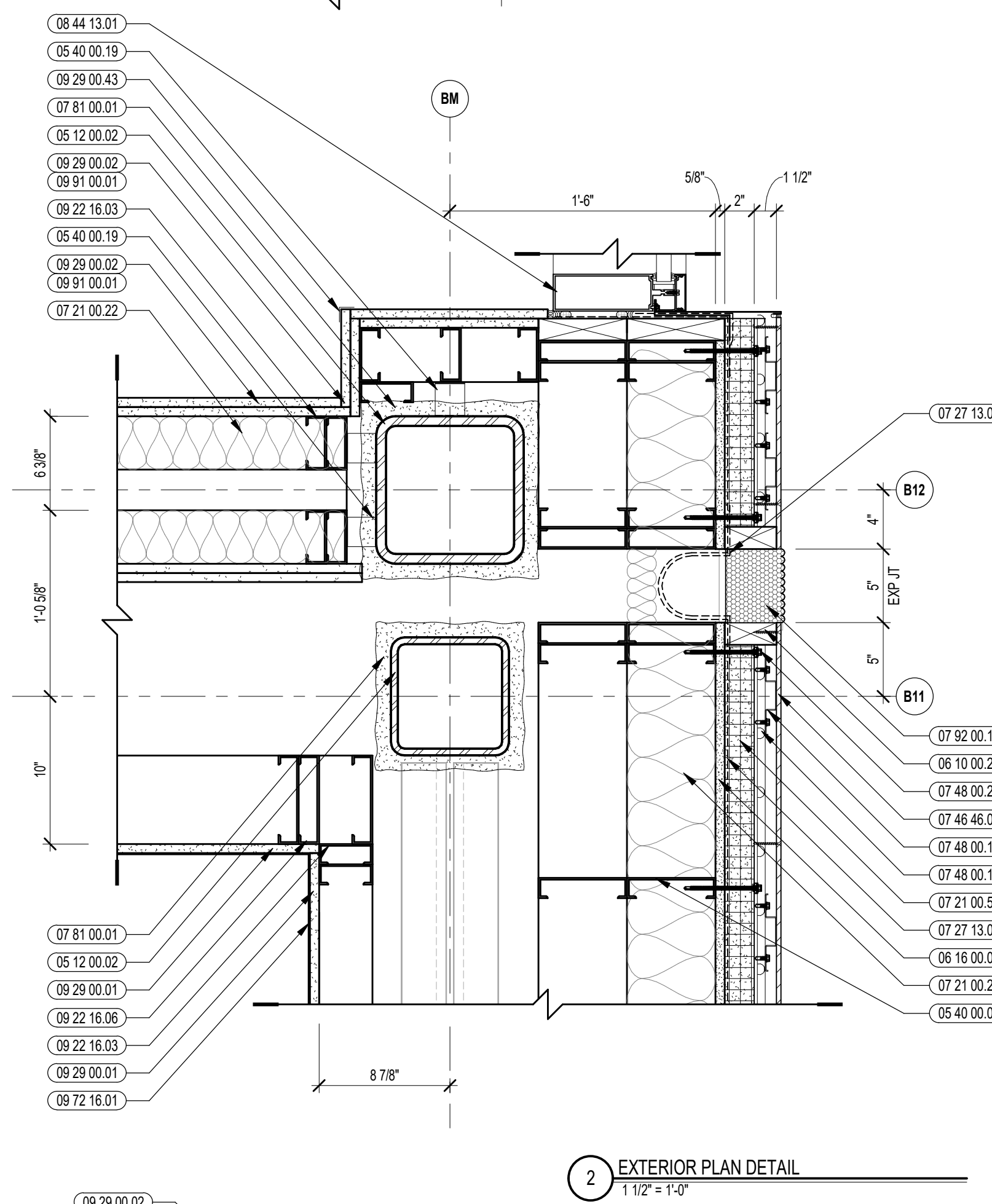
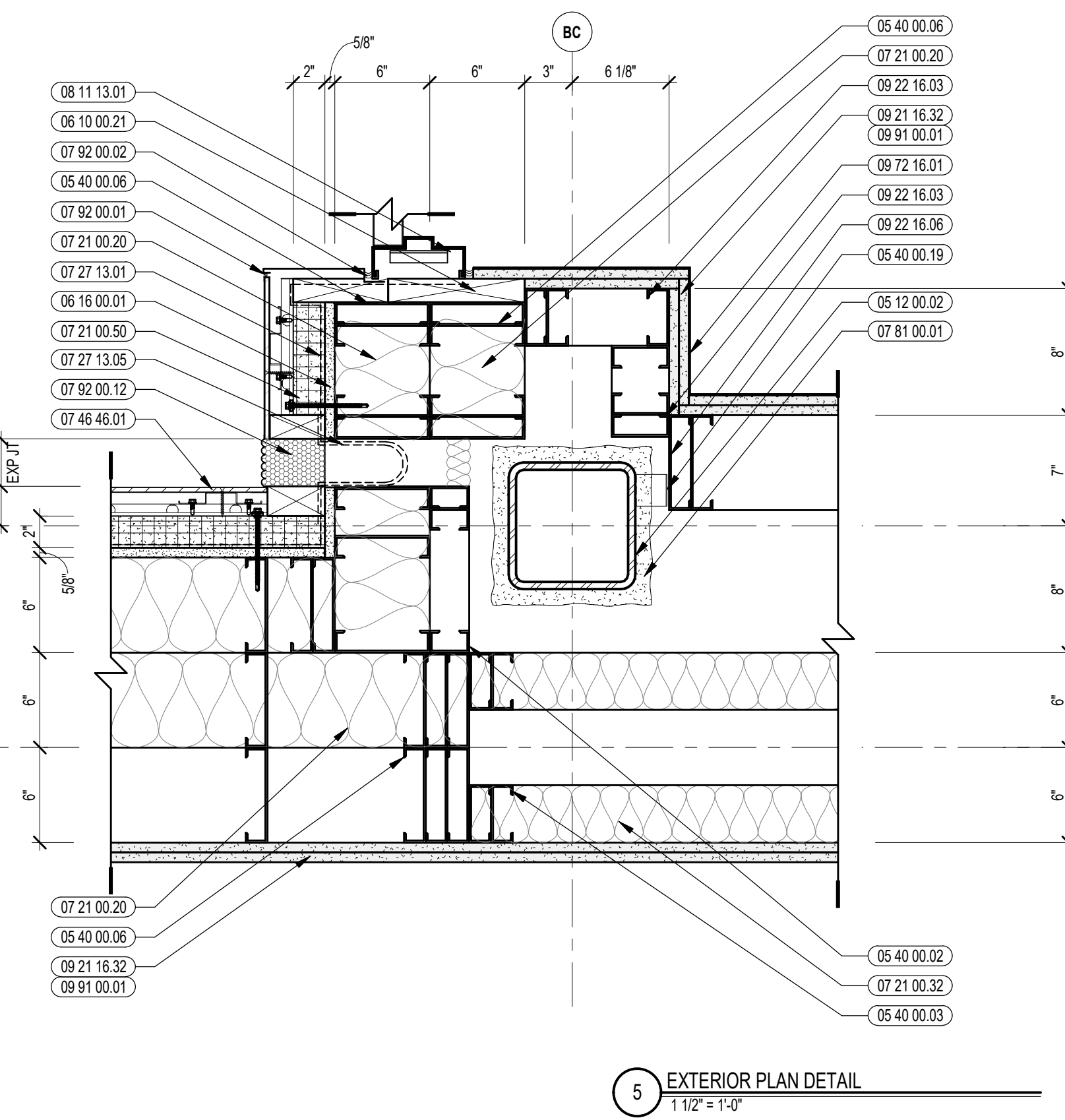
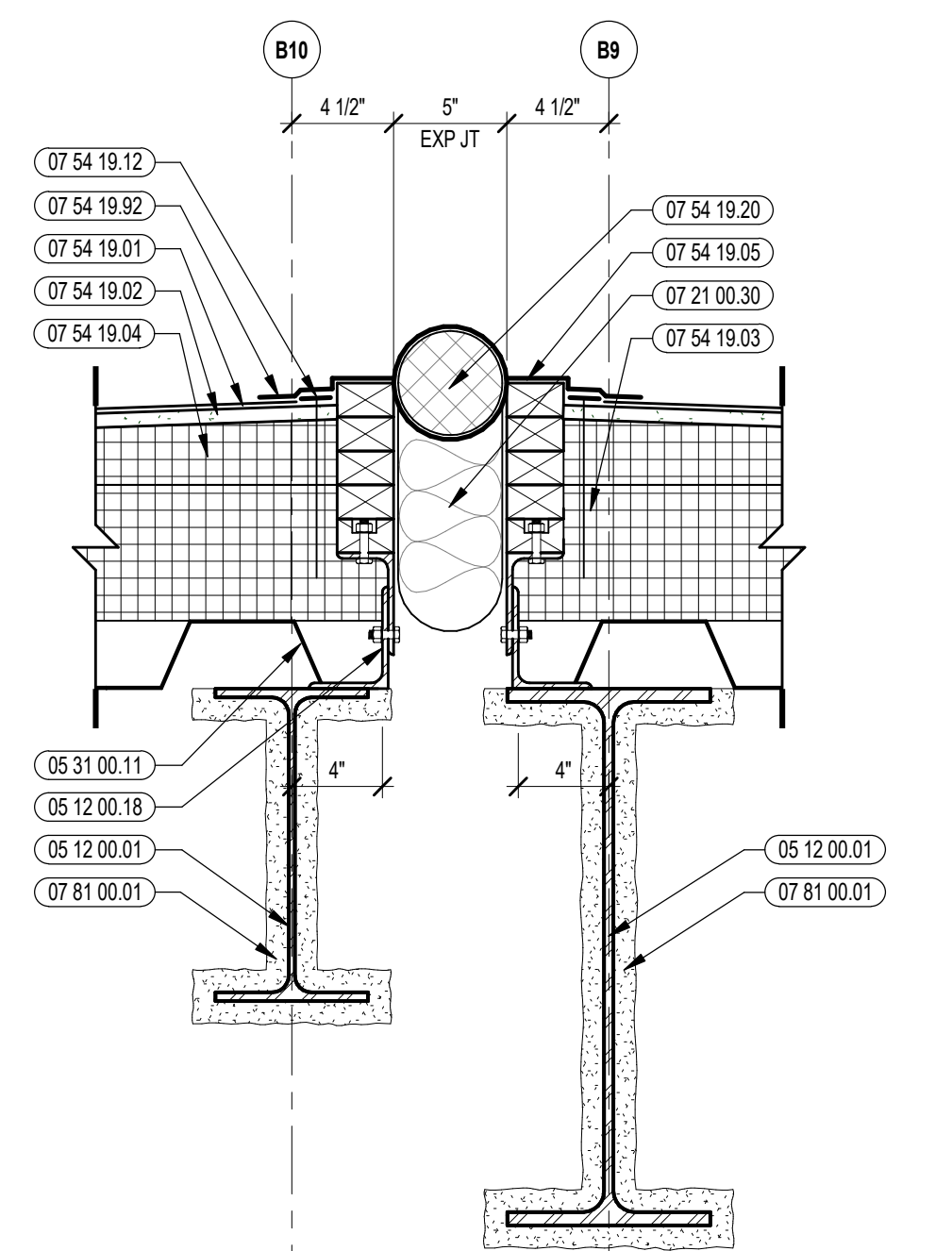
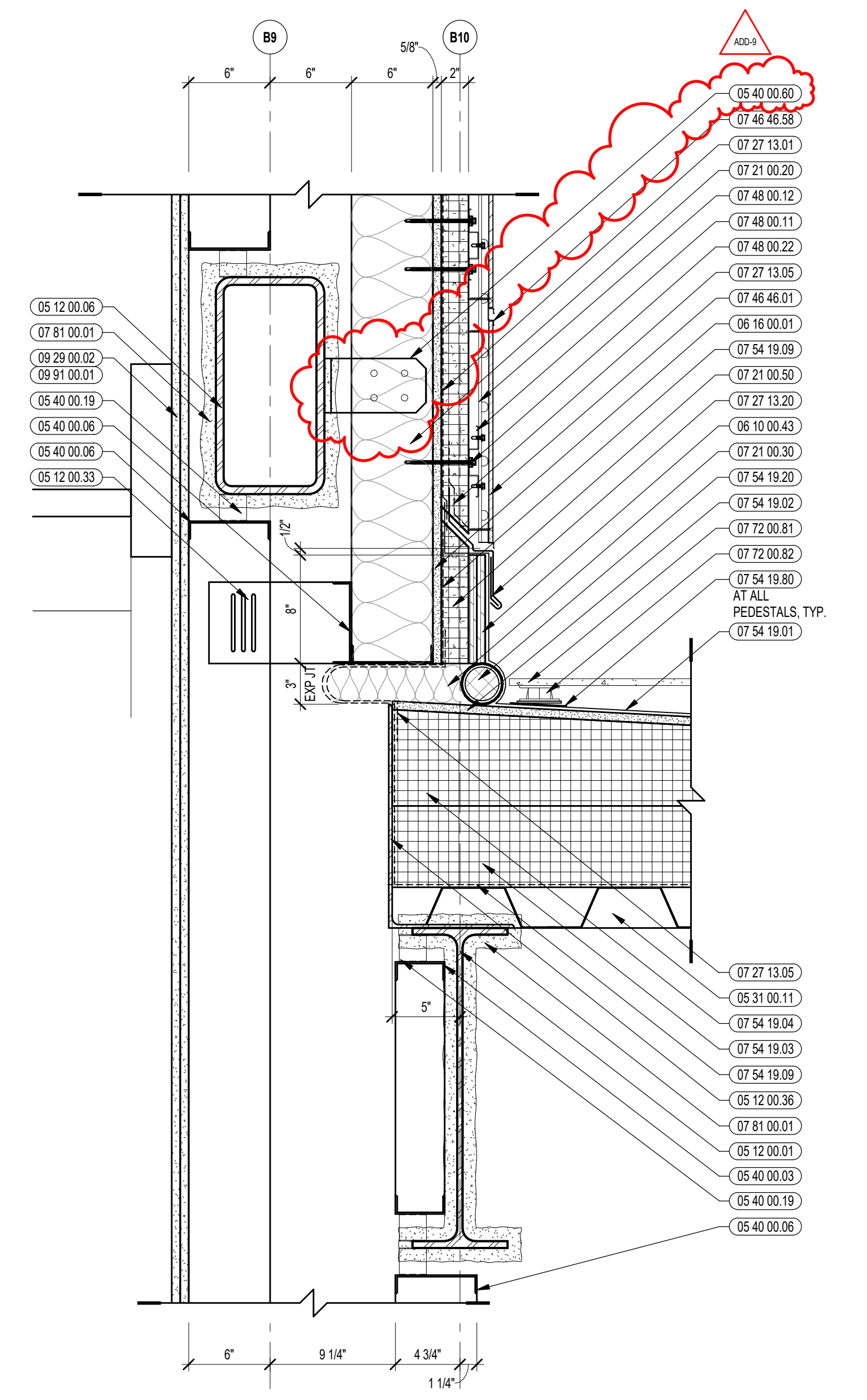
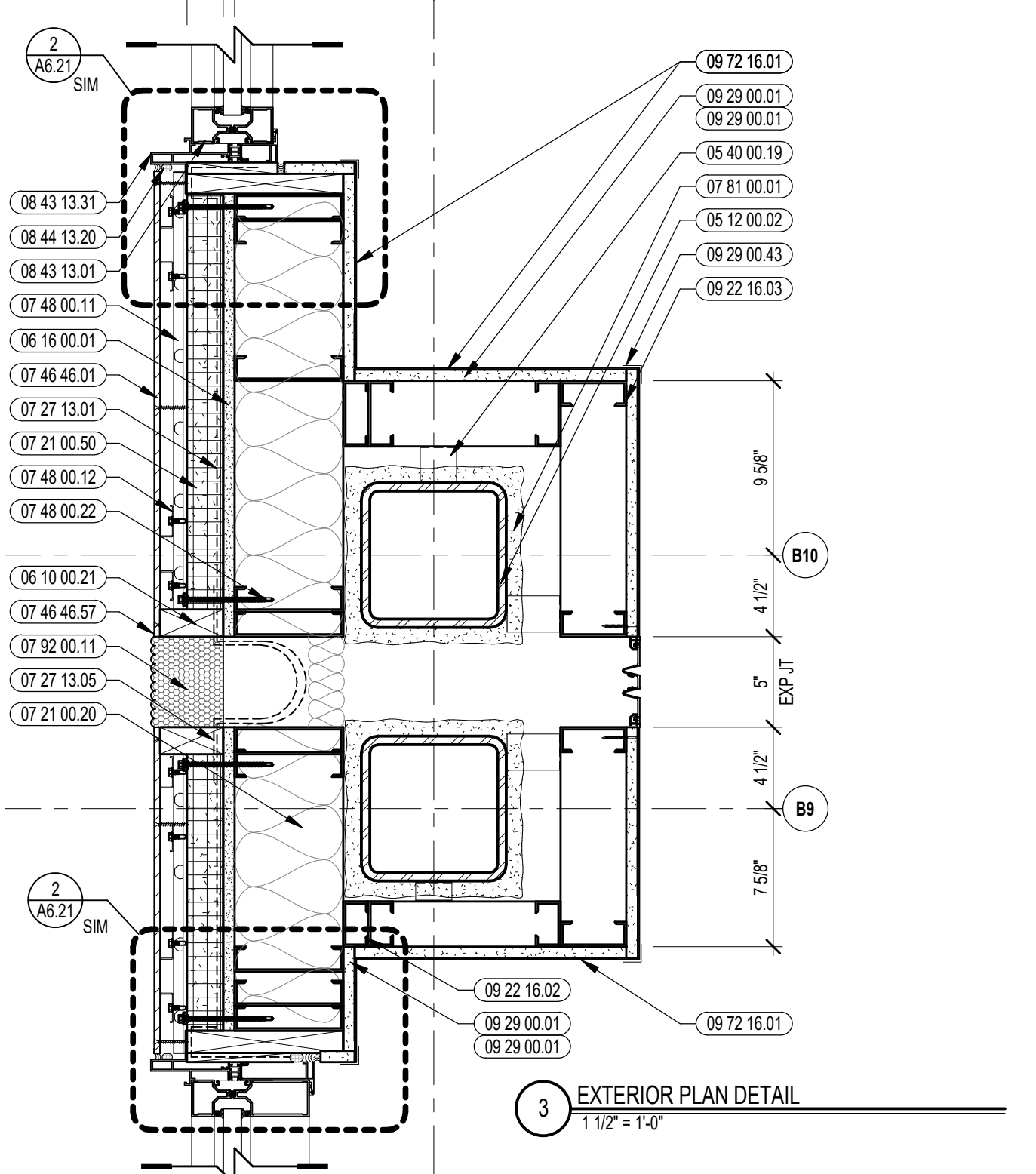
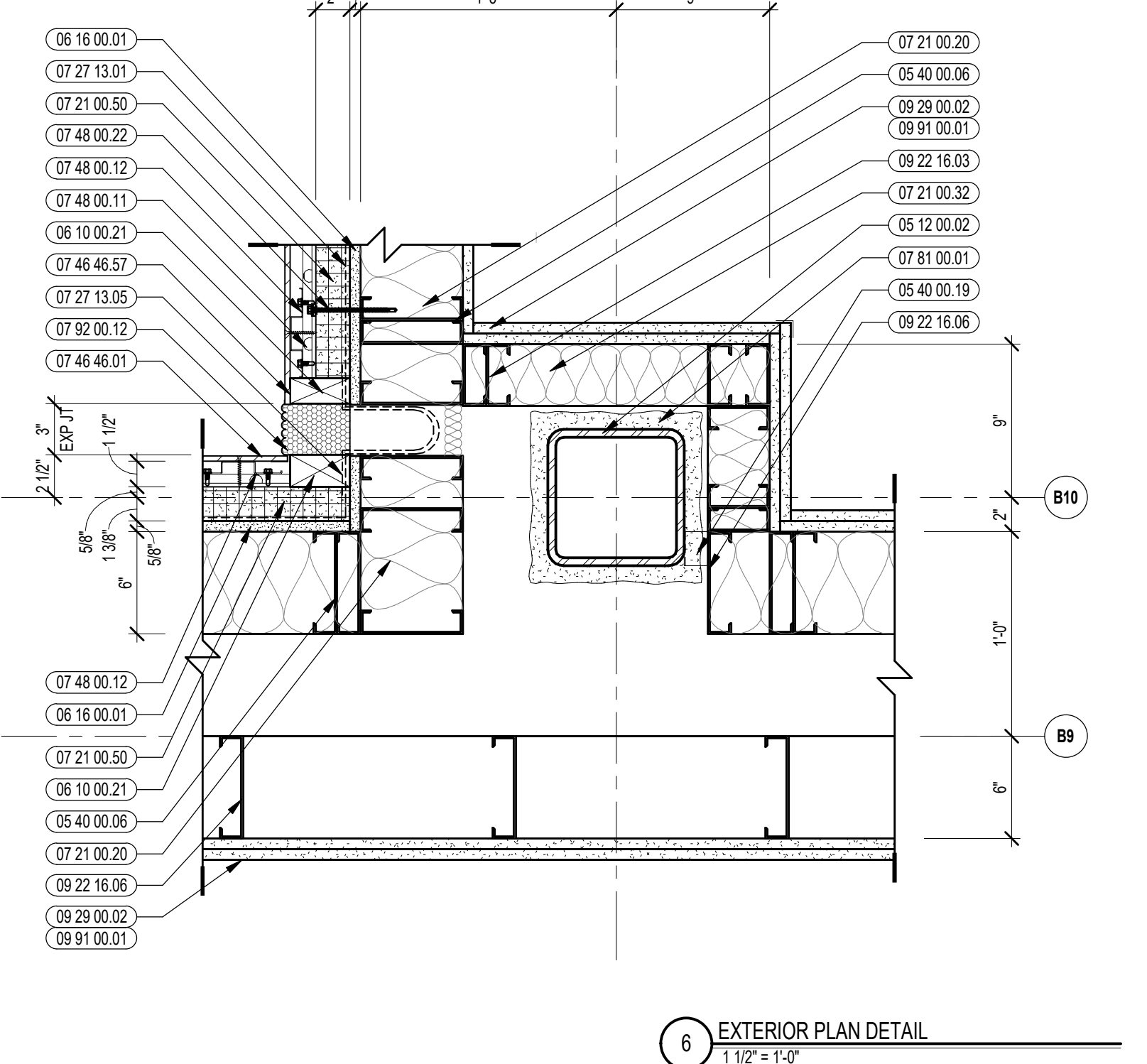
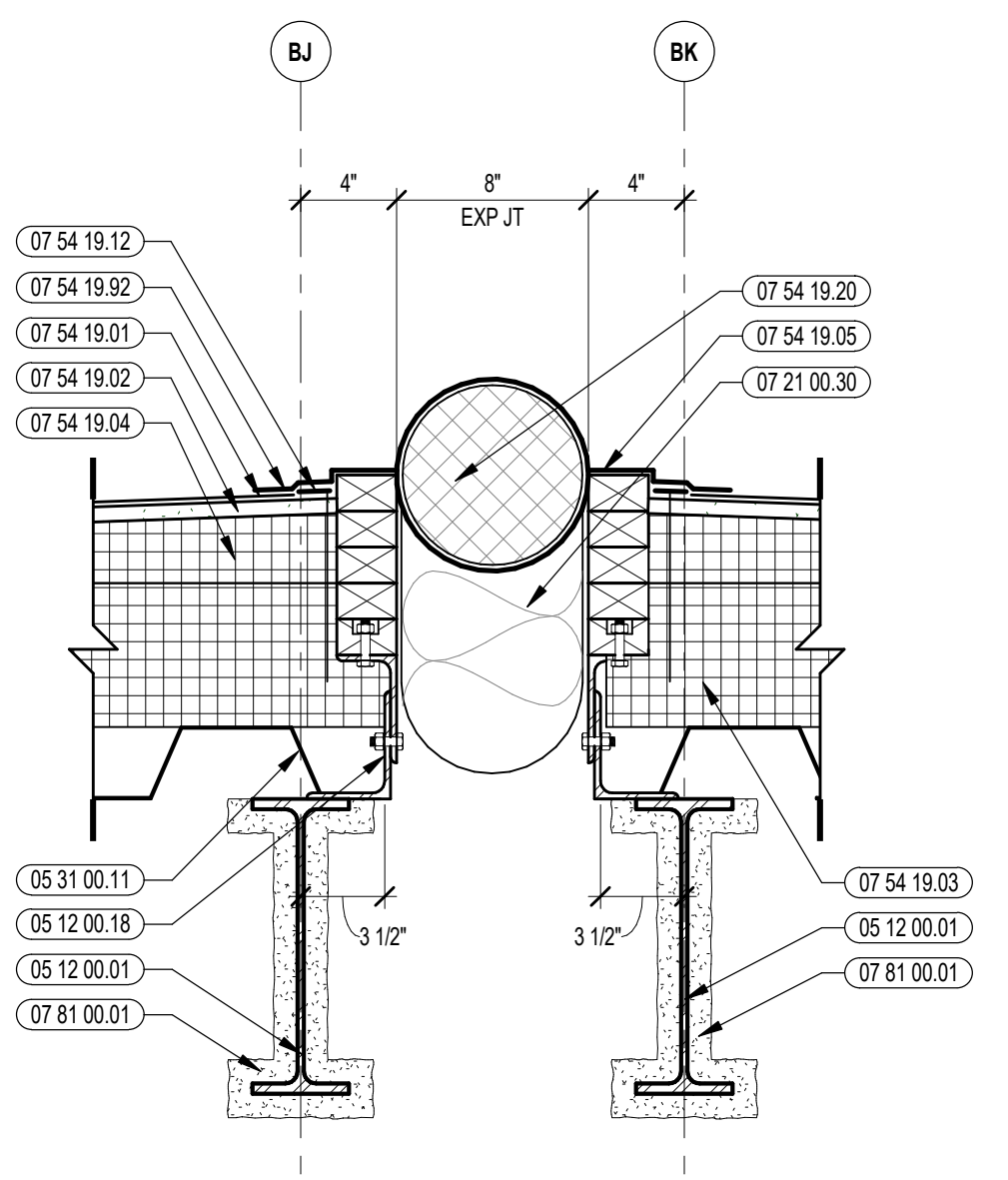
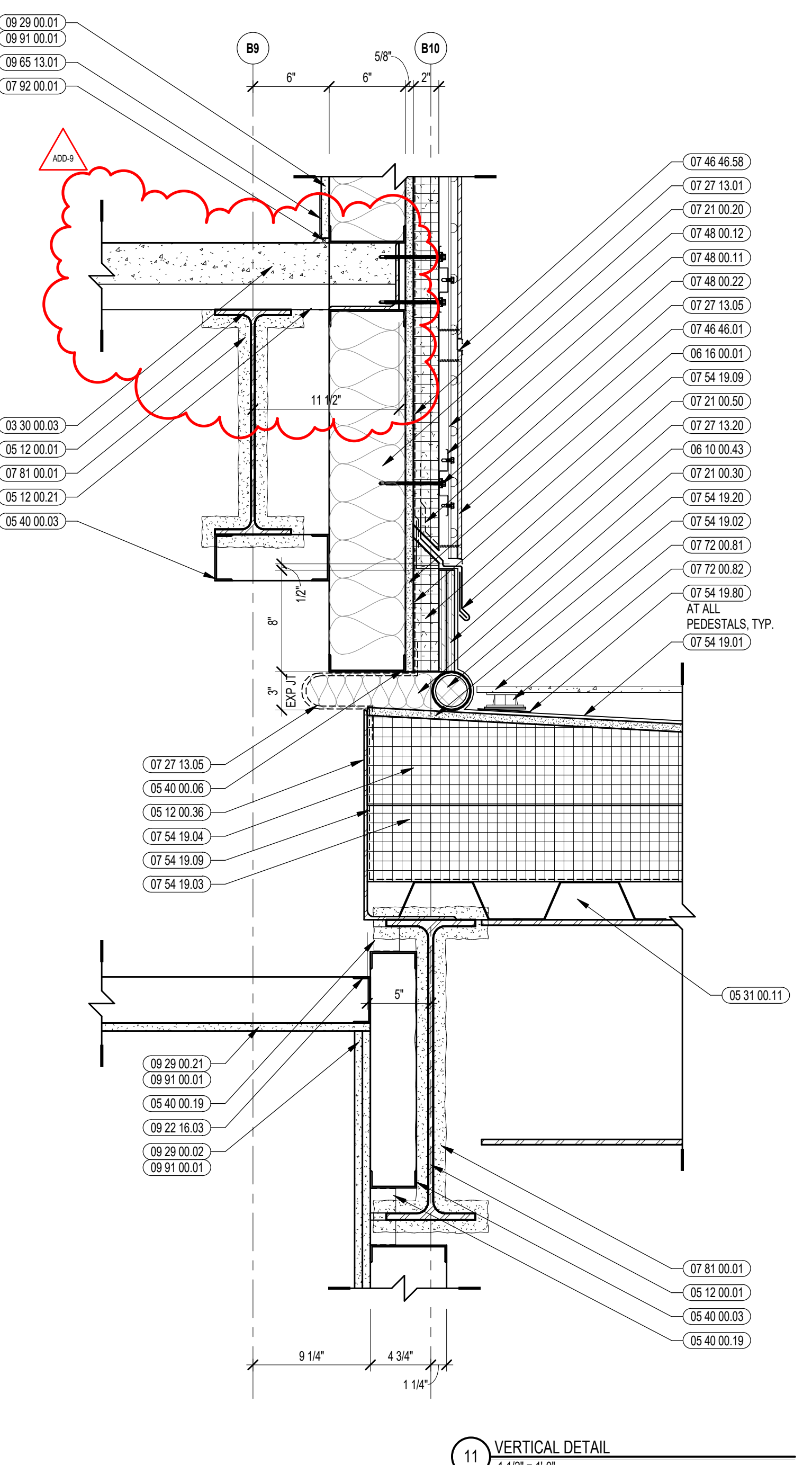
KEY PLAN NORTH ARROW



DRAWING NAME:

**EXPANSION JOINT DETAILS**

DRAWN BY: BFC  
 REVIEWED BY: CHR/KK  
 SCALE: AS INDICATED | DRAWING NUMBER:  
 JOB NO.: 2202.02  
 DATE: OCTOBER 13, 2023 **A5.51**





CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

- 03 30 00.01 CONCRETE
- 06 40 00.77 SLIDING GLASS DOOR SET - ALUMINUM TRACKS - PROVIDE LOCKS
- 09 64 53.01 HARDBOARD STAGE FLOORING
- 09 65 19.99 RTF - REFERENCE SCHEDULE AND SAMPLE PATTERNS FOR TYPE
- 09 65 38.01 STATIC-CONTROL COMPOSITE TILE
- 09 68 00.01 CARPET
- 09 91 00.01 PAINT - SEE SCHEDULE
- 10 44 00.01 FIRE EXTINGUISHER CABINET - FULLY RECESSED
- 10 44 00.04 FIRE EXTINGUISHER AND VALVE CABINET - FULLY RECESSED
- 10 44 00.11 FIRE EXTINGUISHER
- 11 52 03.01 PROJECTION SCREEN - TYPE 1
- 12 30 00.71 GROMMET - 3 INCH - PLASTIC
- 12 61 00.01 FIXED AUDIENCE SEAT

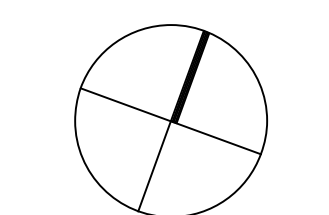
GENERAL NOTES:

1. NOT ALL POWER AND DATA OUTLET SWITCHING LOCATIONS SHOWN. COORDINATE WITH ELECTRICAL AND TECHNOLOGY DRAWINGS FOR ALL LOCATIONS.
2. REFER TO DETAILS ON A7.51 FOR FIRE EXTINGUISHER DETAILS AND MOUNTING HEIGHTS.
3. REFERENCE TOILET ACCESSORIES LEGEND AND SCHEDULE ON DRAWING A8.31 FOR ADDITIONAL INFORMATION.
4. WHERE EXPOSED, ALL STRUCTURAL MEMBERS & MEFPF SHALL RECEIVE PAINTED FINISH, U.N.O. HORIZONTAL PAINT TRANSITION LINE TO BE COORDINATED ON WALLS OF SPACES WITH EXPOSED DECKING.

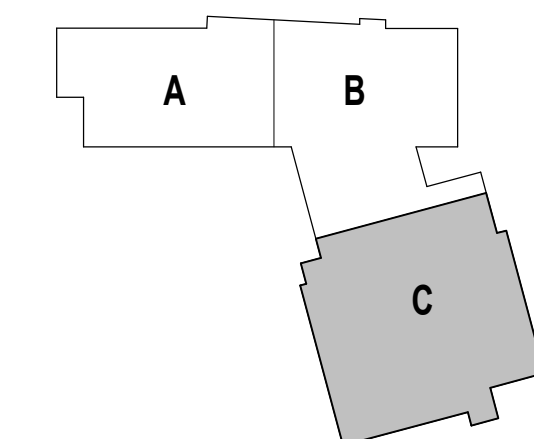
ADD-9 ADDENDUM #9 02.06.2024

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

AUDITORIUM ENLARGED PLAN

DRAWN BY: CHR / MCT

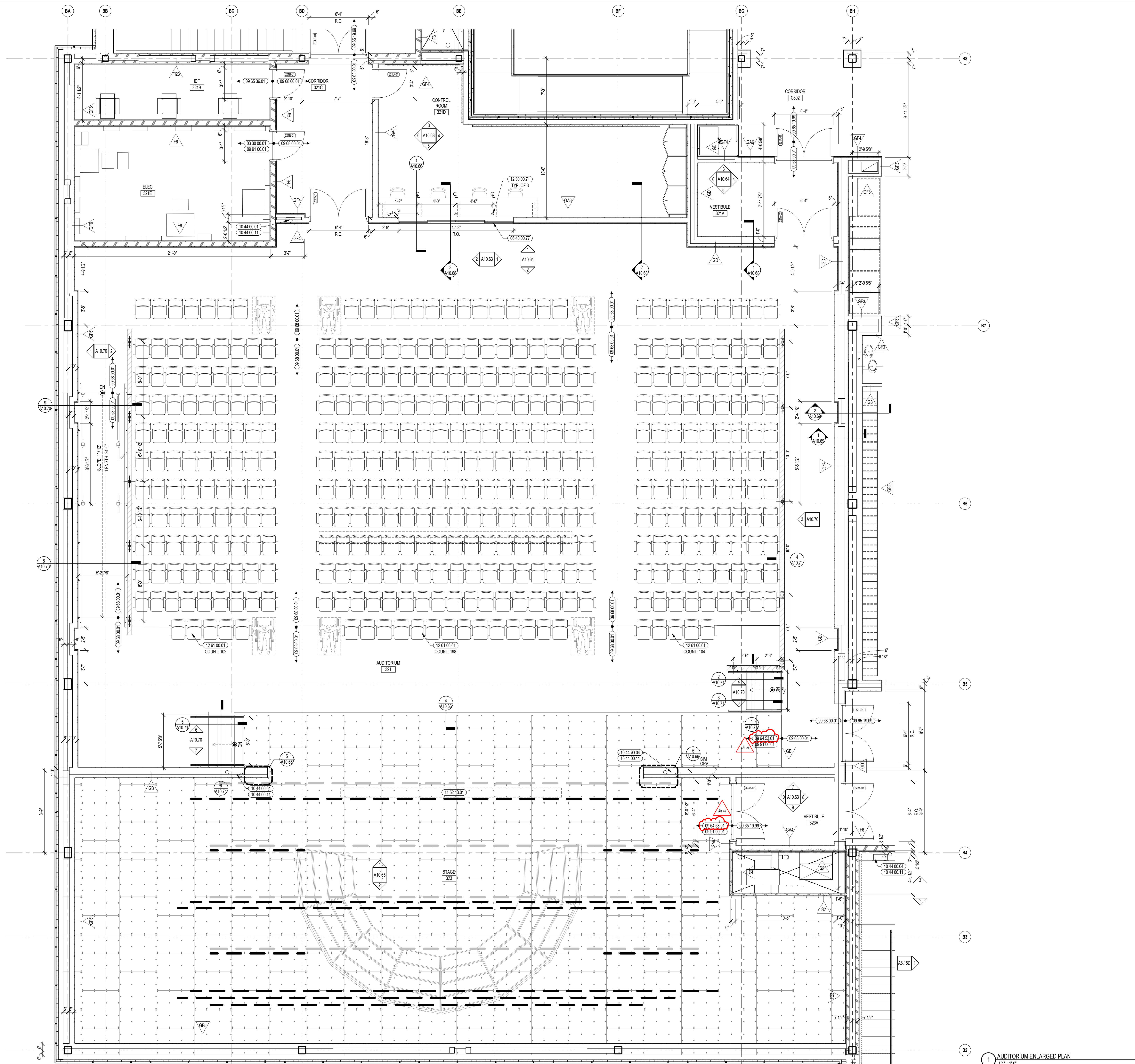
REVIEWED BY: CHR / KK

SCALE: AS INDICATED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

A10.61



1 AUDITORIUM ENLARGED PLAN  
1/4" = 1'-0"

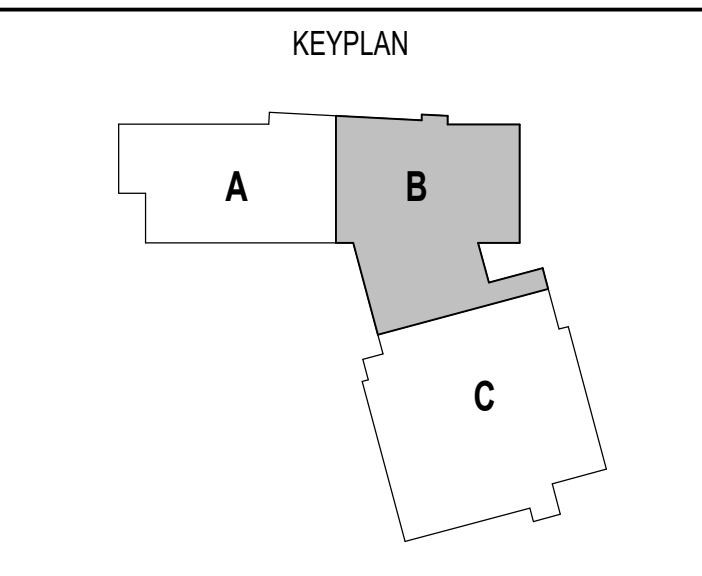
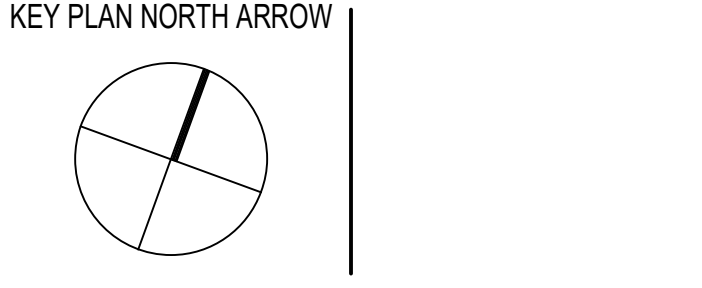
03 30 00.03	CONCRETE SLAB ON DECK - SEE STRUCTURAL
03 30 00.06	CONCRETE WALL - SEE STRUCTURAL
05 12 00.01	STEEL BEAM - SEE STRUCTURAL
05 31 00.01	COMPOSITE STEEL DECK - SEE STRUCTURAL
05 31 00.11	STEEL ROOF DECK - 3 INCH GALVANIZED - SEE STRUCTURAL
06 10 00.33	PLYWOOD - 5/8 INCH
06 10 00.34	PLYWOOD - 3/4 INCH
06 10 00.82	2X4 PRESSURE TREATED SLEEPERS - 16 INCHES O.C.
06 10 00.99	WOOD BLOCKING - SIZE AS NOTED OR DRAWN
06 20 00.04	HARDWOOD TRIM - SULLINGS - TRANSPARENT FINISH
06 20 00.05	HARDWOOD EDGES ON PLYWOOD - TRANSPARENT FINISH
06 20 00.25	PVC PANEL - 1/2 INCH THICK
06 20 00.33	HARDWOOD VENEER PLYWOOD - 3/4 INCH - TRANSPARENT FINISH
06 20 00.59	SHELF SUPPORT BRACKET
06 20 00.99	WOOD BLOCKING - SIZE AS NOTED OR DRAWN
06 40 00.77	SLIDING GLASS DOOR SET - ALUMINUM TRACKS - PROVIDE LOCKS
07 21 00.22	GLASS FIBER ACOUSTICAL BLANKET INSULATION - MATCH DEPTH OF STUD - UNFACED
07 81 00.01	CEMENTITIOUS FIREPROOFING
07 92 00.01	JOINT SEALANT - TYPE AS REQUIRED
09 22 16.02	METAL STUD 2-1/2 INCH - 16 INCHES O.C. MAX
09 22 16.03	METAL STUD 3-5/8 INCH - 16 INCHES O.C. MAX
09 22 16.06	METAL STUD 6 INCH - 16 INCHES O.C. MAX
09 22 16.31	ROCK WOOL
09 29 00.01	5/8 INCH GYPSUM BOARD - LEVEL 4 FINISH - 1 LAYER
09 29 00.02	5/8 INCH GYPSUM BOARD - LEVEL 4 FINISH - 2 LAYERS
09 29 00.04	5/8 INCH GYPSUM BOARD - LEVEL 4 FINISH - 2 LAYERS EACH SIDE
09 29 00.21	5/8 INCH GYPSUM BOARD - LEVEL 4 FINISH - SAG-RESISTANT
09 29 00.43	CORNER BEAD
09 29 00.99	GYPSUM BOARD SYSTEM - LEVEL 4 FINISH - REFER TO FLOOR PLANS AND WALL TYPES FOR COMPONENTS
09 51 00.51	ACT SUSPENSION SYSTEM
09 51 00.52	EDGE MOLDING SYSTEM
09 51 00.61	PENITRER EDGE TRIM SYSTEM - VERTICAL PROFILE - HEIGHT AS NOTED
09 51 00.99	ACOUSTICAL CEILING - REFERENCE REFLECTED CEILING PLANS FOR TYPE AND HEIGHT
09 64 53.01	HARDWOOD STAGE FLOORING
09 65 13.01	RUBBER BASE - 4 INCH
09 84 00.98	ACOUSTICAL PANEL - REFERENCE ELEVATIONS FOR TYPE AND SIZE
09 84 00.99	CONCEALED 2-CLIP MOUNTING SYSTEM
09 91 00.01	PAINT - SEE SCHEDULE

**GENERAL NOTES:**

- NOT ALL POWER AND DATA OUTLET/ SWITCHING LOCATIONS SHOWN. COORDINATE WITH ELECTRICAL AND TECHNOLOGY DRAWINGS FOR ALL LOCATIONS.
- REFER TO DETAILS ON A151 FOR FIRE EXTINGUISHER DETAILS AND MOUNTING HEIGHTS.
- REFERENCE TOILET ACCESSORIES LEGEND AND SCHEDULE ON DRAWING A8.31 FOR ADDITIONAL INFORMATION.
- WHERE EXPOSED, ALL STRUCTURAL MEMBERS & MEPP SHALL RECEIVE PAINTED FINISH, U.N.O. HORIZONTAL PAINT TRANSITION LINE TO BE COORDINATED ON WALLS OF SPACES WITH EXPOSED DECKING.

ADD-9 ADDENDUM #9 02.06.2024

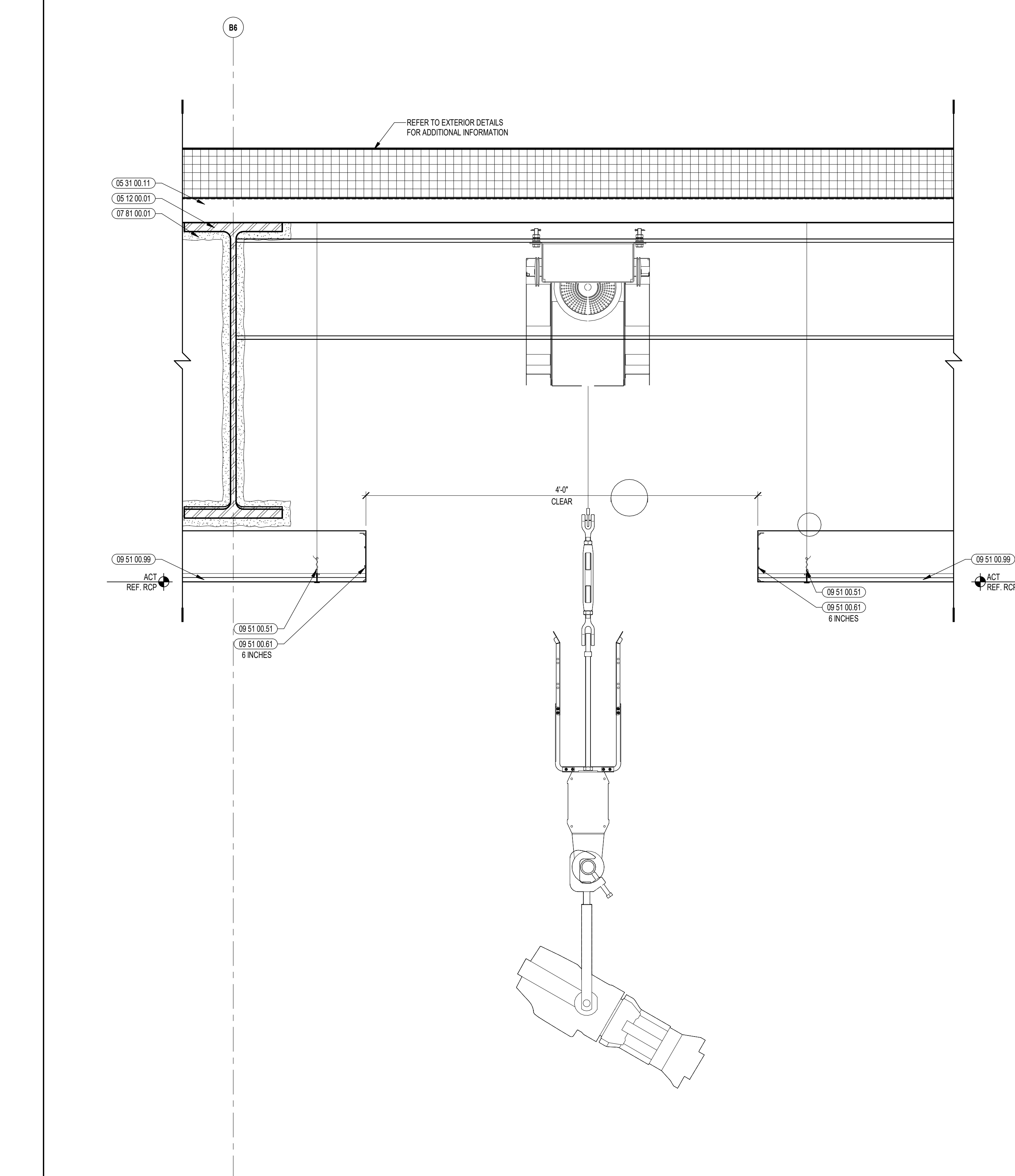
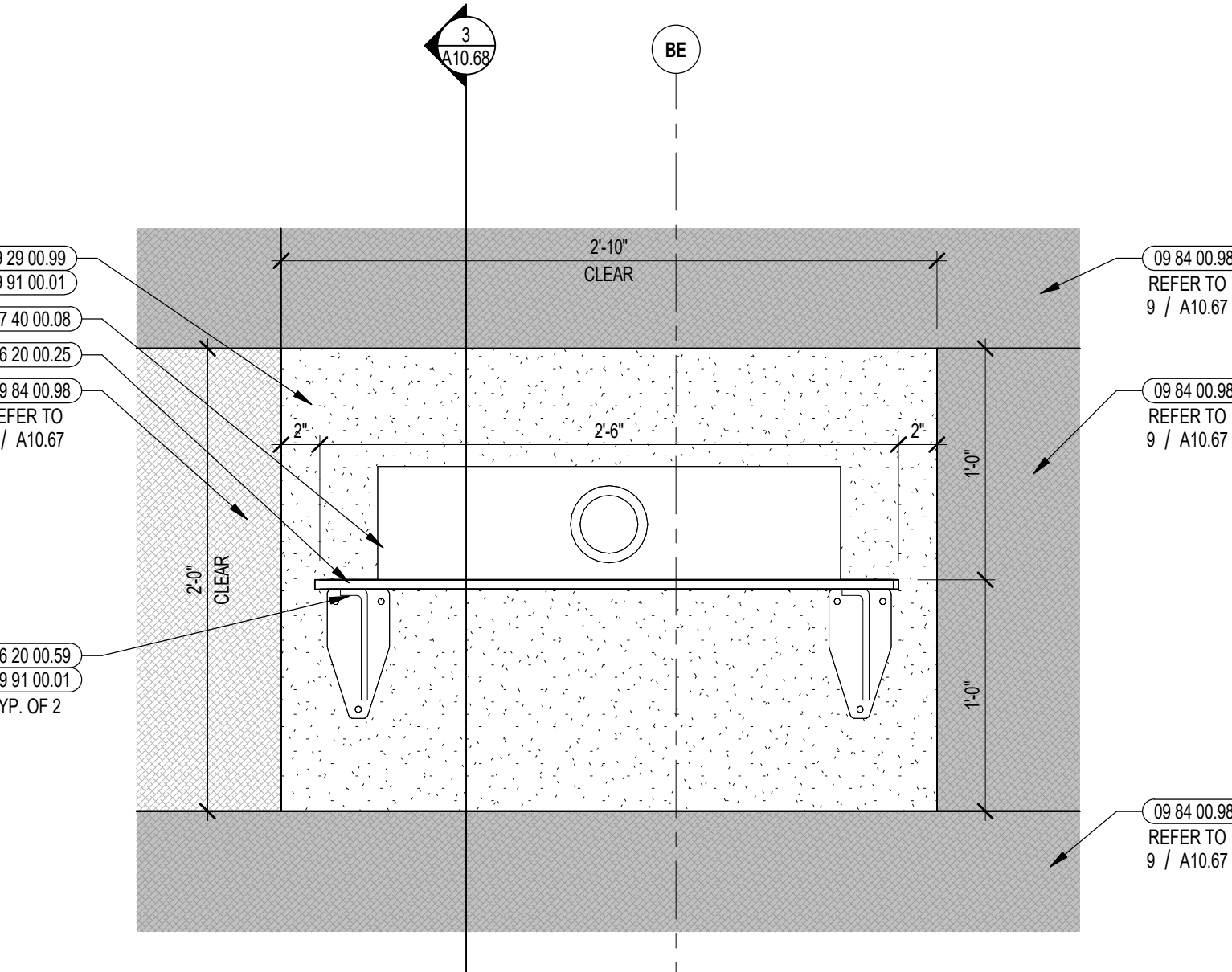
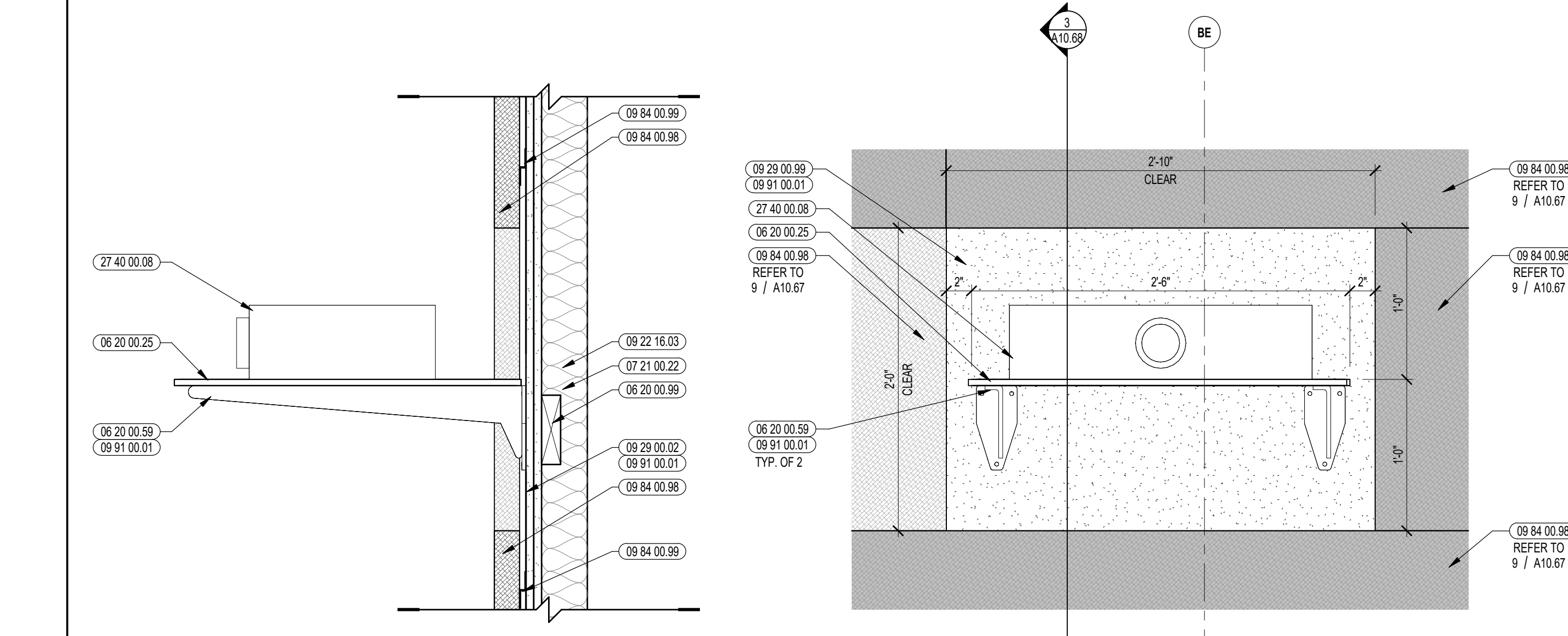
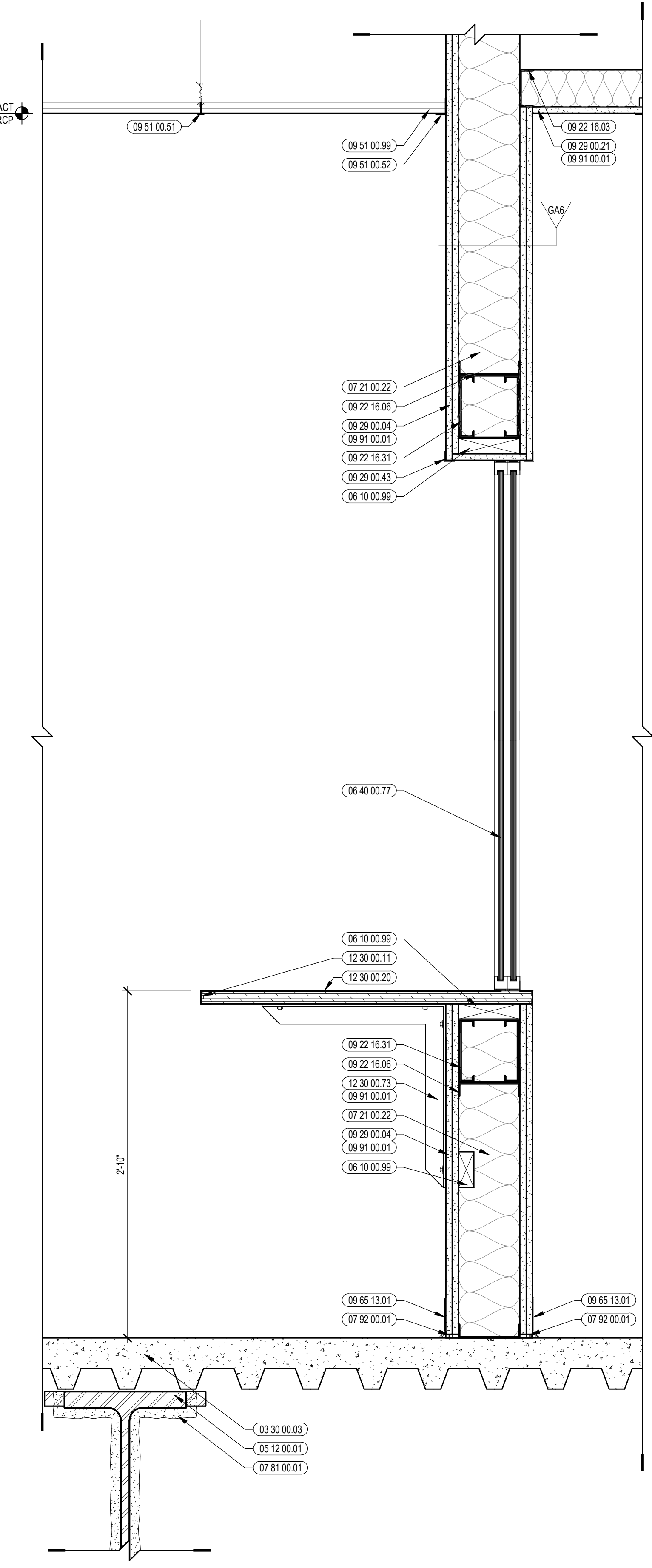
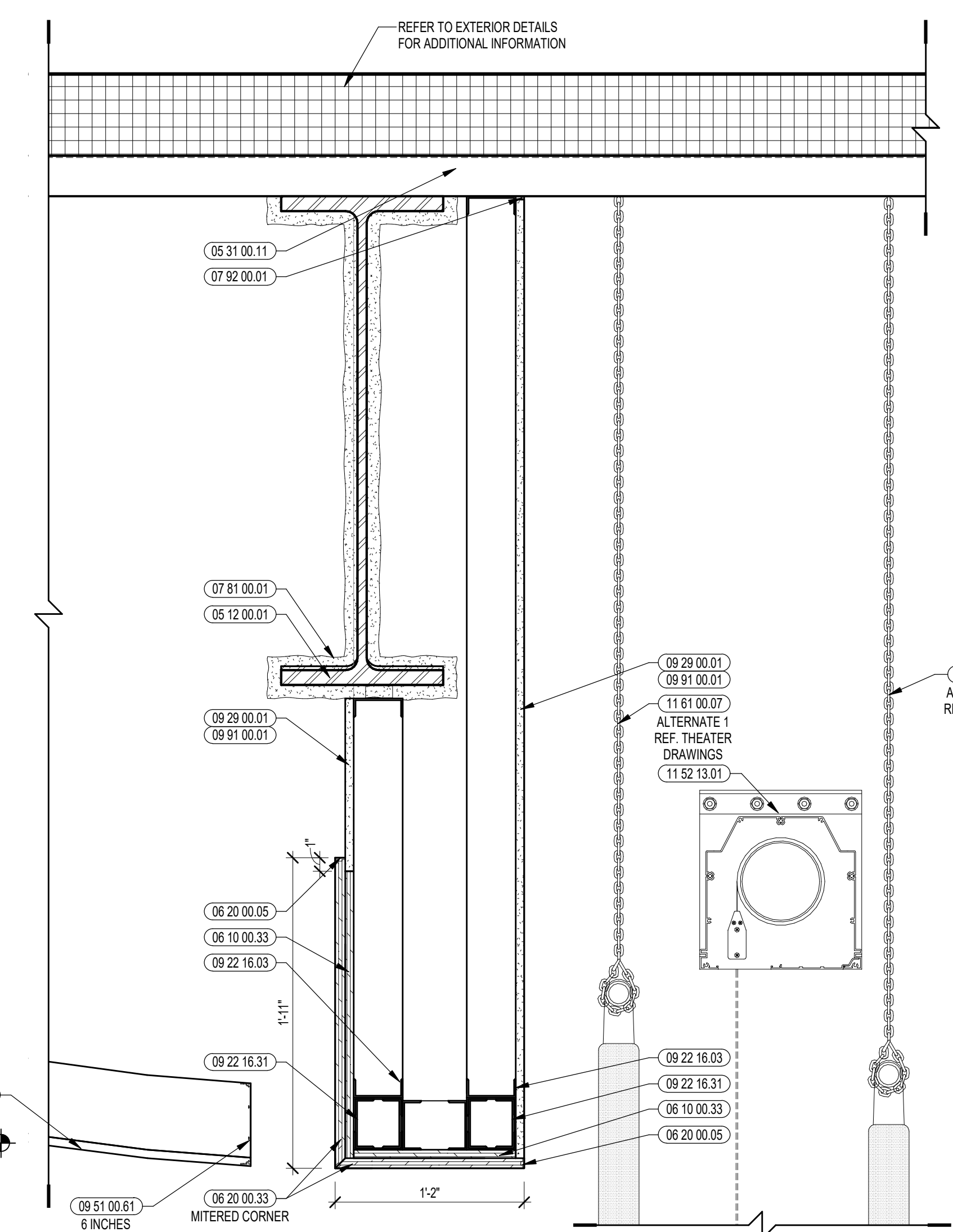
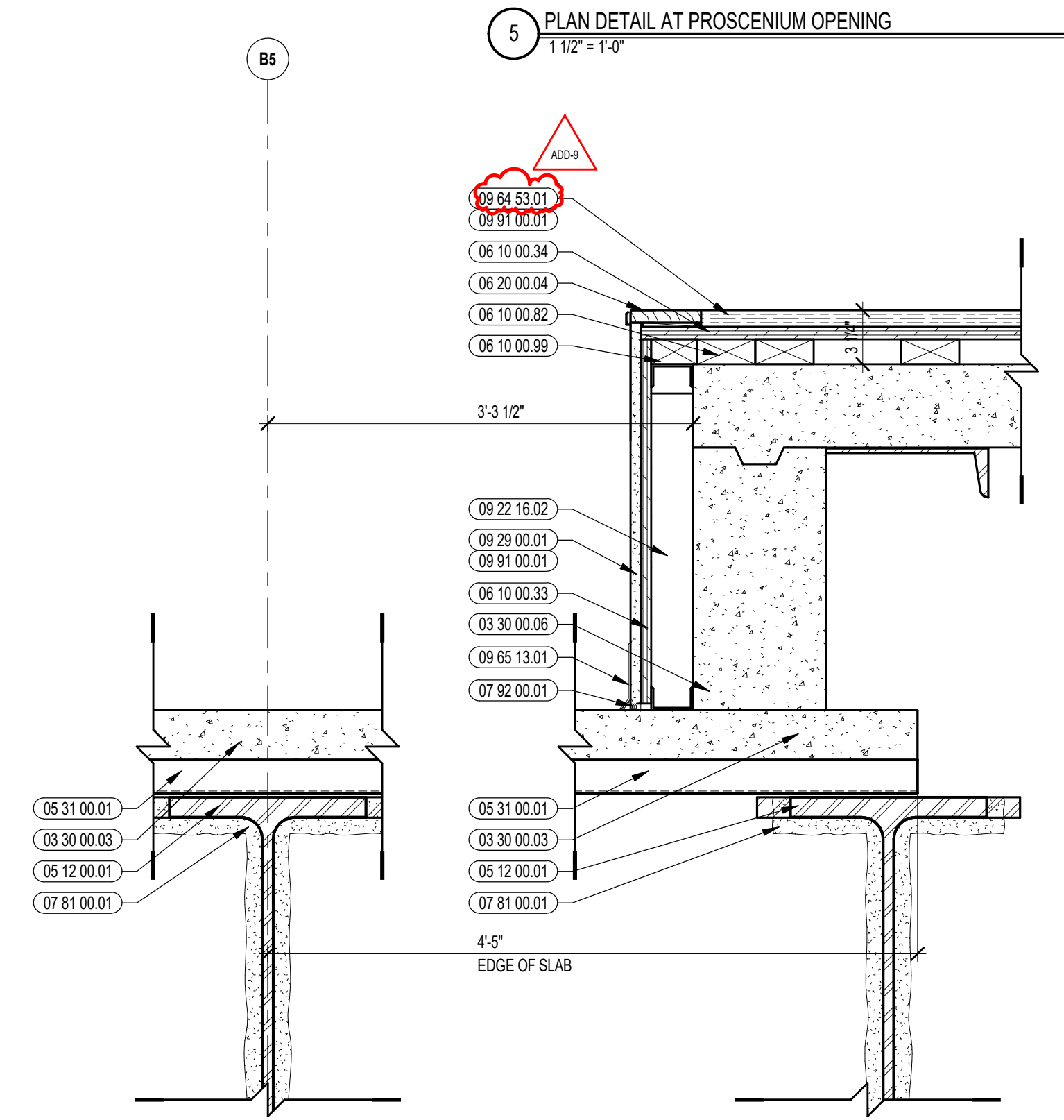
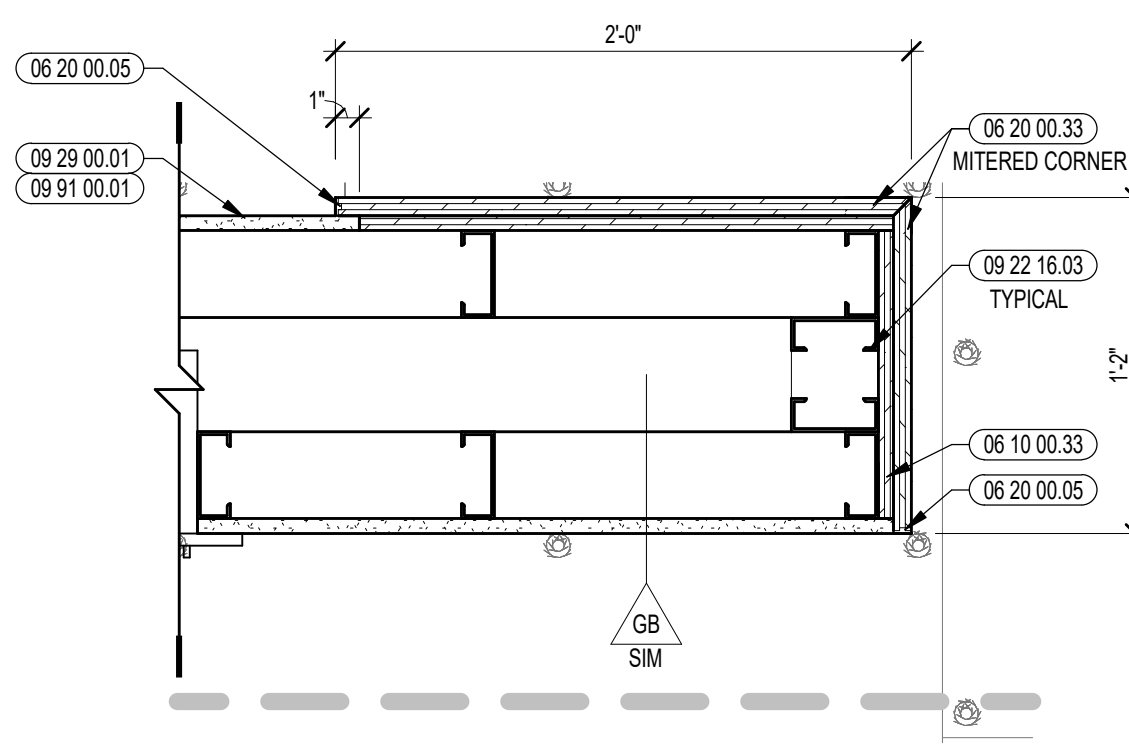
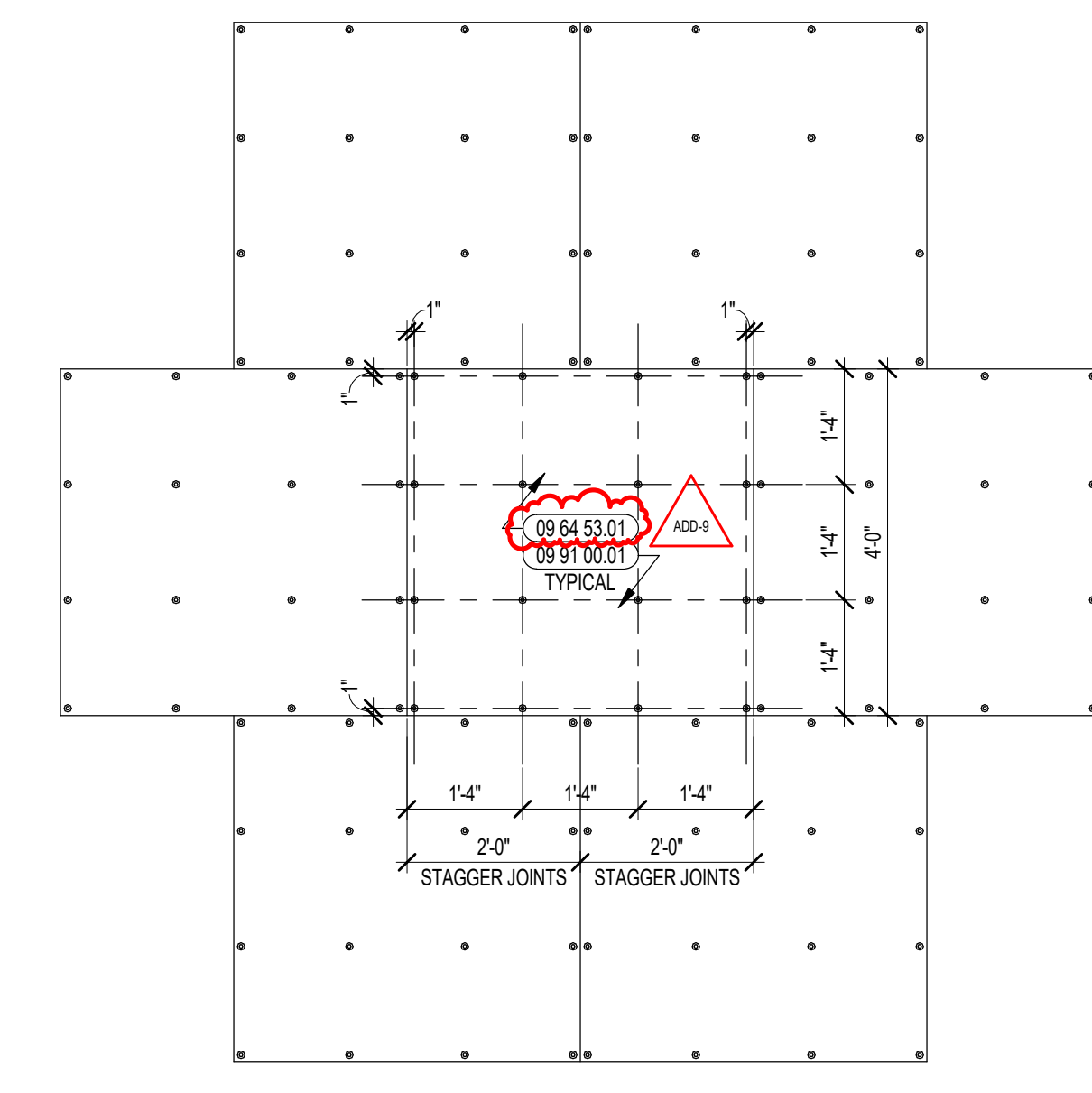
100% CONSTRUCTION DOCUMENTS



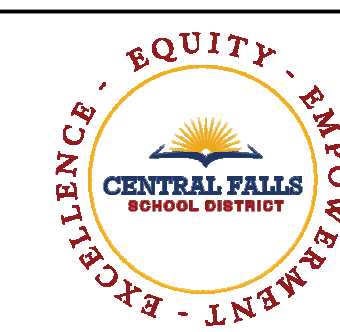
DRAWING NAME:  
**AUDITORIUM DETAILS**

DRAWN BY: CHR  
REVIEWED BY: CHR / KK

SCALE: AS INDICATED | DRAWING NUMBER:  
JOB NO.: 2202.02 | **A10.66**  
DATE: OCTOBER 13, 2023



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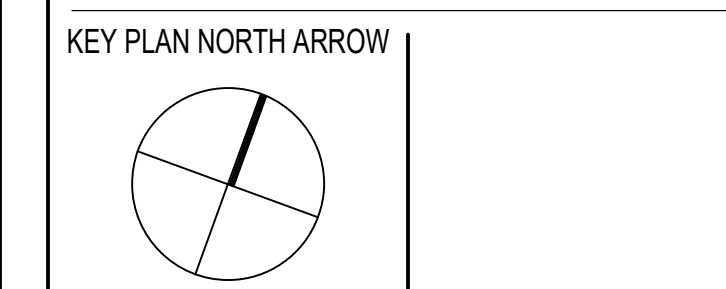
CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

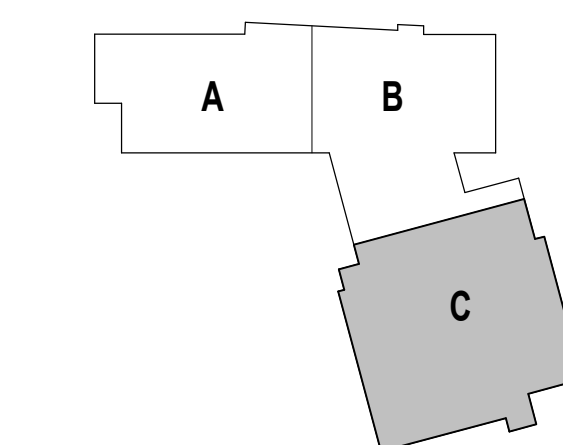
03 30 00 01	CONCRETE
03 30 00 03	CONCRETE SLAB ON DECK - SEE STRUCTURAL
03 30 00 06	CONCRETE WALL - SEE STRUCTURAL
05 12 00 01	STEEL BEAM - SEE STRUCTURAL
05 12 00 18	STEEL ANGLE CONTINUOUS - SEE STRUCTURAL
05 51 00 01	COMPOSITE STEEL DECK - SEE STRUCTURAL
05 51 00 02	POUR STOP - FLOOR SLAB - SEE STRUCTURAL
05 50 00 22	STEEL TUBE - SIZE AS NOTED OR DRAWN
05 50 00 41	STEEL PLATE - 1/4 INCH THICK - SIZE AS NOTED OR DRAWN
05 50 00 82	EXPANSION BOLT
05 51 00 01	STEEL PAN TREAD AND RISER
05 51 00 07	STEEL TUBE STRINGER
05 51 00 10	STEEL ANGLE CONTINUOUS
05 51 00 32	STAINLESS STEEL INTERMEDIATE HANDRAIL WITH POSTS ANCHORED TO FLOOR
05 51 00 33	STAINLESS STEEL PIPE HANDRAIL - 1-1/2 INCH O.D.
05 51 00 34	STAINLESS STEEL HANDRAIL BRACKET
06 10 00 33	PLYWOOD - 5/8 INCH
06 10 00 34	PLYWOOD - 3/4 INCH
06 10 00 82	2X4 PRESSURE TREATED SLEEPERS - 16 INCHES O.C.
06 10 00 99	WOOD BLOCKING - SIZE AS NOTED OR DRAWN
06 20 00 03	HARDWOOD TRIM - EASED EDGE 1/4 INCH RADIUS - TRANSPARENT FINISH
06 20 00 04	HARDWOOD TRIM - BULLNOSE - TRANSPARENT FINISH
06 20 00 19	STAINLESS STEEL BOLTS - NUTS AND WASHERS - SIZE AS NOTED
06 20 00 99	WOOD BLOCKING - SIZE AS NOTED OR DRAWN
07 81 00 01	CEMENTITIOUS FIREPROOFING
07 92 00 01	JOINT SEALANT - TYPE AS REQUIRED
07 92 00 02	BACKER ROD AND SEALANT - TYPE AS REQUIRED
09 22 16 02	METAL STUD 2-1/2 INCH - 16 INCHES O.C. MAX
09 22 16 03	METAL STUD 3-5/8 INCH - 16 INCHES O.C. MAX
09 29 00 01	5/8 INCH GYPSUM BOARD - LEVEL 4 FINISH - 1 LAYER
09 29 00 03	5/8 INCH GYPSUM BOARD - LEVEL 4 FINISH - 1 LAYER EACH SIDE
09 29 00 99	GYPSUM BOARD SYSTEM - LEVEL 4 FINISH - REFER TO FLOOR PLANS AND WALL TYPES FOR COMPONENTS
09 64 53 01	HARDBOARD STAGE FLOORING
09 64 66 02	RUBBER COVE WALL BASE - VENTED
09 65 13 01	RUBBER BASE - 4 INCH
09 68 00 12	METAL CARPET REDUCING STRIP
09 91 00 01	PAINT - SEE SCHEDULE

ADD-9 ADDENDUM #9 02.06.2024  
ADD-6 ADDENDUM #6 01.23.2024

100% CONSTRUCTION DOCUMENTS



KEYPLAN



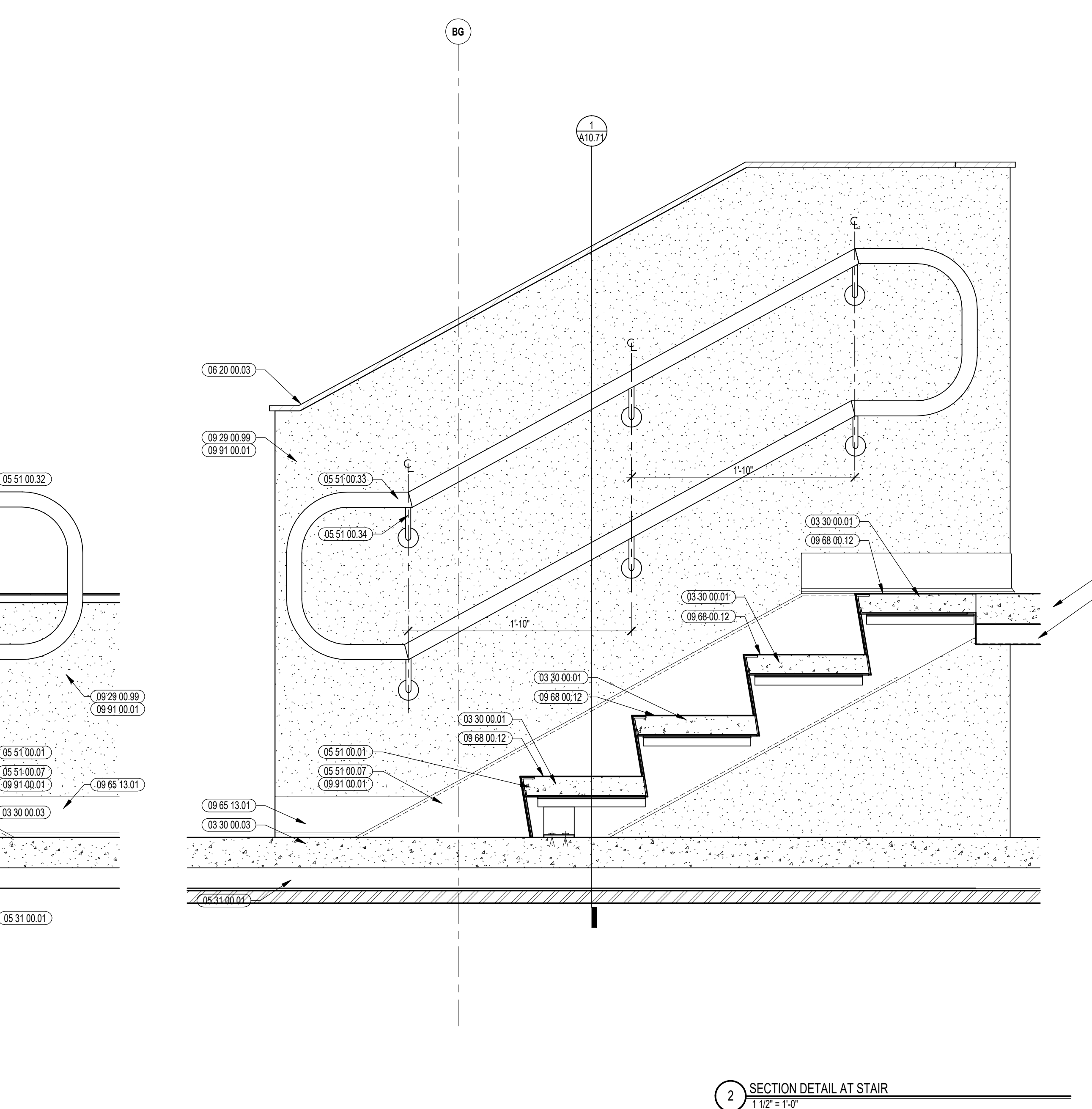
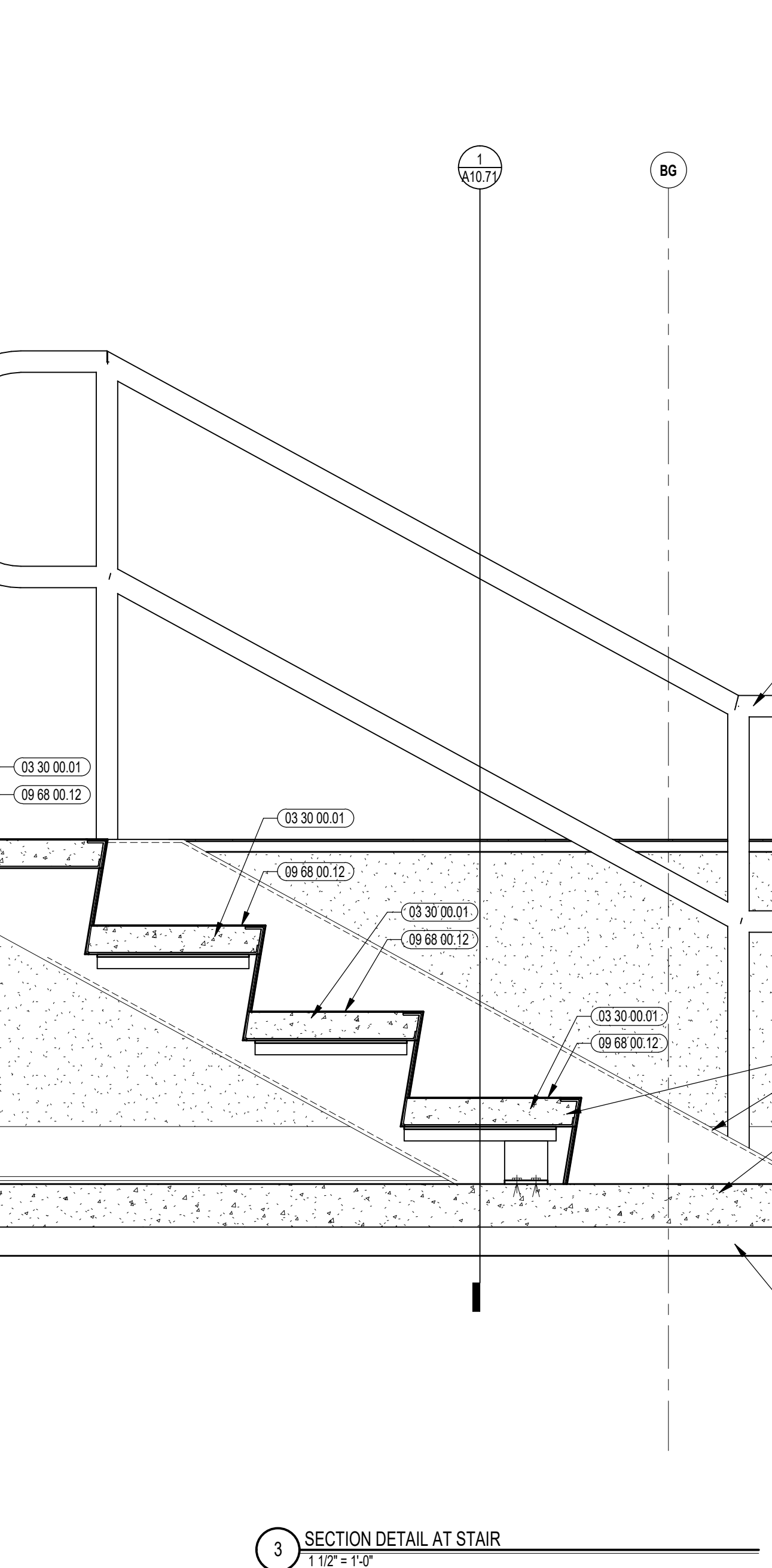
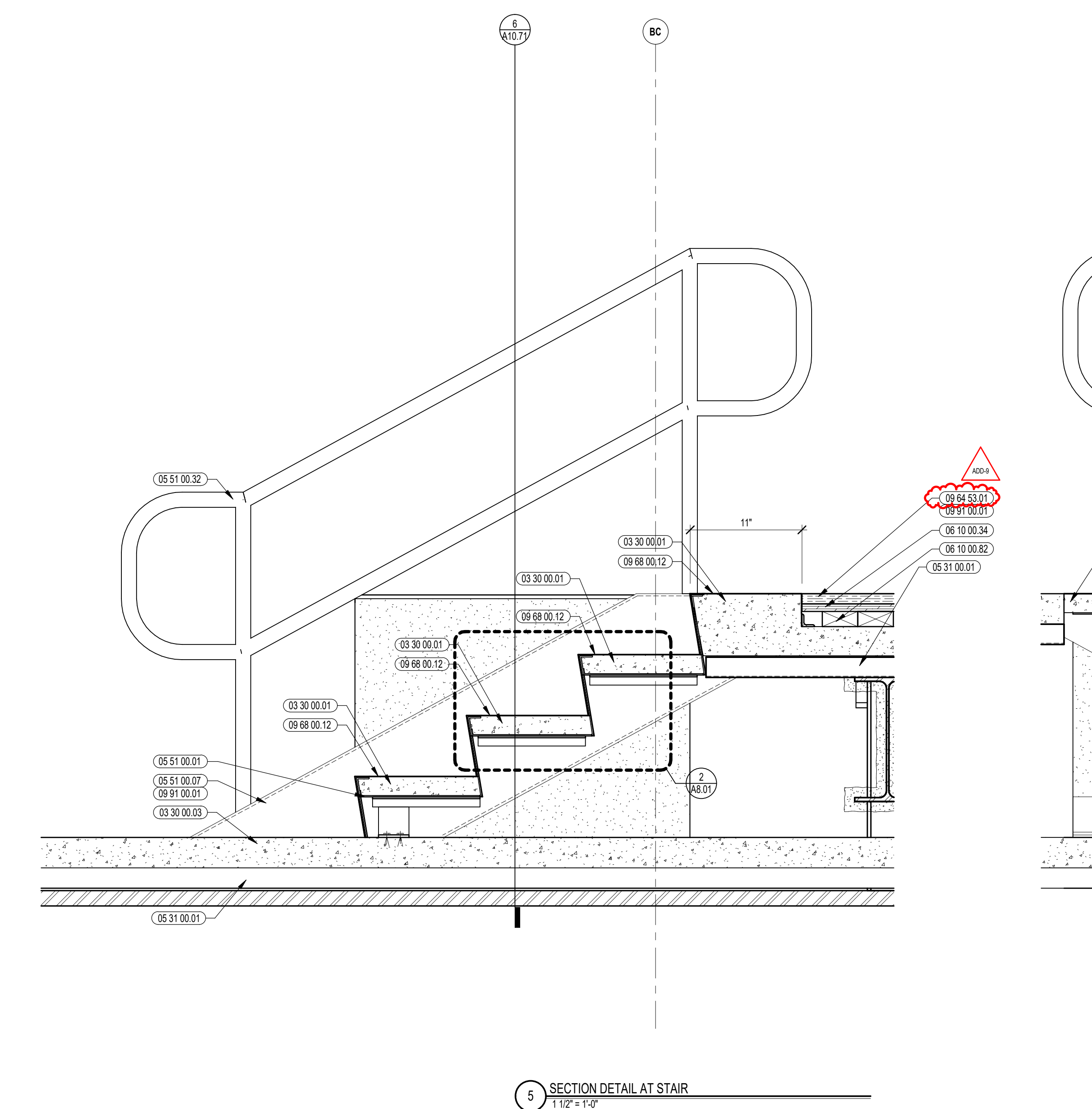
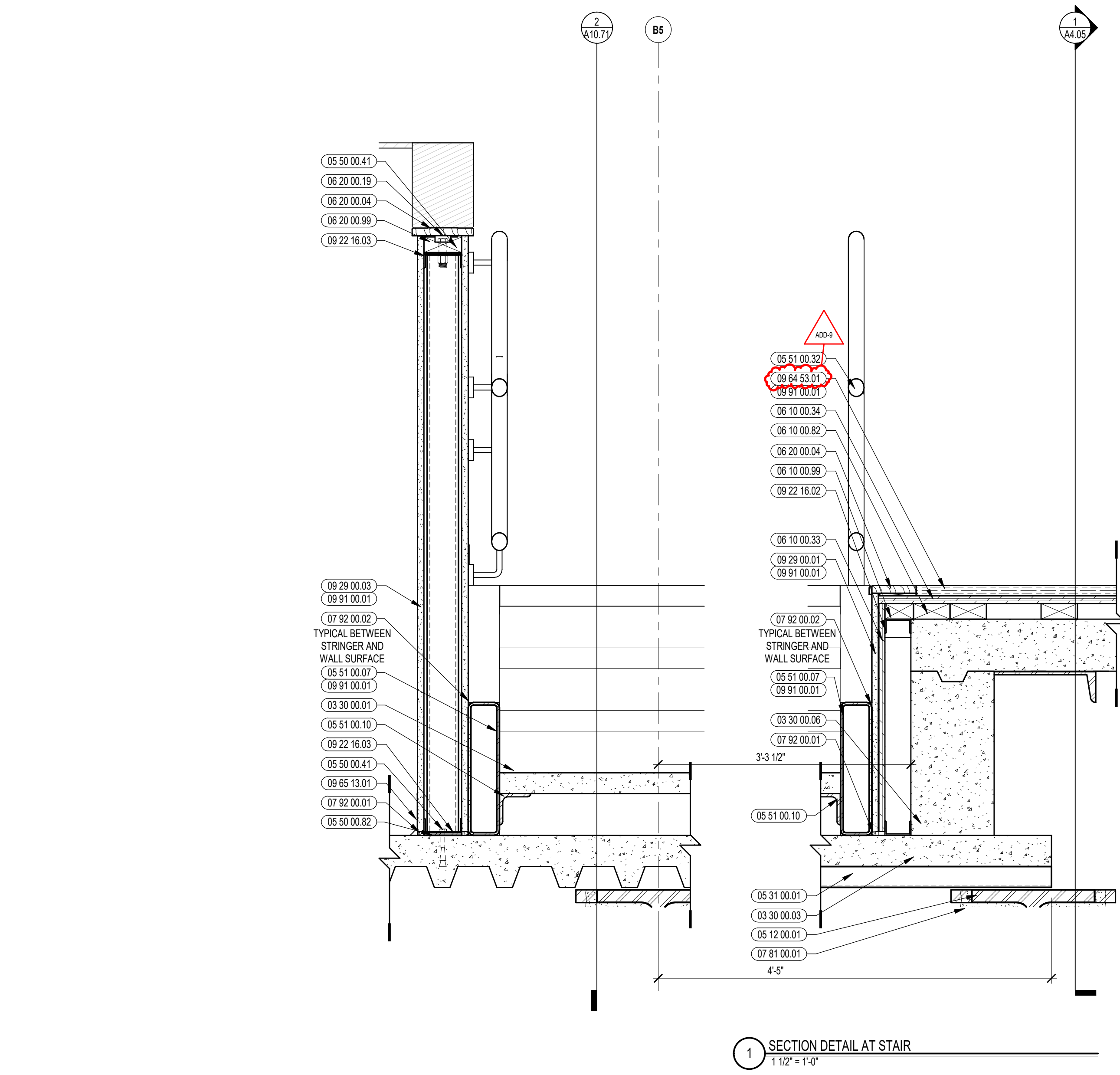
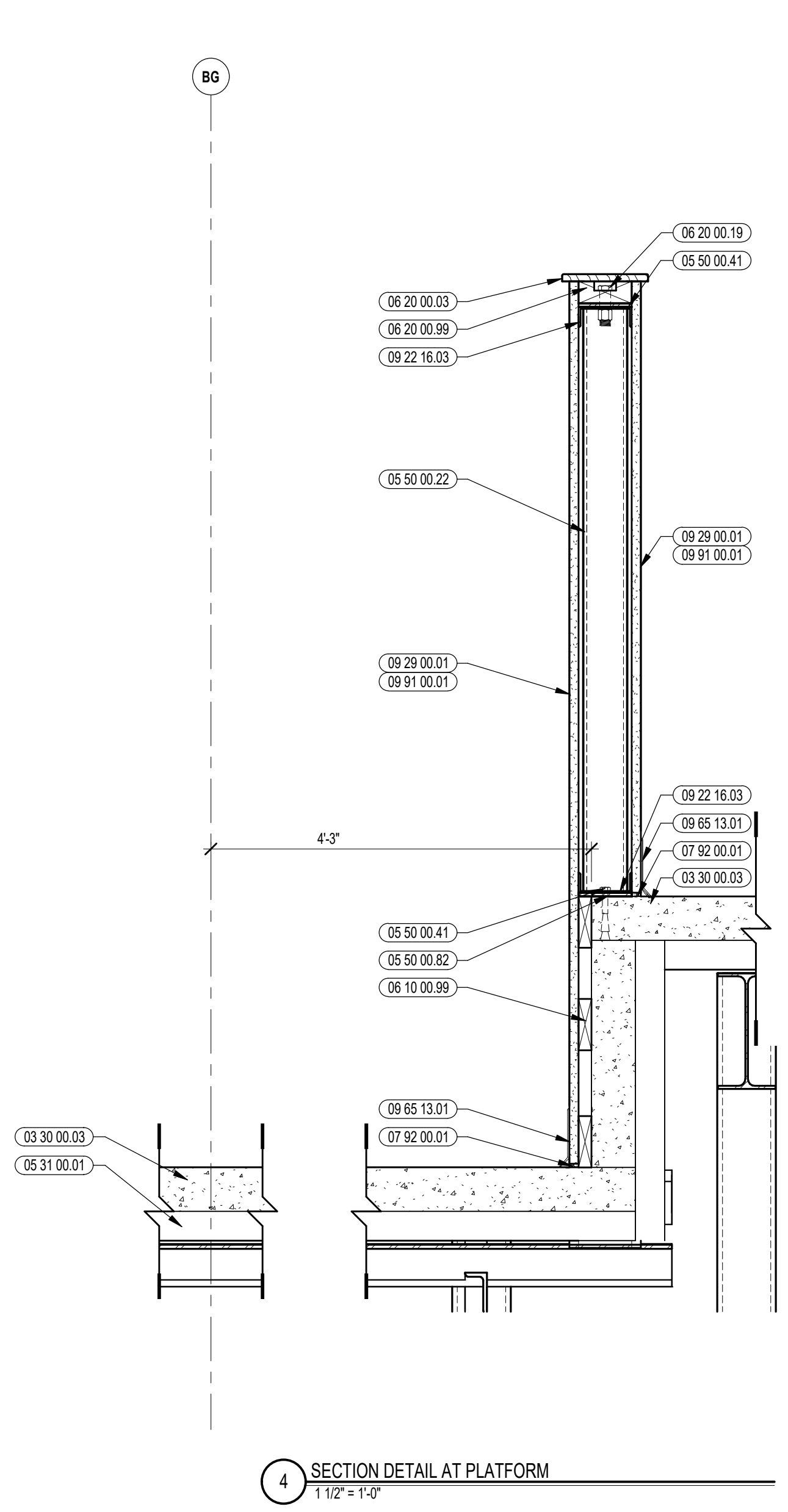
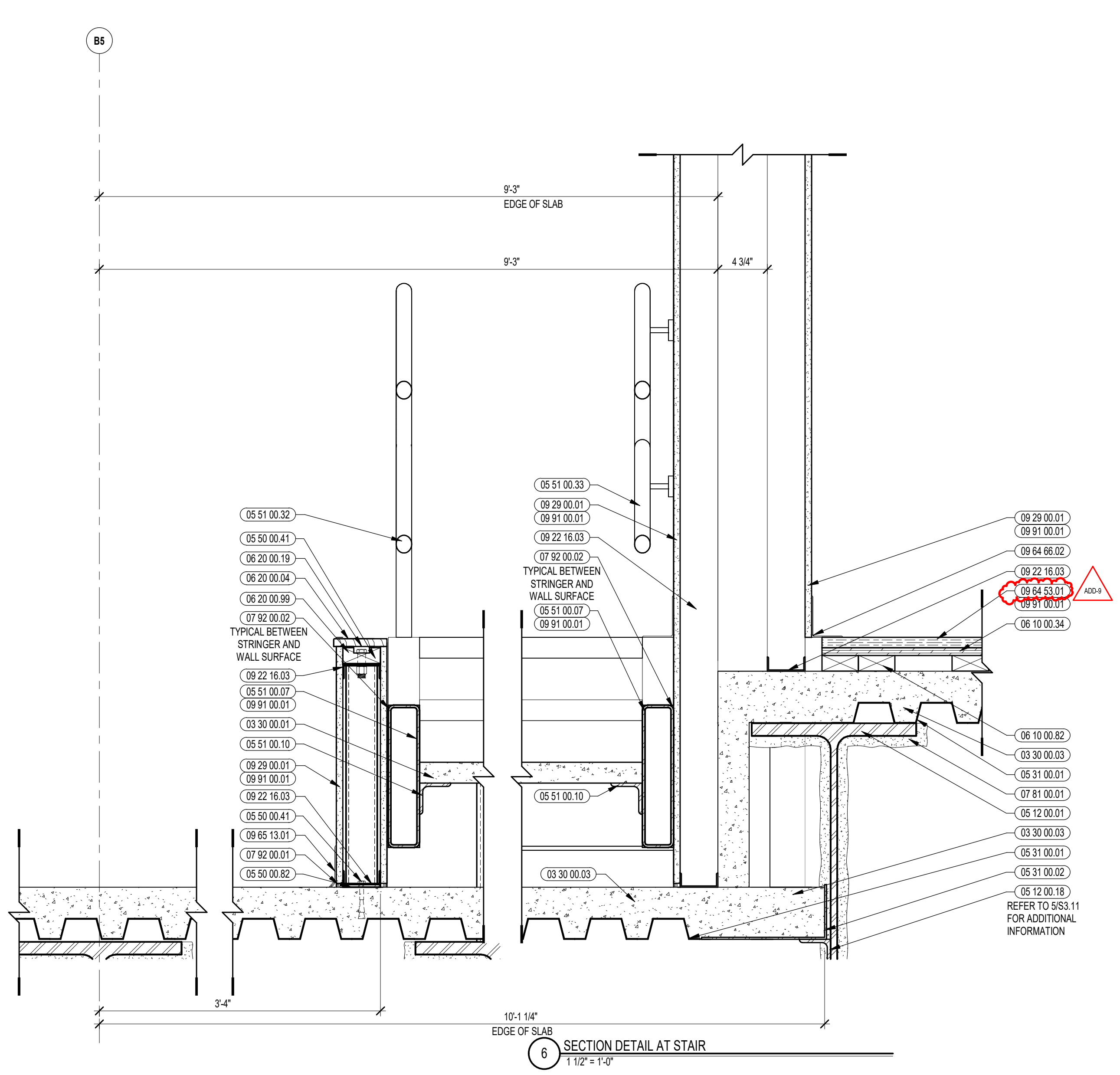
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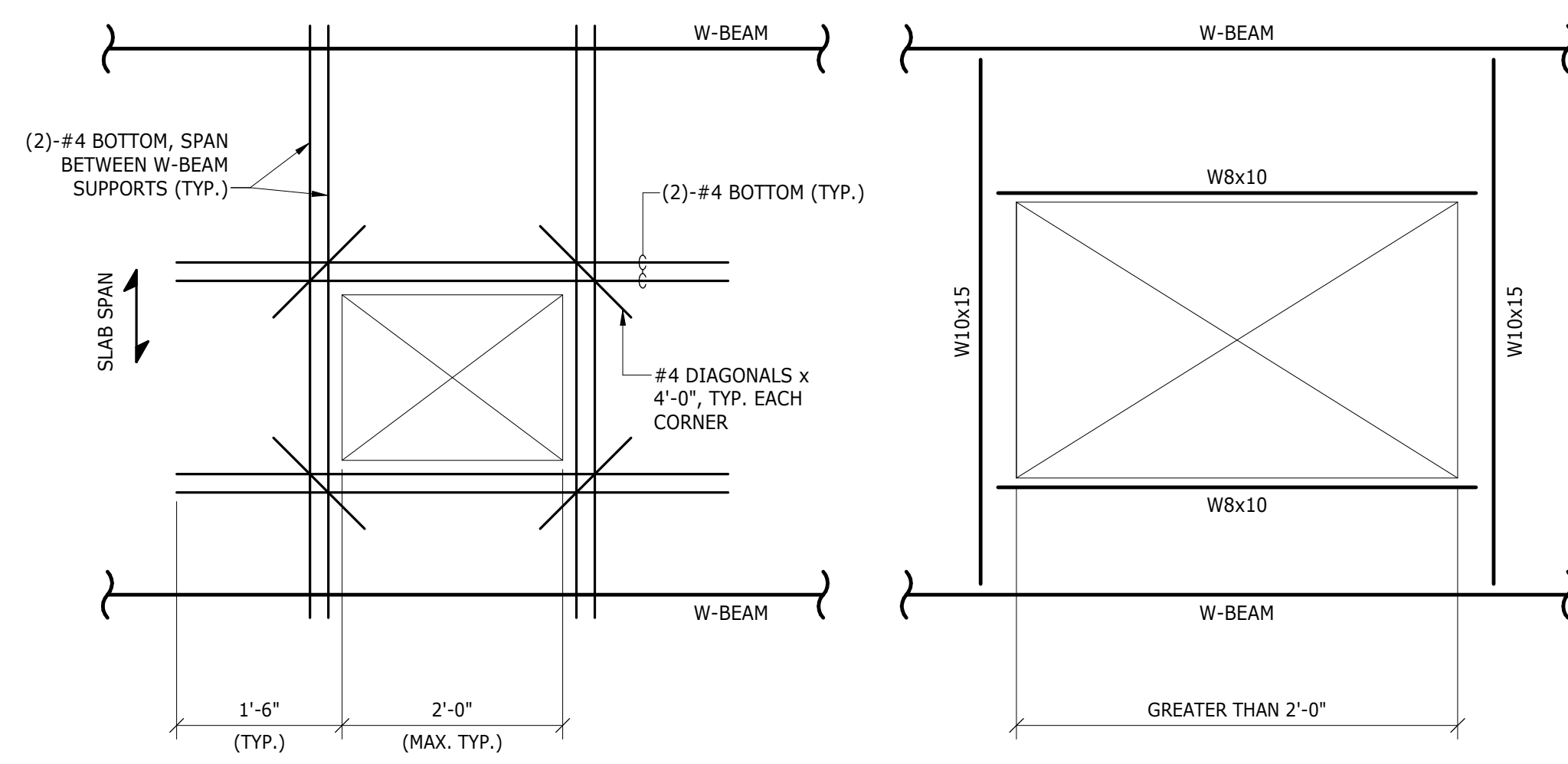
AUDITORIUM STAIR & GUARDRAIL DETAILS

DRAWN BY: CHR

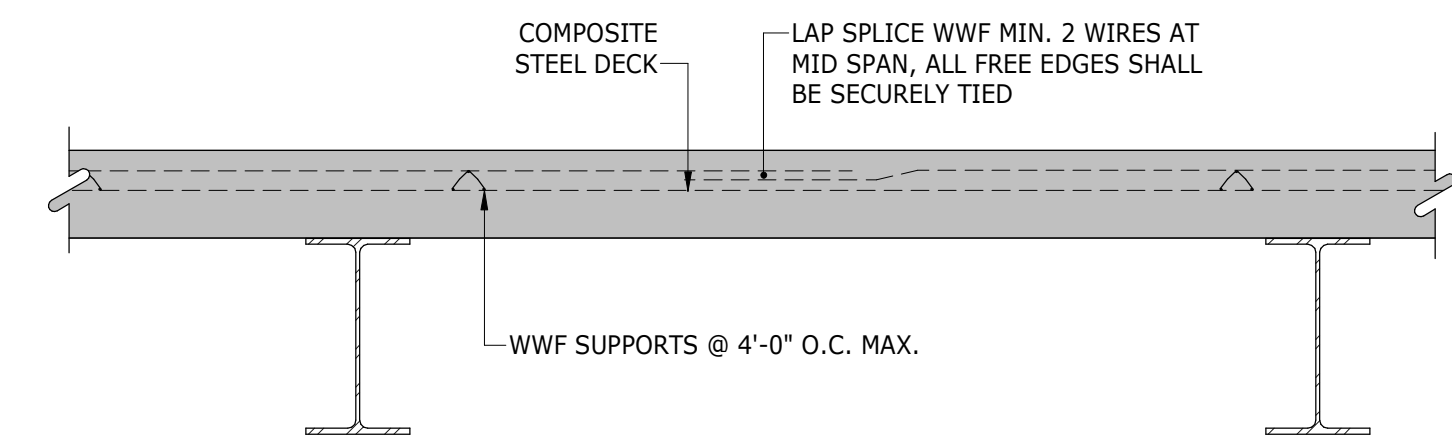
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JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 A10.71

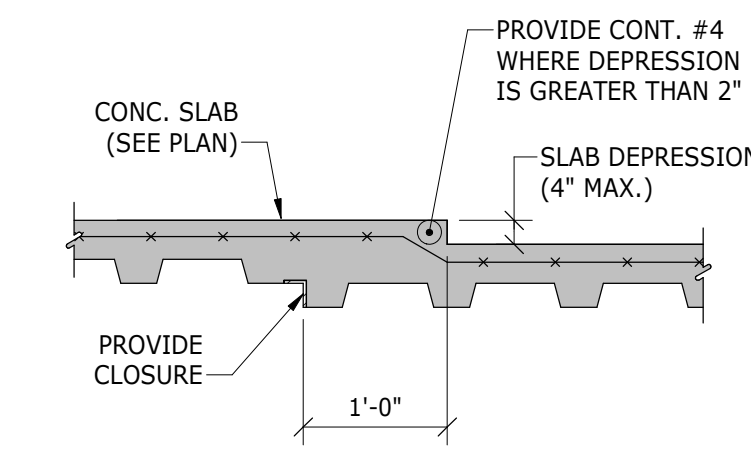




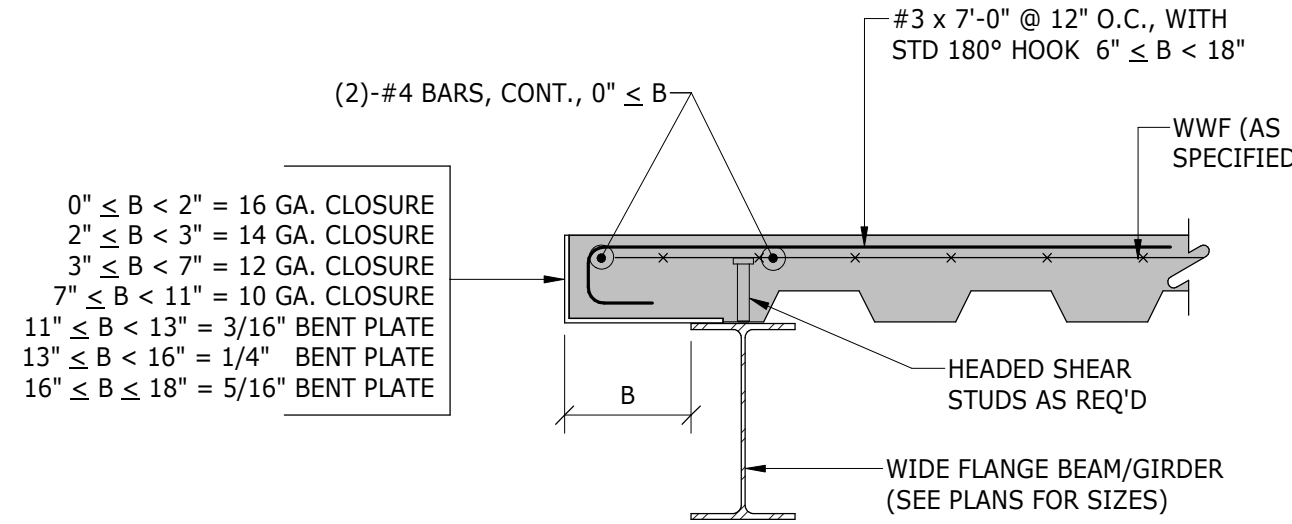
**TYPICAL OPENINGS IN SLAB**  
NOT TO SCALE



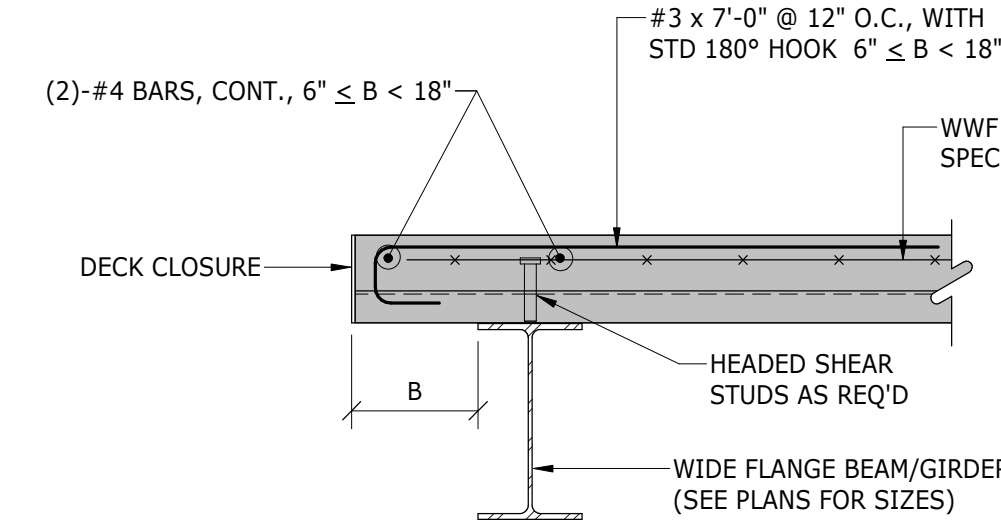
**INTERIOR - TYPICAL**



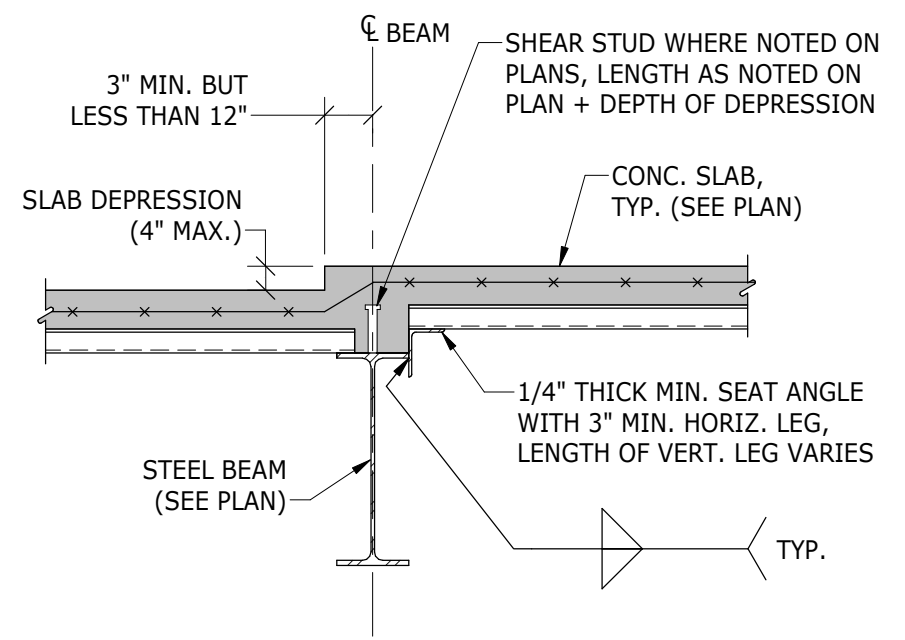
**DECK PARALLEL**



**SLAB EDGE DETAIL**  
(DECK PARALLEL TO BEAM SPAN)



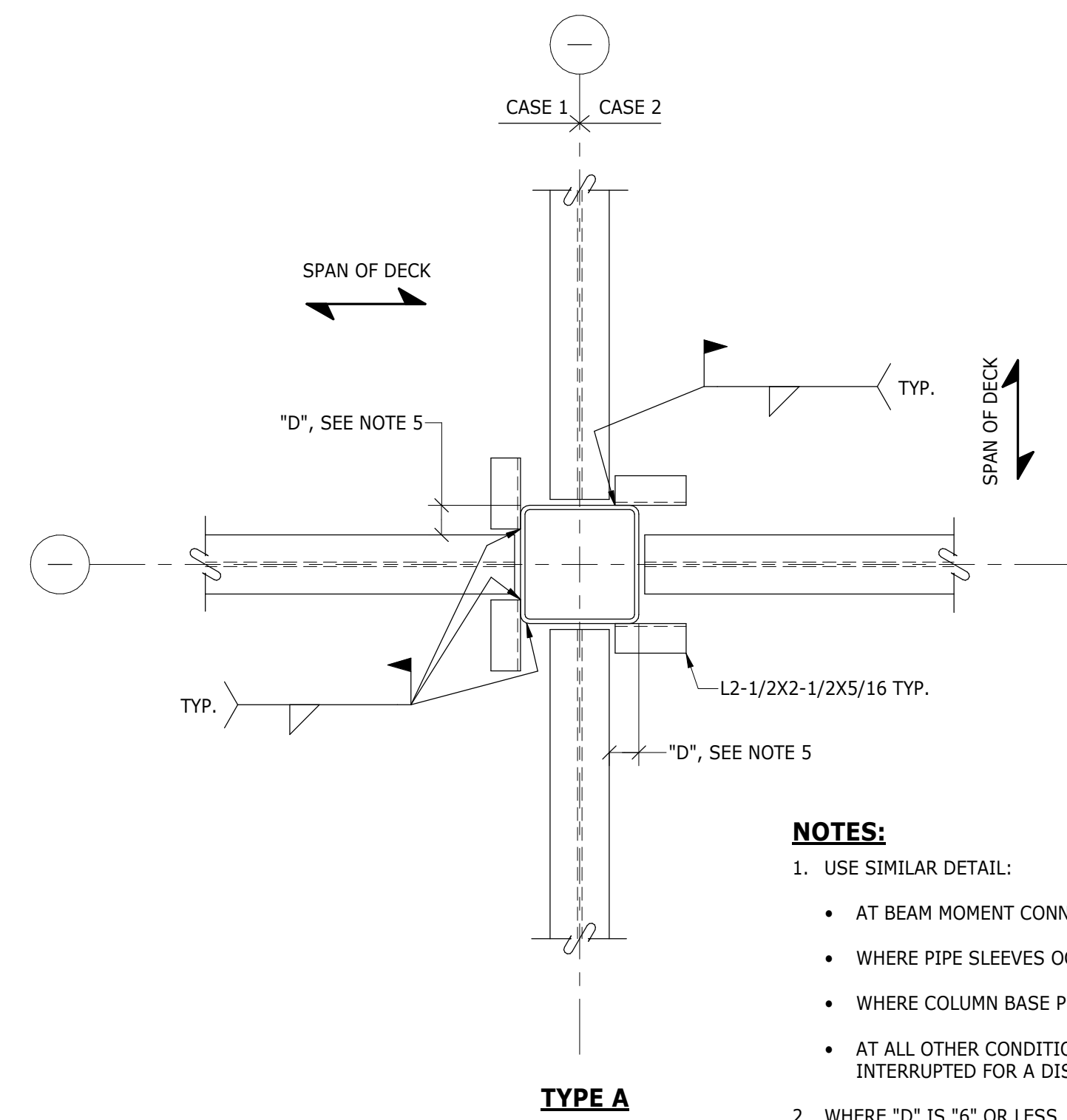
**SLAB EDGE DETAIL**  
(DECK PERPENDICULAR TO BEAM SPAN)



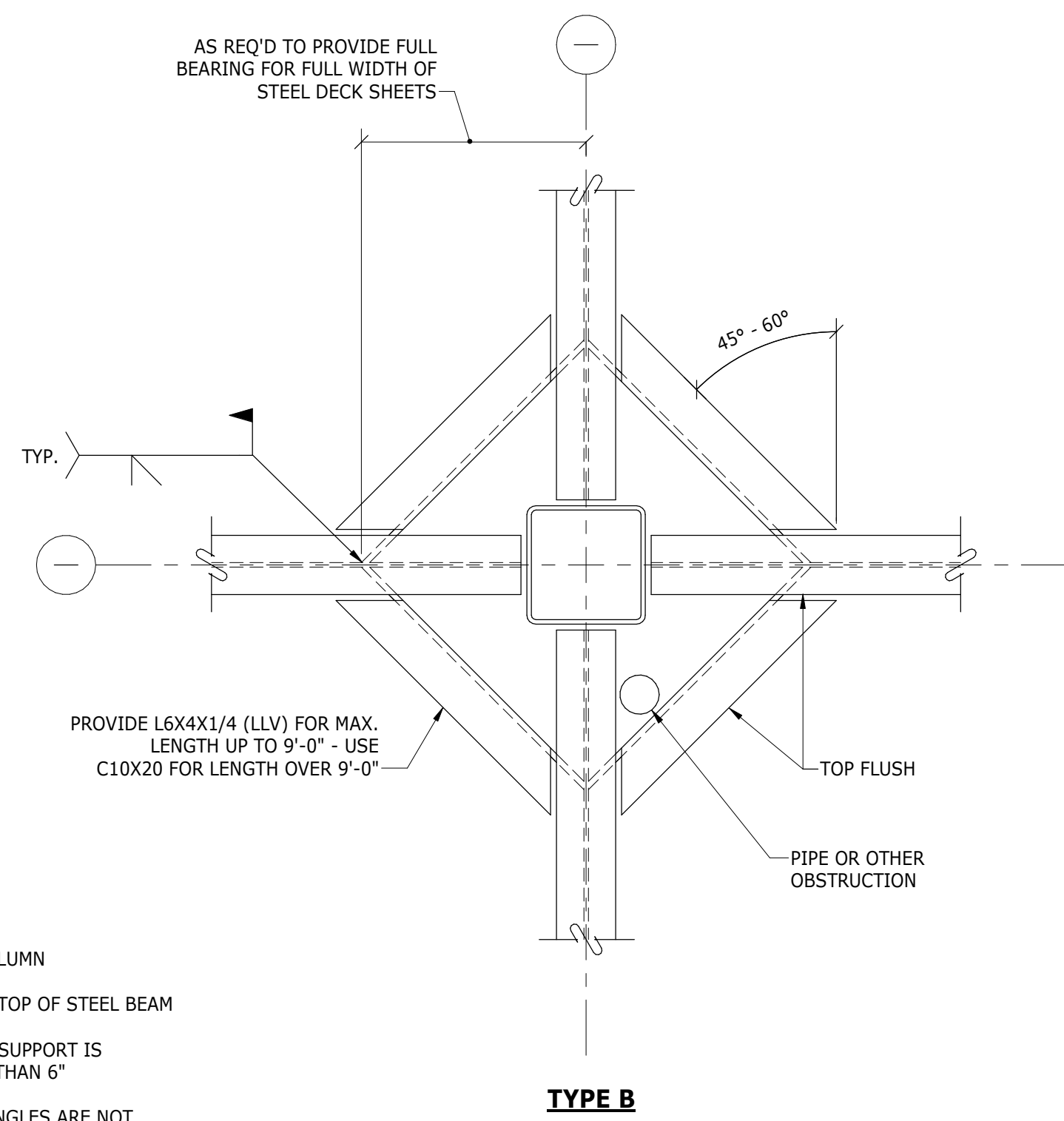
**DECK PERPENDICULAR**

**TYPICAL STEEL DECK AT CHANGES IN SLAB ELEVATIONS OR SLAB THICKNESS DETAIL**  
NOT TO SCALE

**TYPICAL COMPOSITE SLAB SECTION**  
NOT TO SCALE



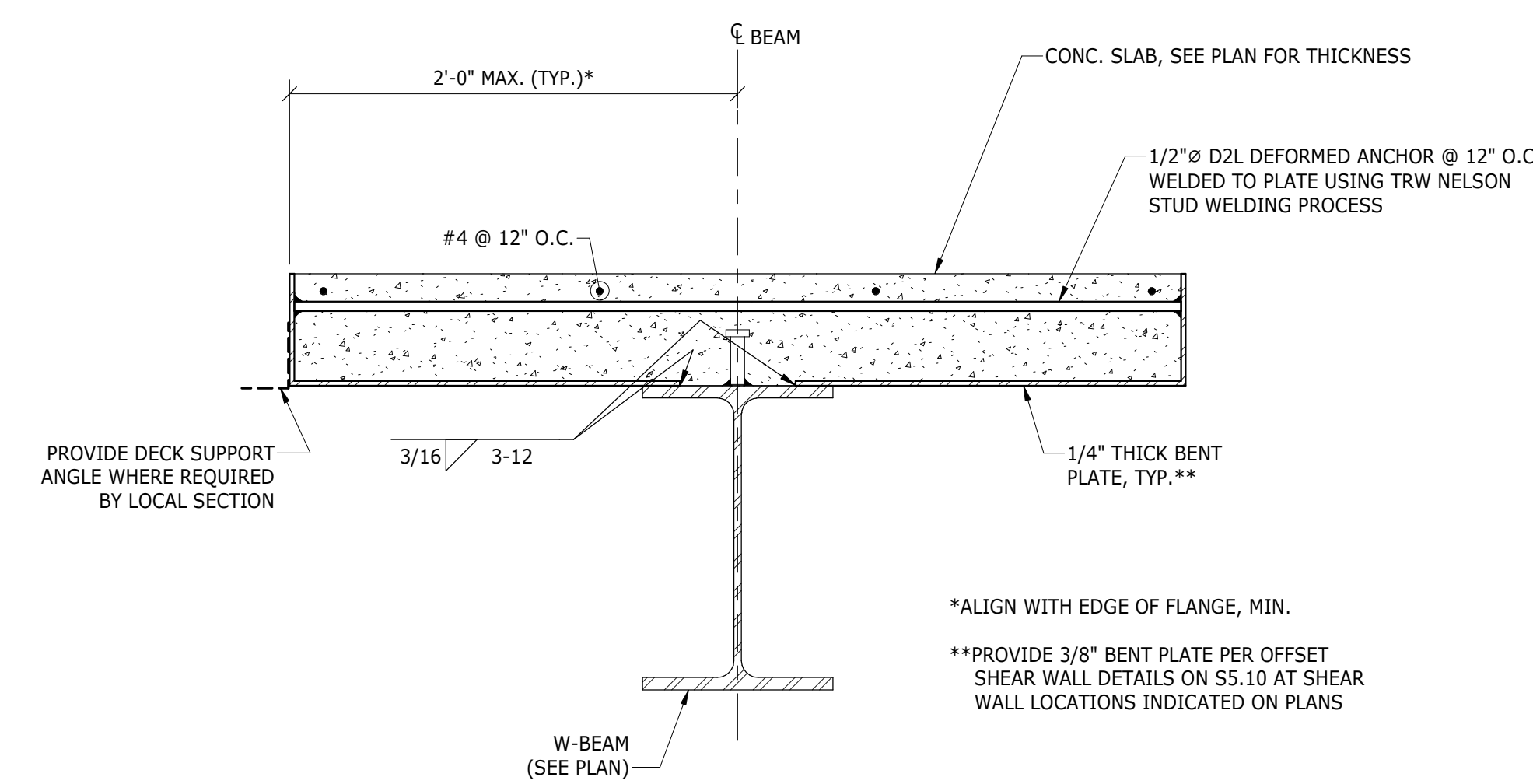
**TYPE A**



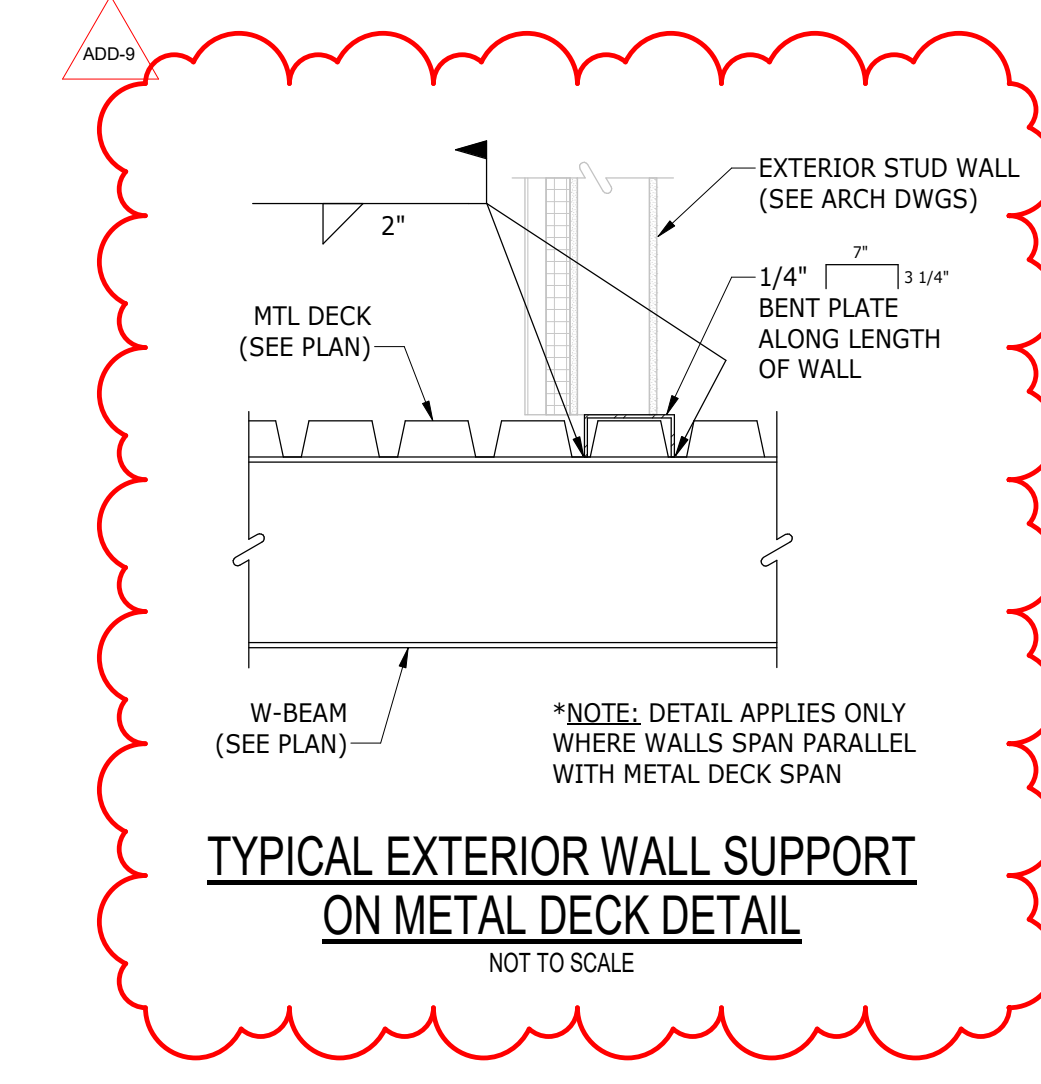
**TYPE B**

- NOTES:**
- USE SIMILAR DETAIL:
    - AT BEAM MOMENT CONNECTION
    - WHERE PIPE SLEEVES OCCUR NEXT TO COLUMN
    - WHERE COLUMN BASE PLATE OCCURS ON TOP OF STEEL BEAM
    - AT ALL OTHER CONDITIONS WHERE DECK SUPPORT IS INTERRUPTED FOR A DISTANCE GREATER THAN 6"
  - WHERE "D" IS "6" OR LESS, DECK SUPPORT ANGLES ARE NOT REQUIRED EXCEPT AS NEEDED AT DECK PERIMETER LOCATIONS WHERE REQ'D TO SUPPORT POUR STOPS, ETC.
  - HSS COLUMNS SHOWN, WIDE FLANGE COLUMNS SIMILAR.

**TYPICAL PLAN OF STEEL DECK SUPPORT DETAIL**  
NOT TO SCALE



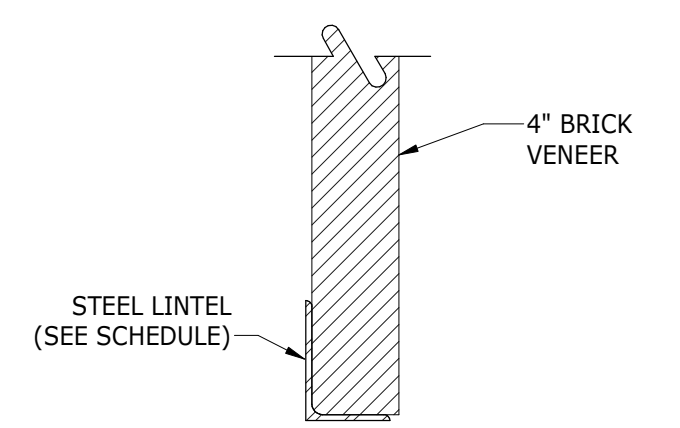
**TYPICAL SECTION AT ISOLATED SLAB-ON-DECK**  
NOT TO SCALE



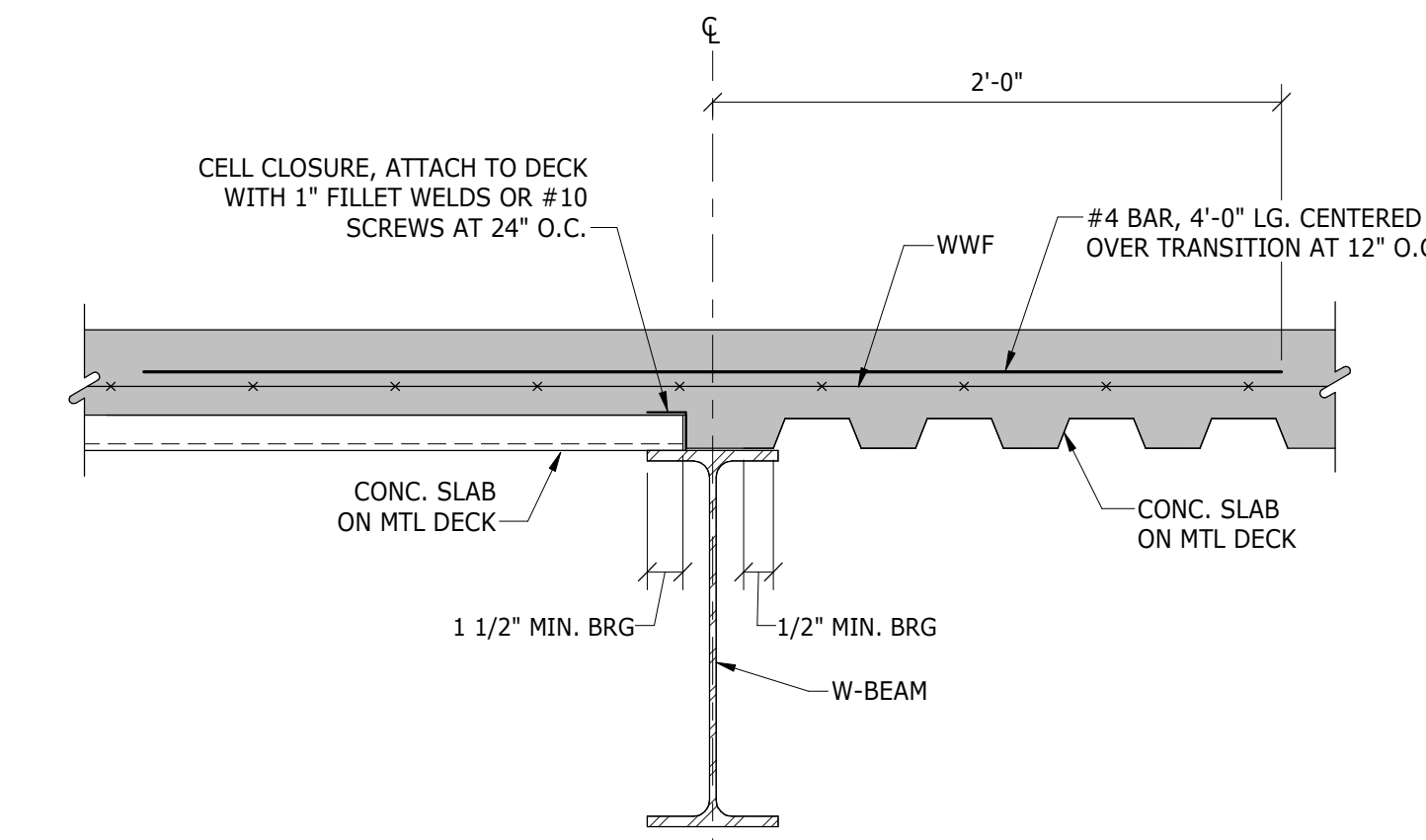
**TYPICAL EXTERIOR WALL SUPPORT ON METAL DECK DETAIL**  
NOT TO SCALE

STEEL LINTEL SCHEDULE	
SPAN	LINTEL
To 4'-0"	L4X3-1/2X1/4
4'-1" To 6'-0"	L6X3-1/2X5/16
6'-1" To 8'-0"	L6X3-1/2X3/8

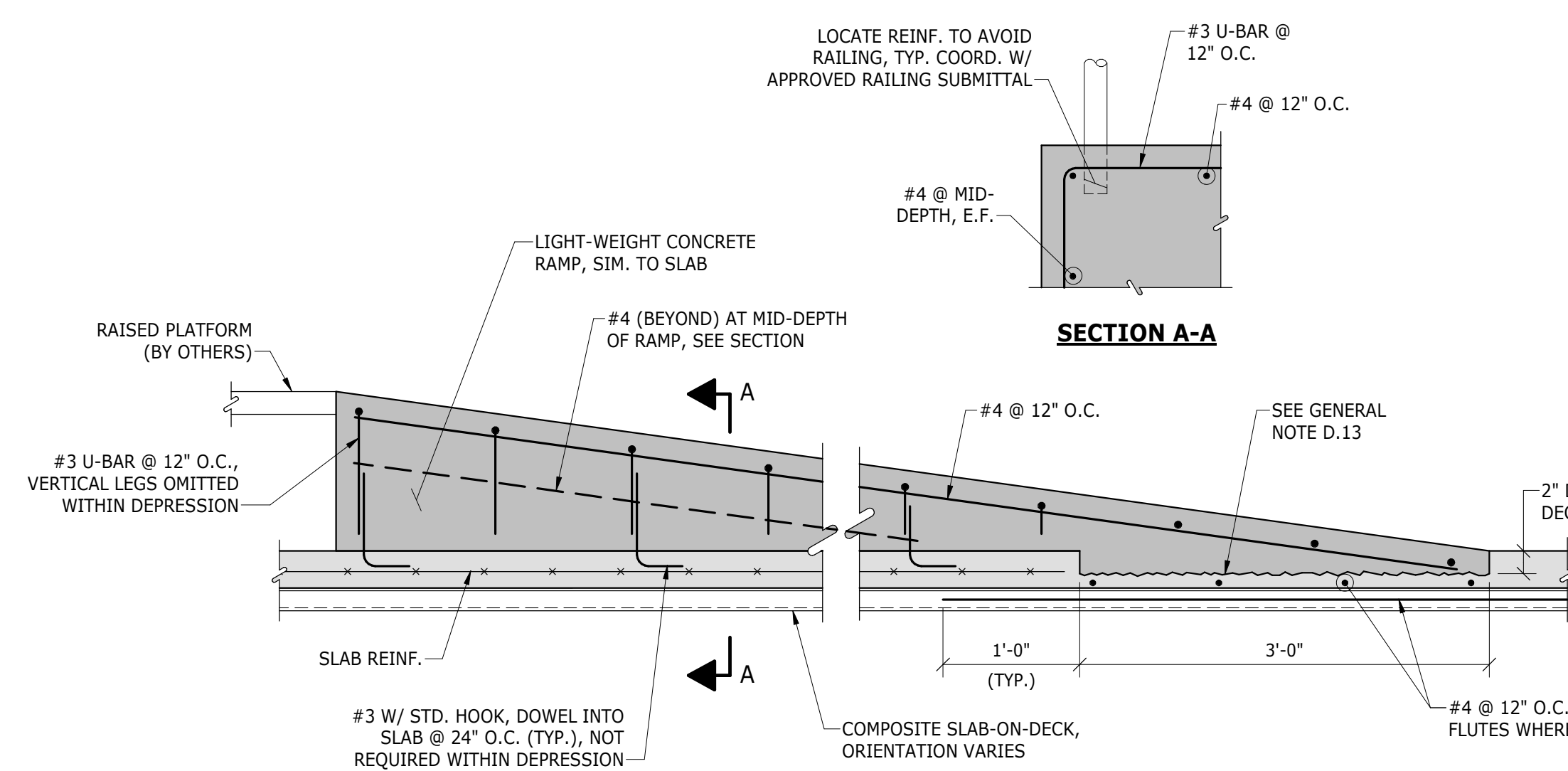
- NOTES:**
- SINGLE ANGLE SIZE PER EACH 4" WYTHE OF MASONRY UP TO 8". PROVIDE SIZES SHOWN IN TABLE ABOVE FOR OPENINGS UNLESS INDICATED OTHERWISE ON DRAWINGS.
  - SPAN LENGTH IS CLEAR OPENING.
  - PROVIDE MIN. 8" BEARING EACH END.
  - LONG LEG SET VERTICAL.
  - ALL EXTERIOR ANGLES SHALL BE HOT-DIP GALVANIZED.
  - LOOSE LINTELS SHALL BE FURNISHED BY METAL FABRICATIONS (M.M.) (SPEC. 05 50 00) AND INSTALLED BY UNIT MASONRY ASSEMBLIES (SPEC. 04 20 00).



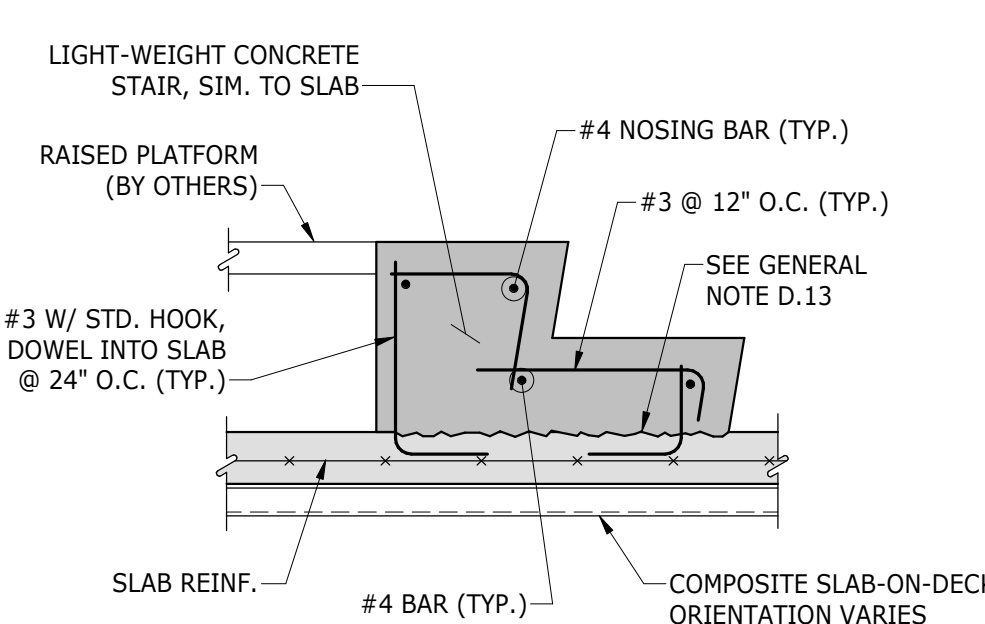
**TYPICAL STEEL LINTEL SECTION**  
NOT TO SCALE



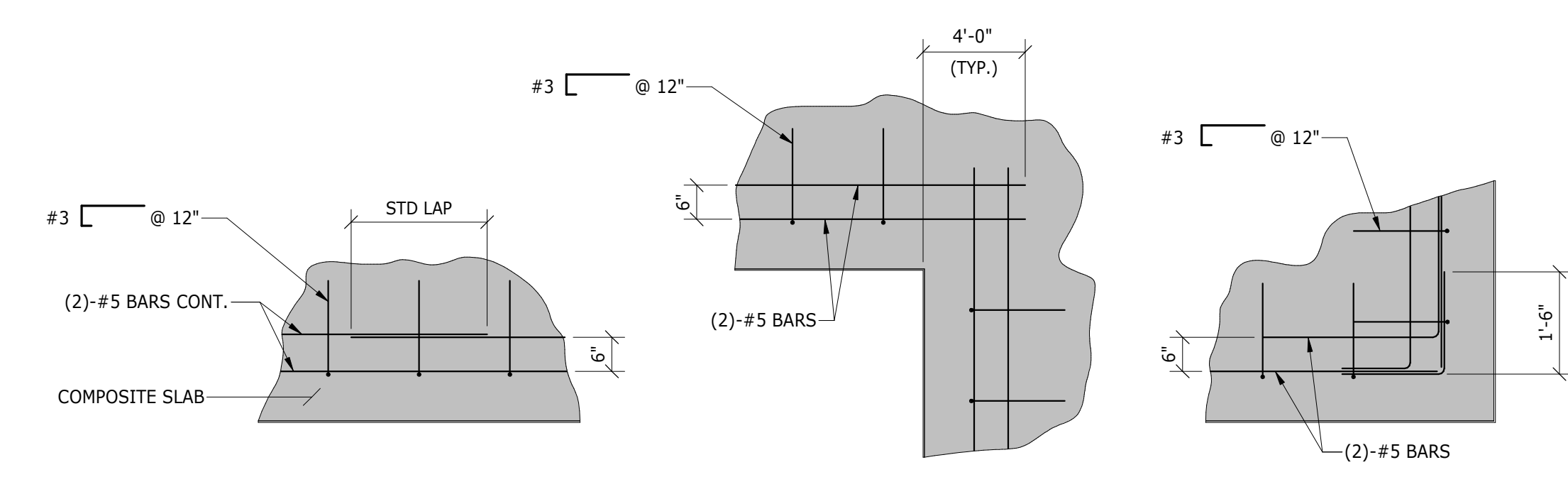
**TYPICAL SLAB ON METAL DECK DIRECTION CHANGE DETAIL**  
NOT TO SCALE



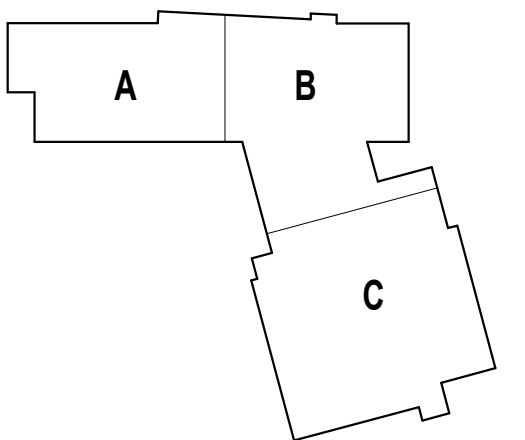
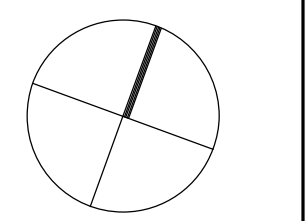
**TYPICAL CONCRETE RAMP ON SLAB-ON-DECK**  
NOT TO SCALE

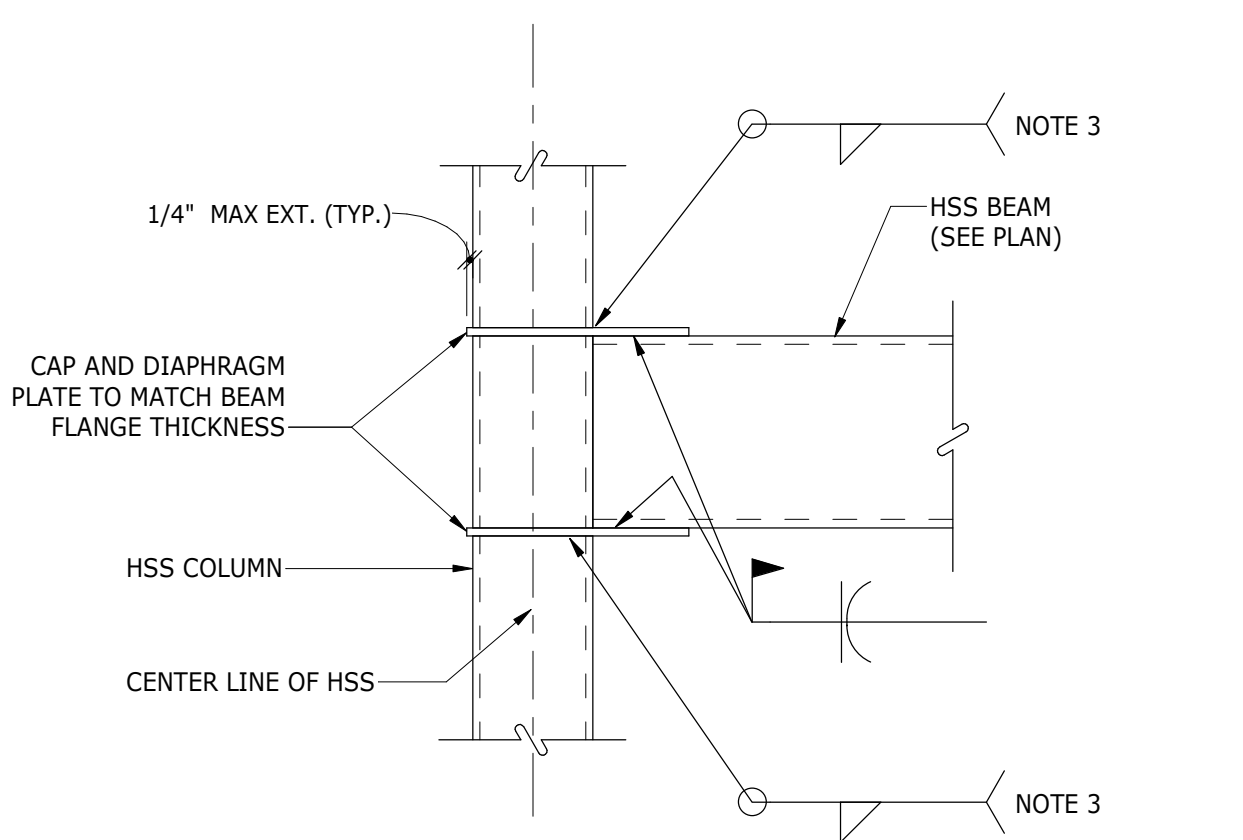


**TYPICAL CONCRETE STAIR ON SLAB-ON-DECK**  
NOT TO SCALE



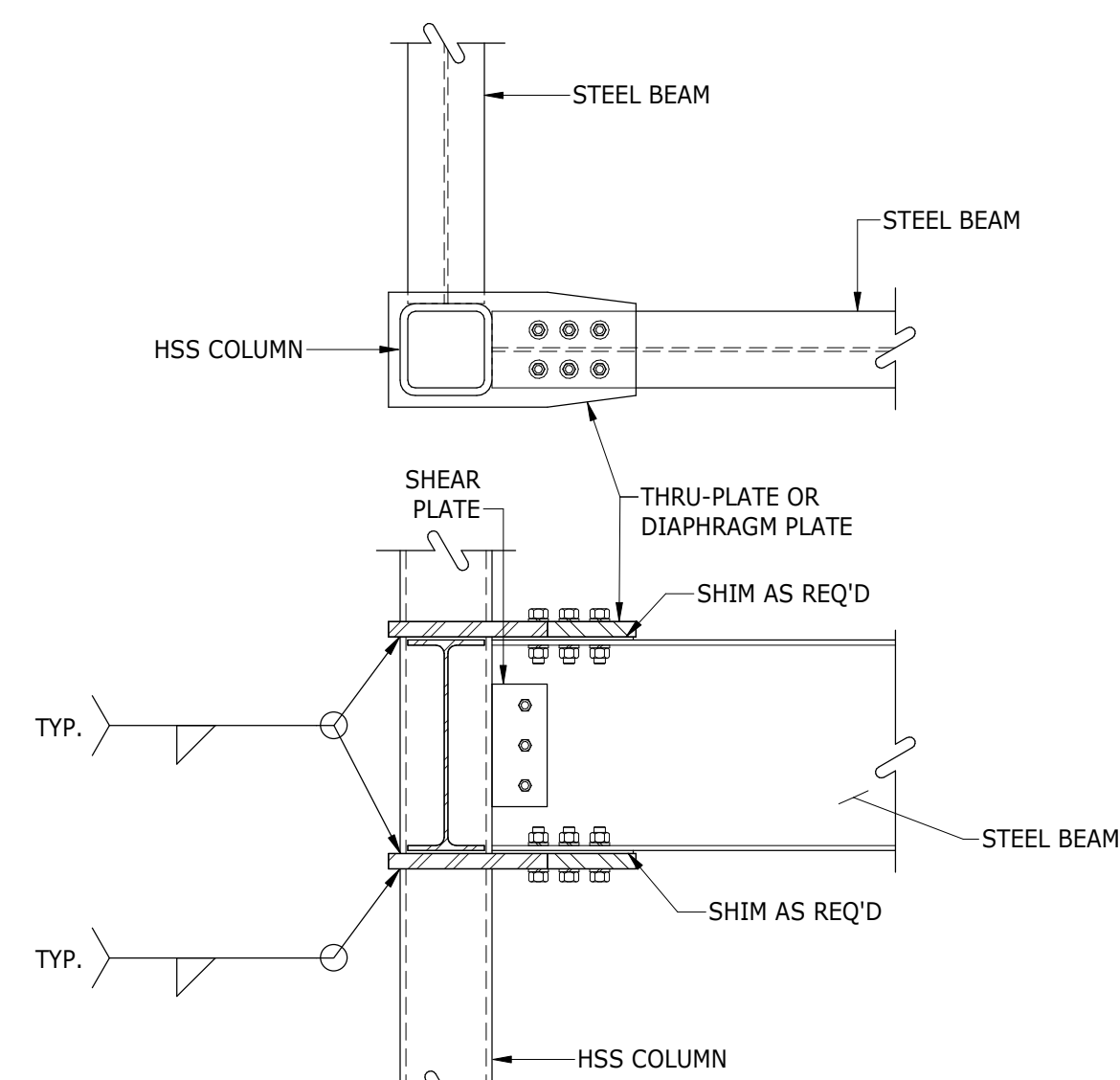
**TYPICAL COMPOSITE SLAB EDGE REINFORCEMENT**  
NOT TO SCALE





- NOTES:**
- WHERE A DESIGN FORCE IS NOT SPECIFIED ON THE PLANS, THE MOMENT CONNECTIONS SHALL BE DESIGNED TO DEVELOP THE FULL MOMENT CAPACITY OF THE HSS COLUMN.
  - CONNECTIONS SHALL BE DESIGNED BY A P.E. REGISTERED IN RHODE ISLAND. SUBMIT STAMPED DRAWINGS AND CALCULATIONS FOR REVIEW.
  - SEE CONNECTION DESIGN FORCES TABLE FOR SHEAR (DEAD + LIVE) FORCE ACTING ON BEAM MEMBER.
  - FORCES ARE PROVIDED AT SERVICE LEVEL (ASD).

**HSS BEAM TO HSS COLUMN MOMENT CONNECTION DETAIL**  
NOT TO SCALE



- NOTES:**
- IF A DESIGN FORCE IS NOT SPECIFIED ON THE PLANS, THE MOMENT CONNECTIONS SHALL BE DESIGNED TO DEVELOP THE FULL MOMENT CAPACITY OF THE HSS COLUMN.
  - CONNECTIONS SHALL BE DESIGNED BY A P.E. REGISTERED IN RHODE ISLAND. SUBMIT STAMPED DRAWINGS AND CALCULATIONS FOR REVIEW.
  - SEE CONNECTION FORCE TABLE FOR SHEAR (DEAD AND LIVE) FORCE ACTING ON BEAM MEMBER.
  - FORCES ARE PROVIDED AT SERVICE-LEVEL (ASD).

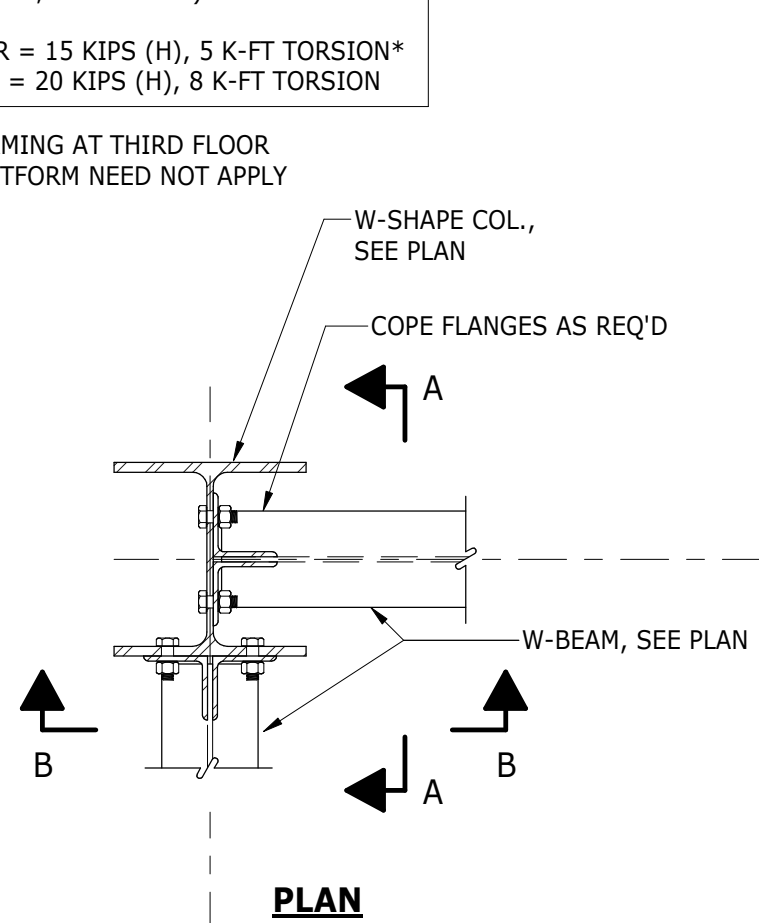
**WIDE FLANGE BEAM TO HSS COLUMN MOMENT CONNECTION DETAIL**  
NOT TO SCALE

**NOTE:**  
ALL HSS BEAM AND GIRDER CONNECTIONS SHALL BE DESIGNED FOR A HORIZONTAL FORCE (H) AND TORSIONAL LOAD AS FOLLOWS. HORIZONTAL FORCE IS IN ADDITION TO FORCES SHOWN IN TABLE ON THIS SHEET AND ON PLANS AND SHALL BE ATTACHED AT THE TOP AND BOTTOM FOR HORIZONTAL FORCE RESISTANCE. DIVIDE FORCE EQUALLY BETWEEN TOP AND BOTTOM ATTACHMENT (SEE DETAIL, THIS SHEET):

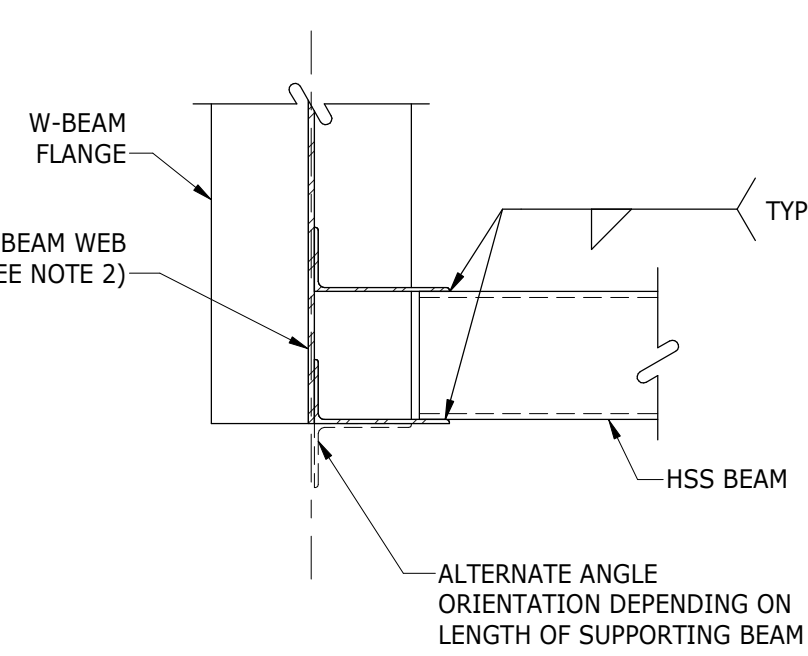
- HSS 12 & UNDER = 15 KIPS (H), 5 K-FT TORSION\*
- HSS14 & ABOVE = 20 KIPS (H), 8 K-FT TORSION

\*HSS FRAMING AT THIRD FLOOR ROOF PLATFORM NEED NOT APPLY

CONNECTION DESIGN FORCES (UNLESS OTHERWISE NOTED ON FRAMING PLANS)		
SHAPE RANGE	VERTICAL (KIPS)	MOMENT (KIP-FT) WHERE INDICATED (SEE PLAN)
W10 (TYP.)	10	-
W10X33	25	-
W12	25	-
W14X22-43	30	45
W14X53-68	40	125
W16	40	55
W18	50	65
W18X143	70	300
W21	55	85
W24X55-76	70	265
W24X84-94	110	300
W27 (TYP.)	80	450
W27X129	95	615
W30	100	-
W33	110	-
W36X135	125	-
W36X150-210	145	245
W40	165	380
HSS12 AND UNDER	20	-
HSS14 AND ABOVE	30	100

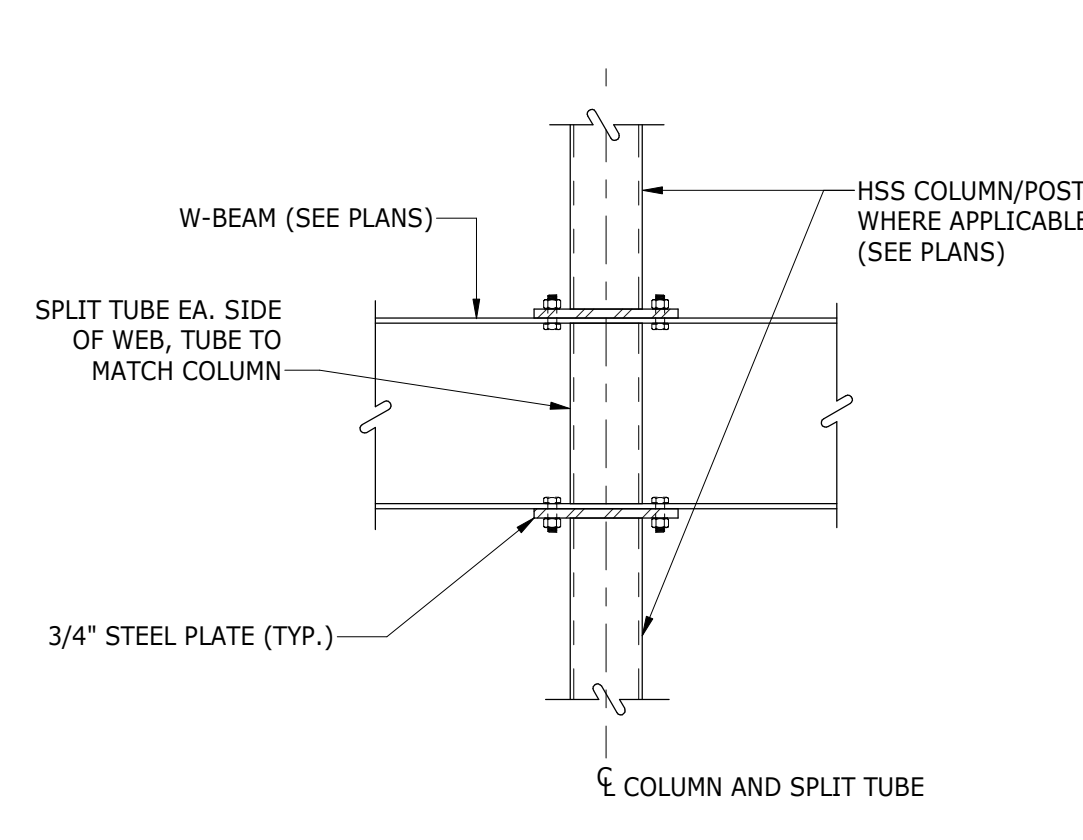


**TYPICAL CAP PLATE HSS COLUMNS**  
NOT TO SCALE

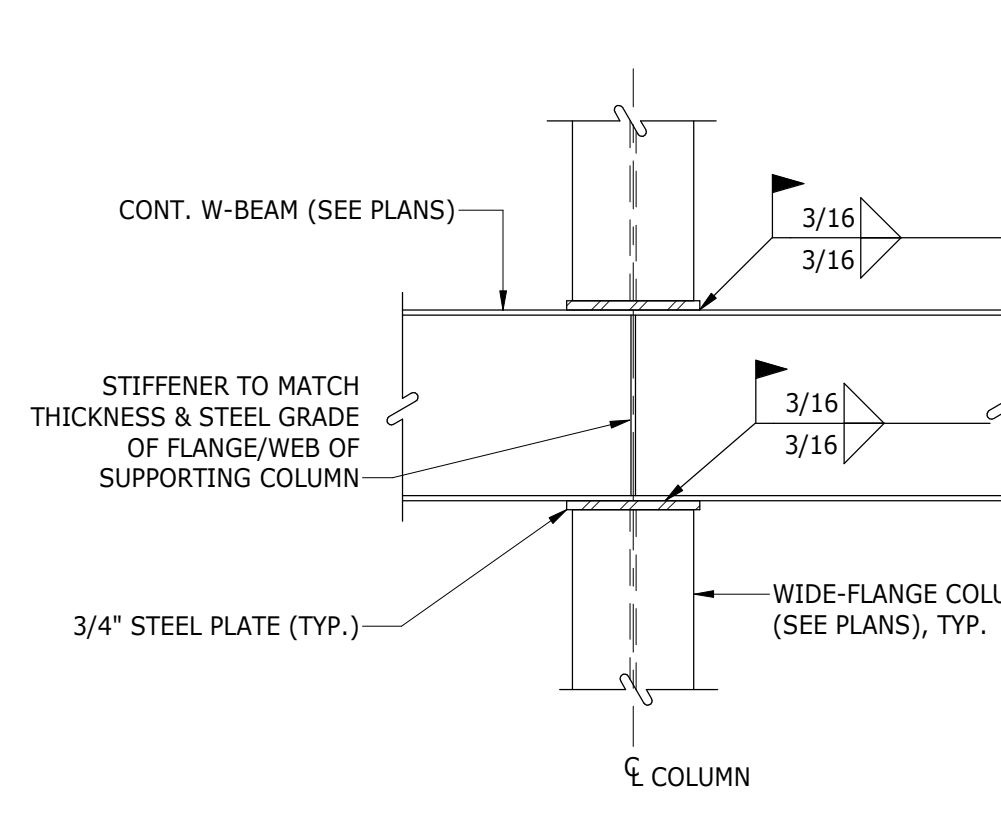


- NOTES:**
- CONTRACTOR IS RESPONSIBLE FOR THE FINAL DESIGN OF CONNECTIONS FOR FORCES SHOWN ON THE DRAWINGS.
  - PROVIDE SIMILAR CONNECTION AT HSS BEAMS TO HSS BEAMS

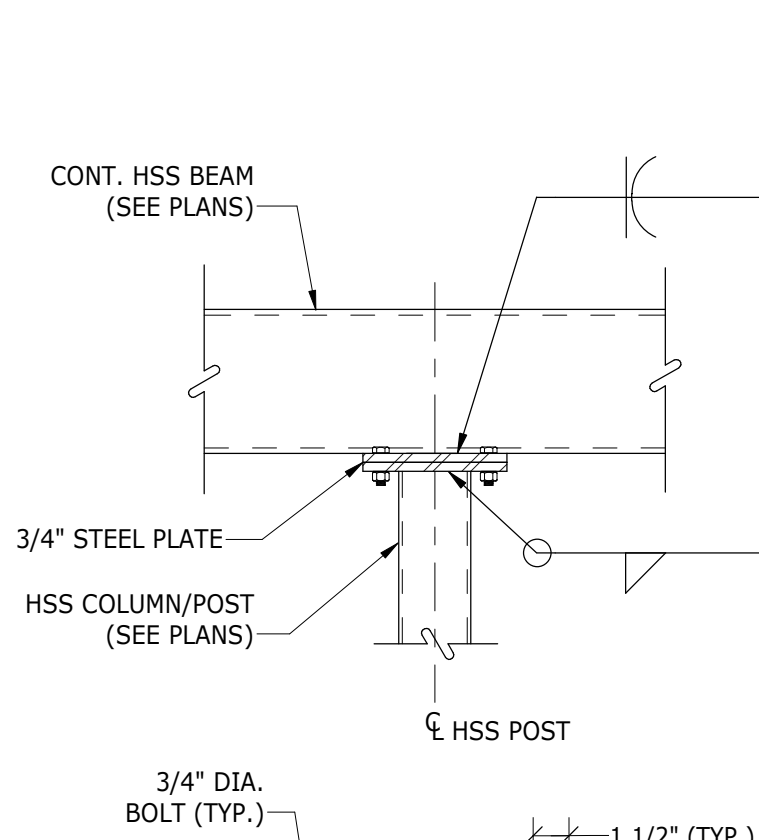
**TYPICAL HSS BEAM TO WIDE-FLANGE OR HSS BEAM CONNECTION (SHEAR)**  
NOT TO SCALE



**HSS COLUMN**

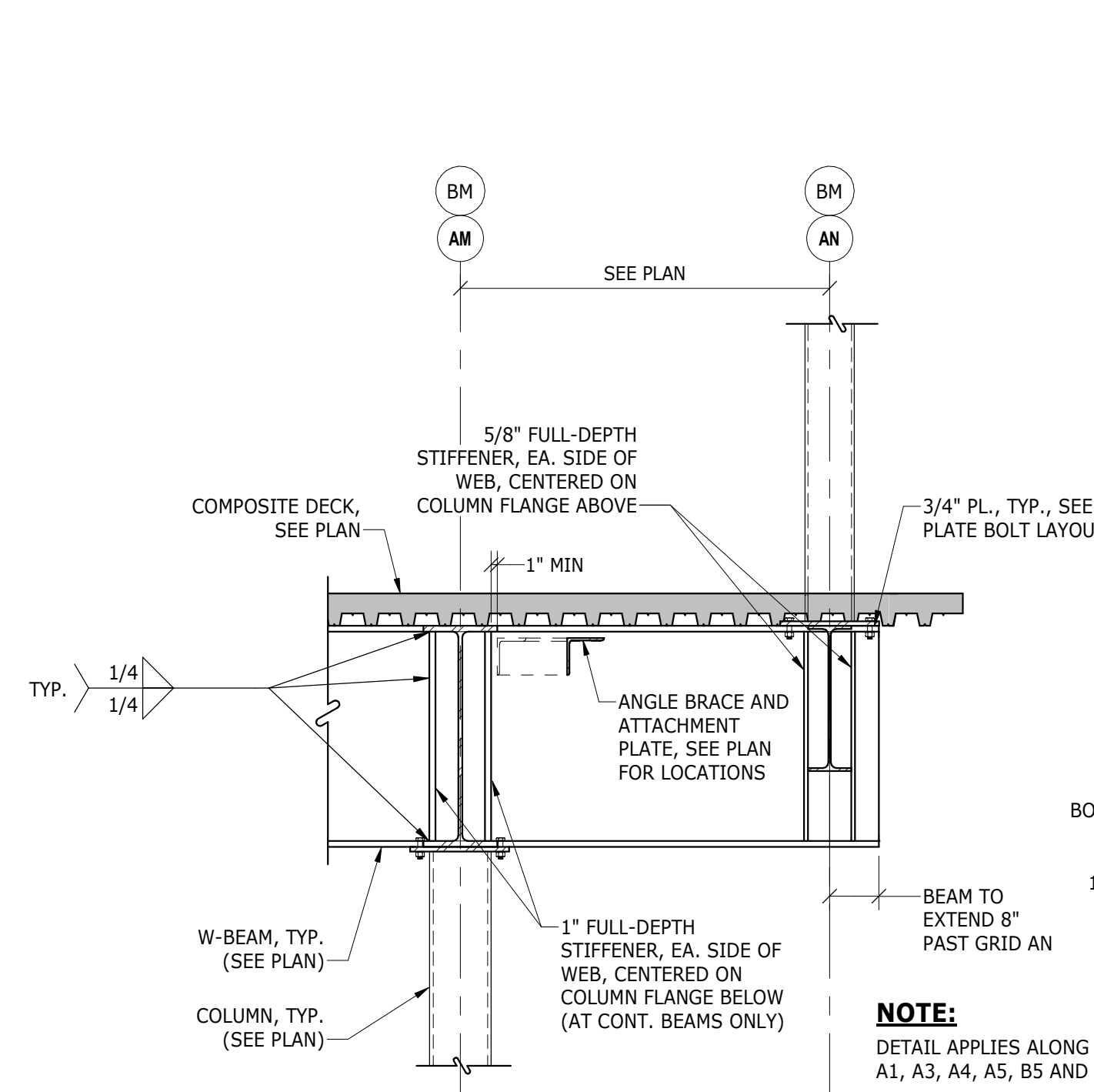


**WIDE-FLANGE COLUMN**



**TYPICAL BOLTED HSS CONTINUOUS BEAM CONNECTION DETAIL**  
NOT TO SCALE

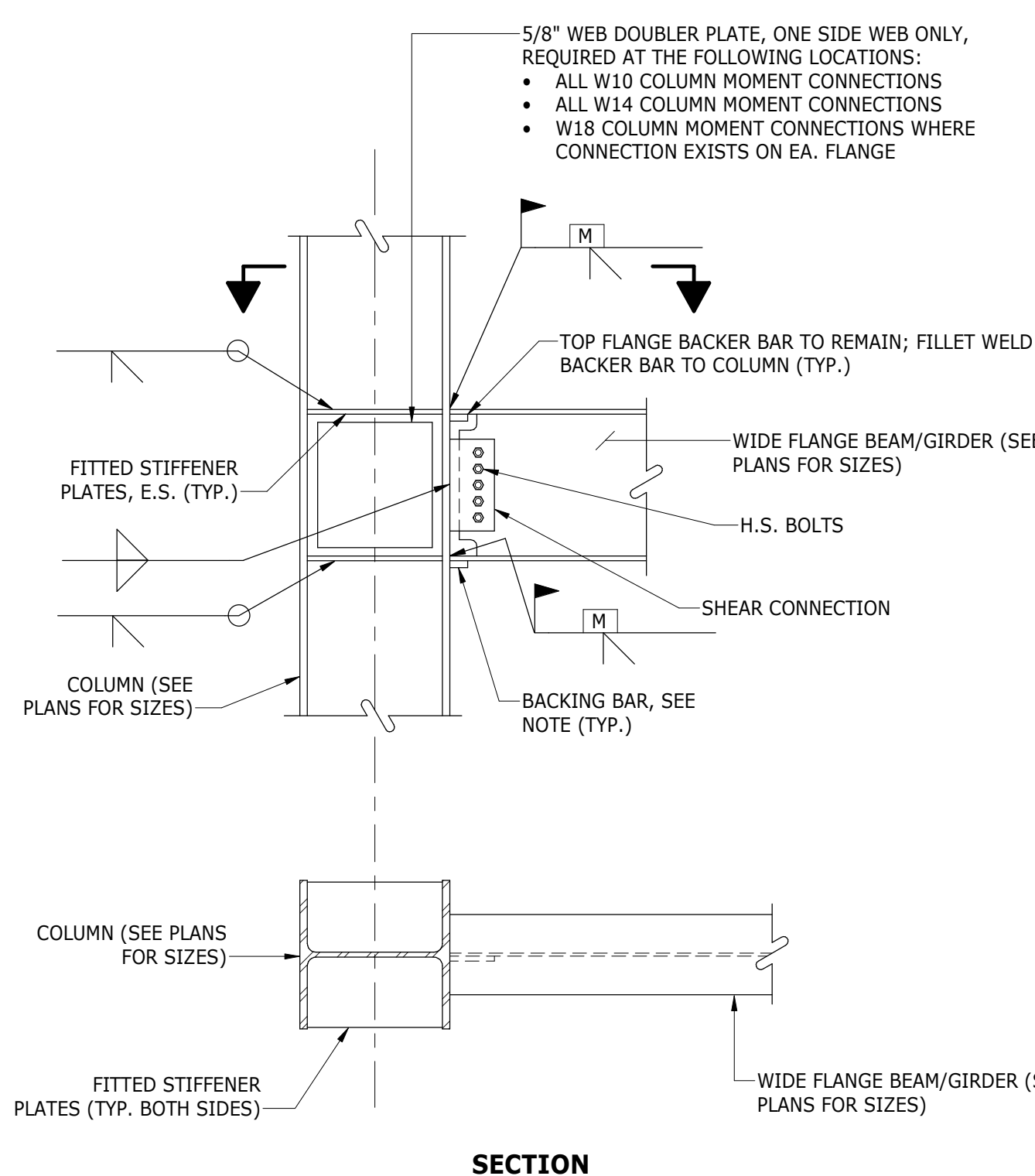
**CONTINUOUS/TRANSFER BEAM CONNECTION DETAIL**  
NOT TO SCALE



**TYPICAL @ CONT. COLUMN**

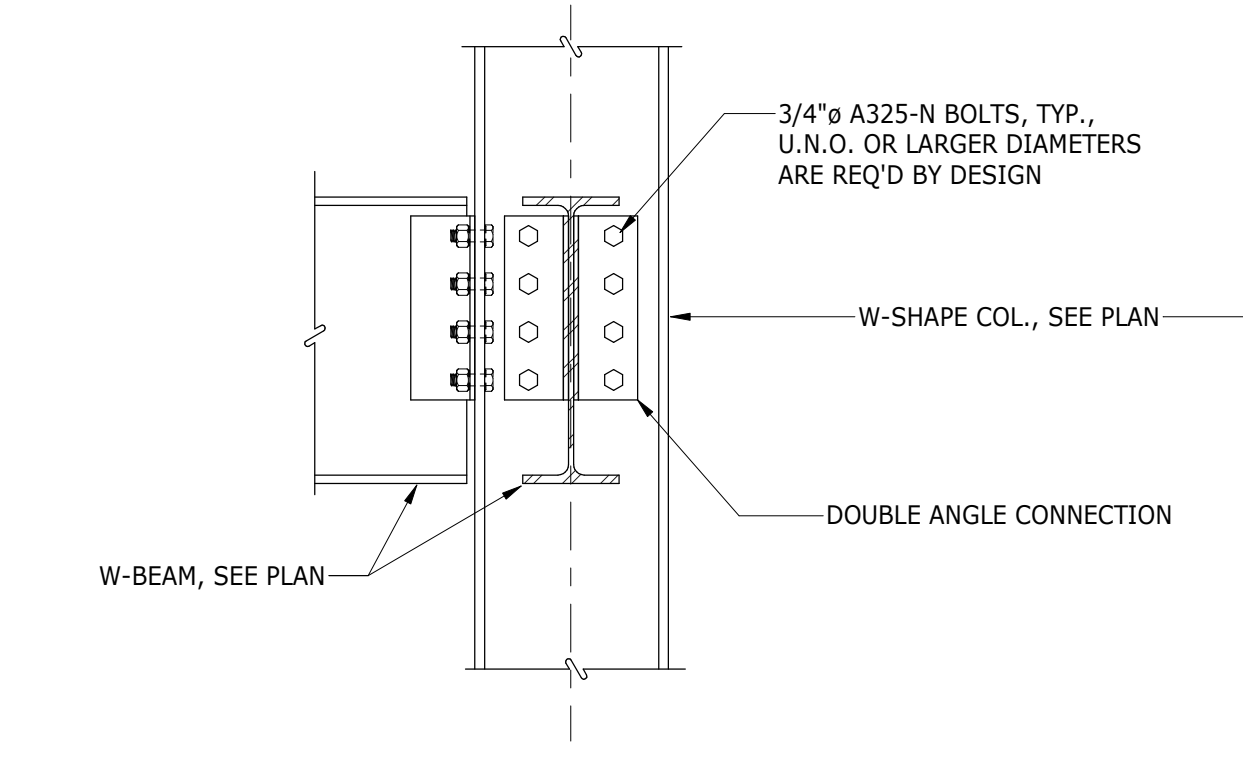
**TYPICAL COL. ON BEAM/OUTRIGGER**

**TYPICAL STIFFENER DETAIL AT SECOND-FLOOR CONTINUOUS BEAMS AND OUTRIGGERS SUPPORTING COLUMNS (SIMILAR)**  
NOT TO SCALE



- NOTE:**
- WHERE A DESIGN FORCE IS NOT SPECIFIED ON THE PLANS, THE MOMENT CONNECTIONS SHALL BE DESIGNED TO DEVELOP THE FULL MOMENT CAPACITY OF THE COLUMN.
  - CONNECTIONS SHALL BE DESIGNED BY A P.E. REGISTERED IN RHODE ISLAND. SUBMIT STAMPED DRAWINGS AND CALCULATIONS FOR REVIEW.
  - SEE CONNECTION DESIGN FORCES TABLE FOR SHEAR (DEAD + LIVE) FORCE ACTING ON BEAM MEMBER.
  - FORCES ARE PROVIDED AT SERVICE-LEVEL (ASD).
  - REMOVE BOTTOM FLANGE BACKER BAR AND WELD TABS AFTER WELDING BACK GOUGE AND RE-WELD.

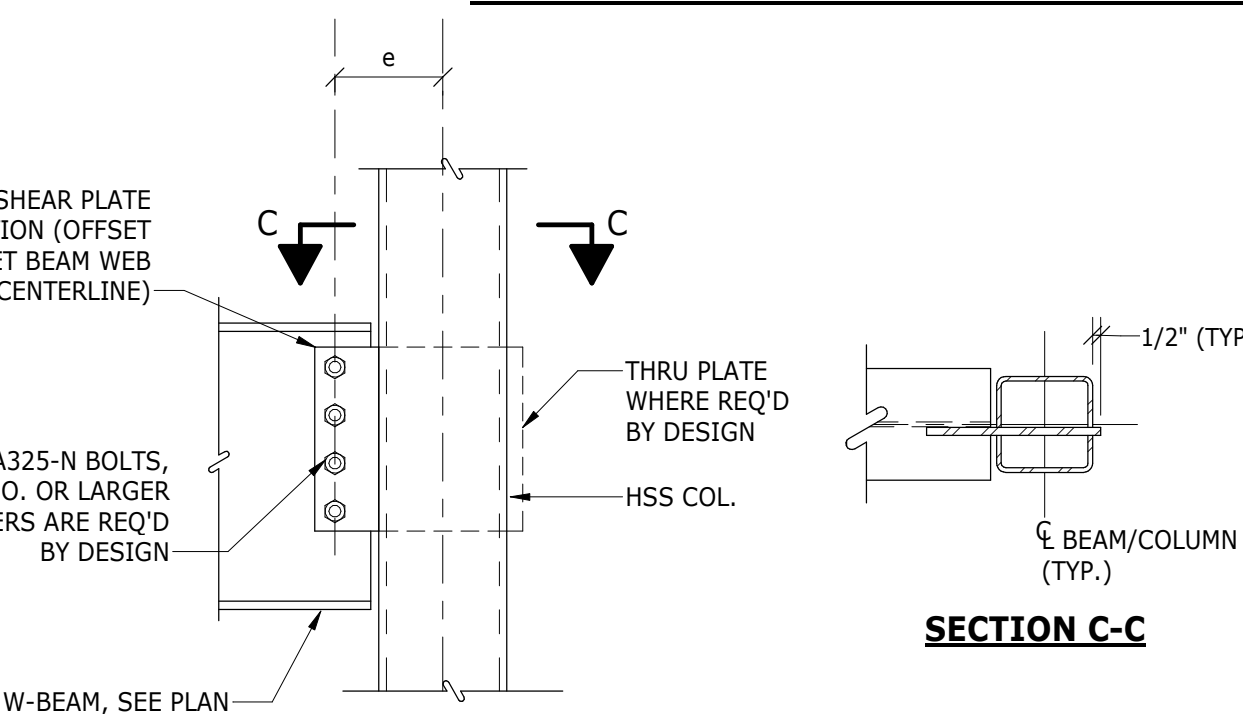
**TYPICAL WIDE-FLANGE COLUMN WELDED MOMENT CONNECTION**  
NOT TO SCALE



**SECTION A-A**

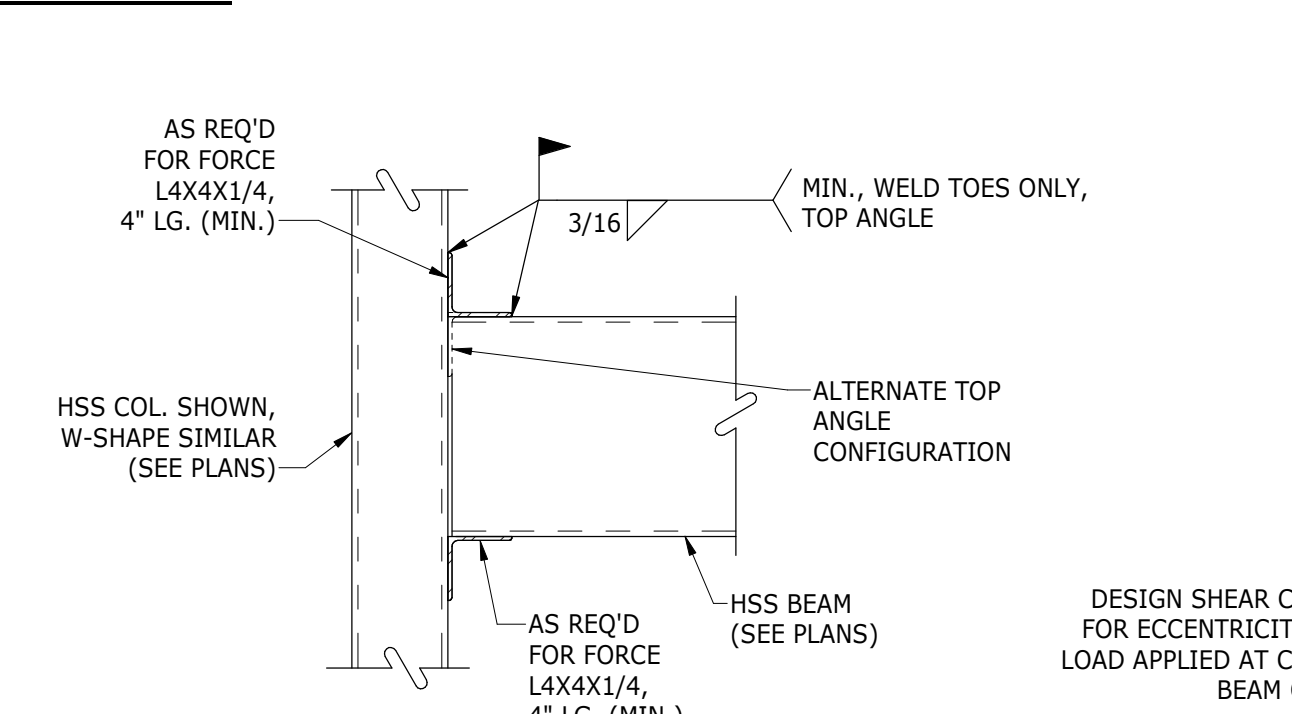
**SECTION B-B**

**WIDE FLANGE BEAM TO WIDE FLANGE COLUMN CONNECTION**



**SECTION C-C**

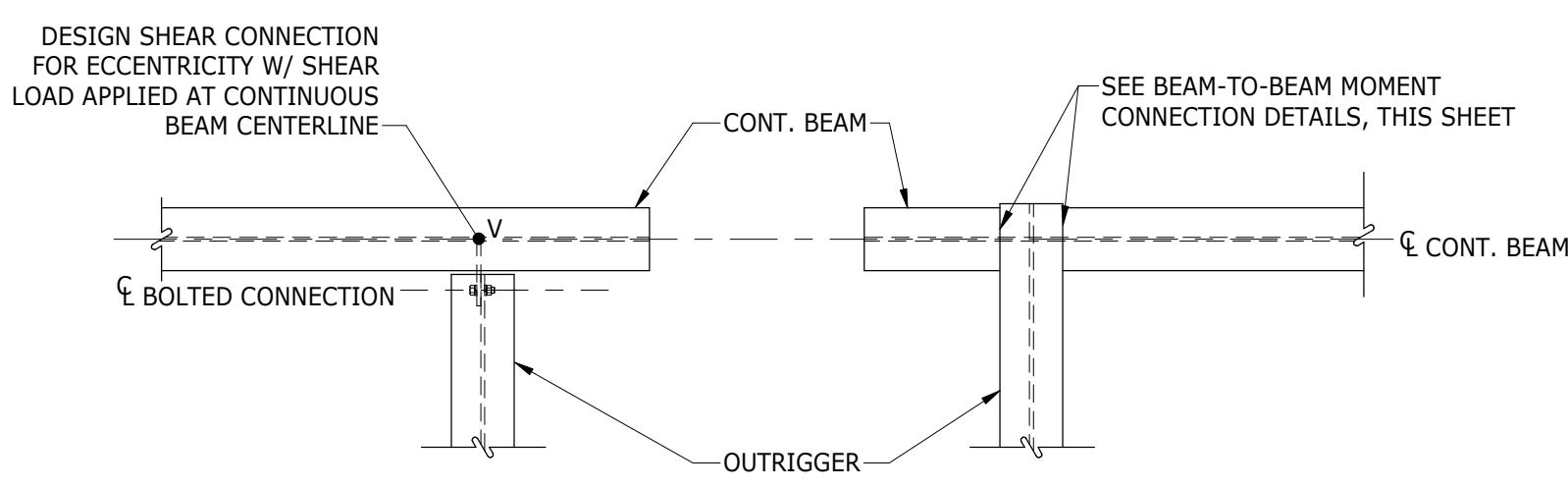
**WIDE FLANGE BEAM TO HSS COLUMN CONNECTION**



**HSS BEAM TO COLUMN CONNECTION**

- NOTES:**
- SPACING OF BOLTS SHALL EXTEND AT LEAST TO THE MID-DEPTH OF THE BEAM.
  - CONNECTIONS SHALL CONFORM TO THE REQUIREMENTS OF PART 9, "CONNECTIONS" OF THE AISC MANUAL OF STEEL CONSTRUCTION AND SHALL BE DESIGNED BY A P.E. REGISTERED IN THE STATE OF RHODE ISLAND. SUBMIT STAMPED DRAWINGS AND CALCULATIONS FOR REVIEW. FORCES ARE PROVIDED AT SERVICE LEVEL (ASD).
  - ALTERNATE BEAM CONNECTIONS MAY BE SUBMITTED BY THE STRUCTURAL STEEL FABRICATOR FOR CONSIDERATION BY THE STRUCTURAL ENGINEER.
  - BOLTS FOR THRU PLATE CONNECTIONS SHALL BE DESIGNED FOR THE ECCENTRICITY  $e$ .

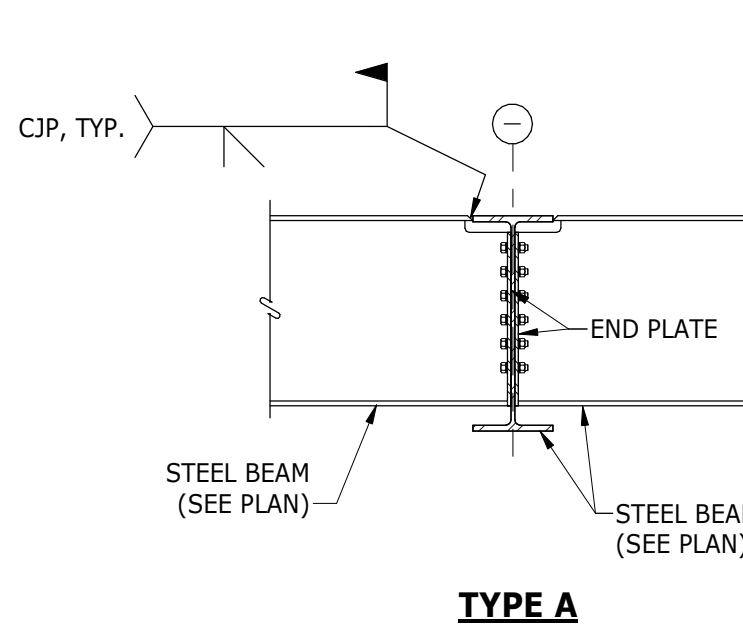
**MINIMUM REQUIREMENTS FOR BEAM CONNECTIONS**  
NOT TO SCALE



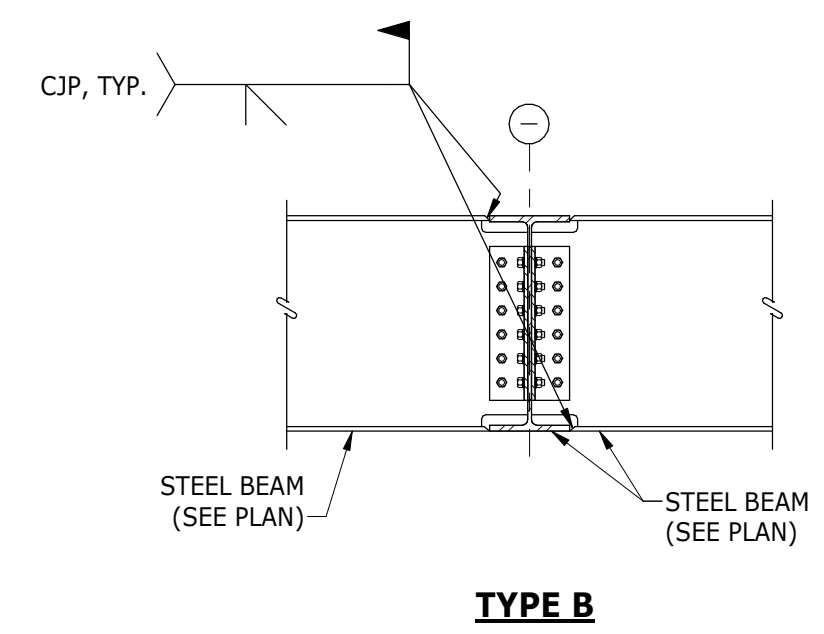
**OPTION A @ SHEAR LOADS 10K OR LESS**

**OPTION B ALL OTHER CASES**

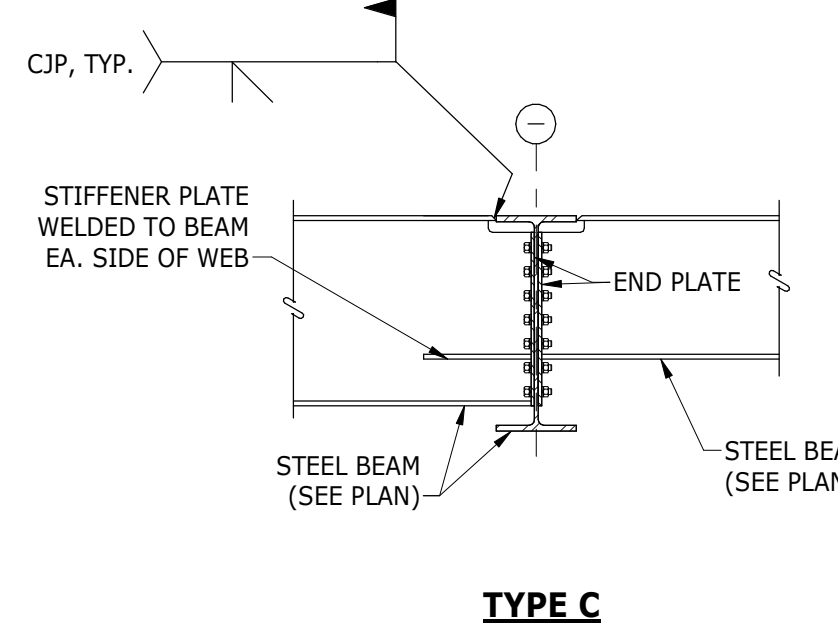
**CONTINUOUS BEAM SUPPORTED AT OUTRIGGER END CONNECTION DETAIL**  
NOT TO SCALE



**TYPE A**



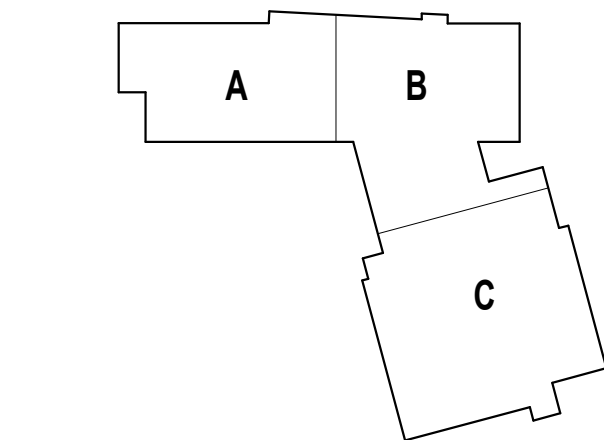
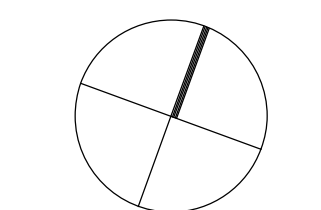
**TYPE B**



**TYPE C**

- NOTES:**
- SHEAR CONNECTION SHALL BE DESIGNED FOR THE BEAM END REACTIONS GIVEN ON THE DRAWINGS.
  - IF A DESIGN FORCE IS NOT SPECIFIED ON THE PLANS, DESIGN MOMENT PLATES FOR THE FULL MOMENT CAPACITY OF THE SMALLER BEAM.
  - AT HSS MOMENT CONNECTIONS, PROVIDE SPLICE PLATES IN LIEU OF FLANGE WELDS.

**BEAM TO BEAM MOMENT CONNECTION DETAILS**  
NOT TO SCALE

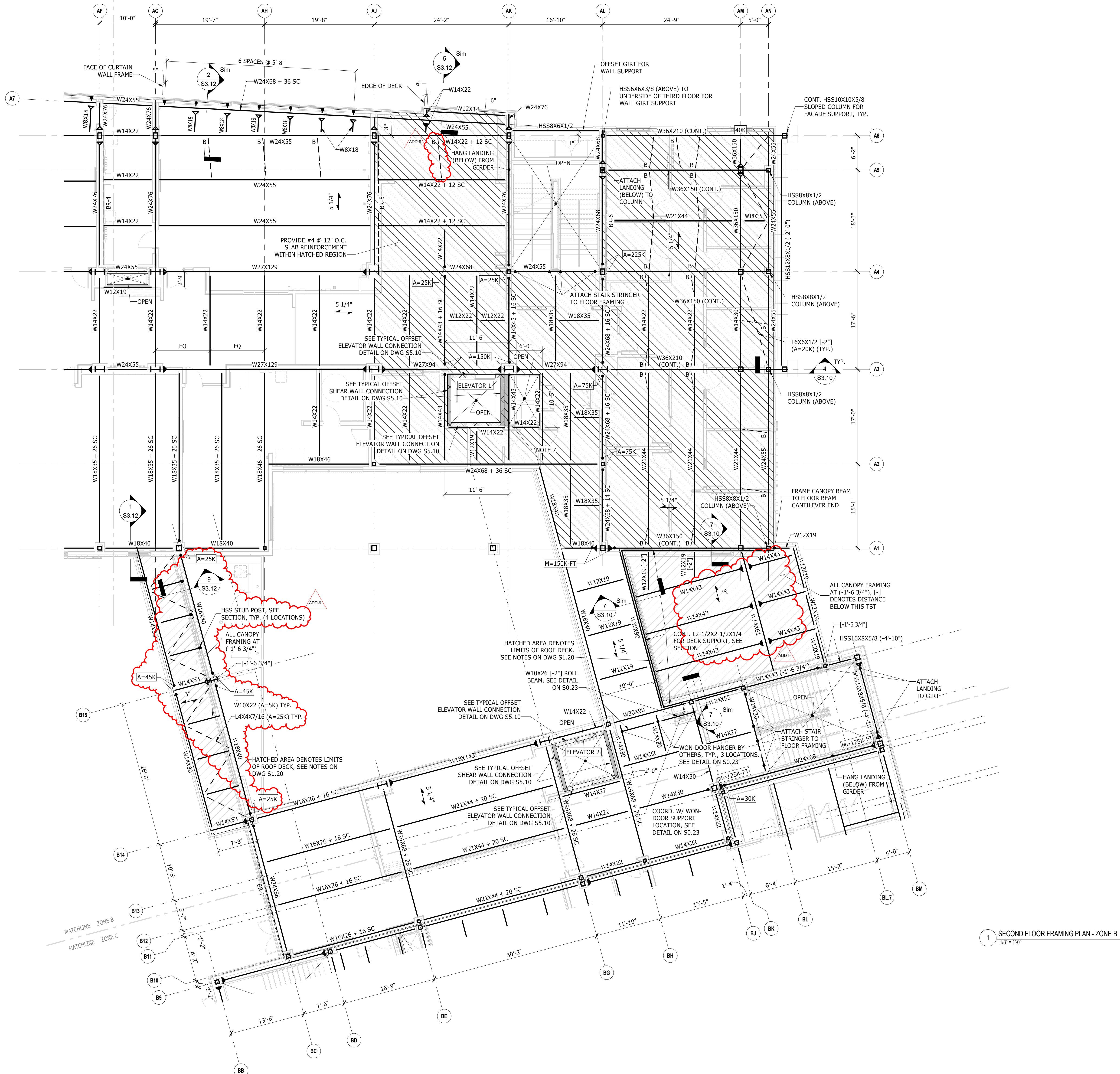






CENTRAL FALLS HIGH SCHOOL  
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1 SECOND FLOOR FRAMING PLAN - ZONE B  
1/8" = 1'-0"

REFER TO DRAWING S1.20 FOR SCHEDULES, NOTES, ETC.

ADD-9 ADDENDUM #9 02.06.2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

**SECOND FLOOR FRAMING PLAN - ZONE B**

DRAWN BY: JDB / MSS

REVIEWED BY: MGM / BP

SCALE: AS INDICATED | DRAWING NUMBER:

JOB NO.: 2202.02

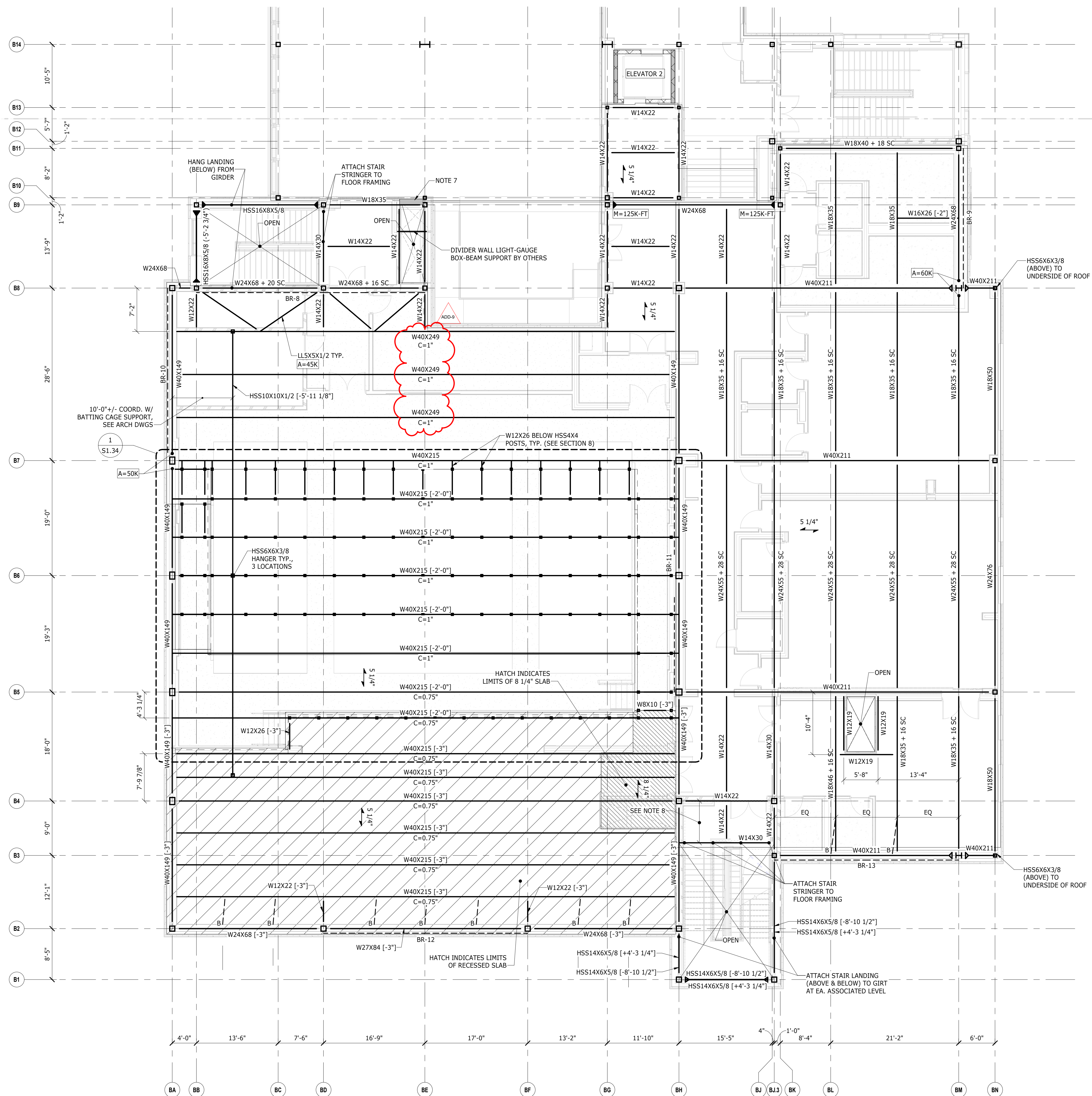
DATE: OCTOBER 13, 2023

**S1.22**



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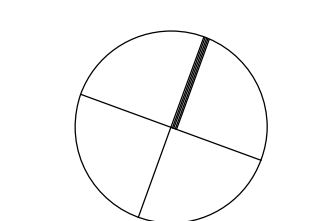
REFER TO DRAWING S1.30 FOR SCHEDULES, NOTES, ETC.

1 THIRD FLOOR PERFORMING FRAMING PLAN - ZONE C  
1/8" = 1'-0"

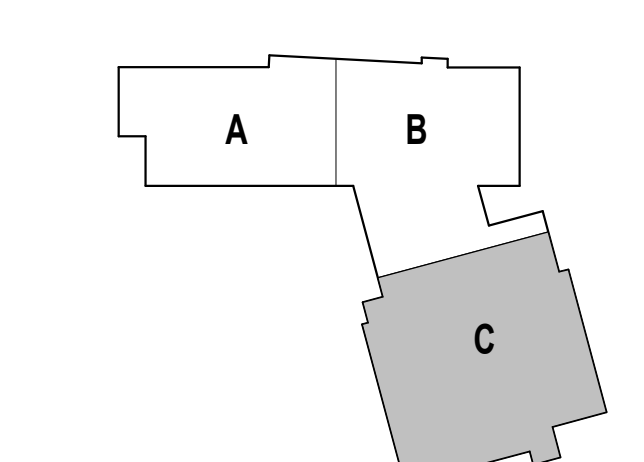
ADD-9 ADDENDUM #9 02.06.2024

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**THIRD FLOOR  
FRAMING PLAN -  
ZONE C**

DRAWN BY: JDB / MSS

REVIEWED BY: MGM / BP

SCALE: AS INDICATED DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

**S1.33**



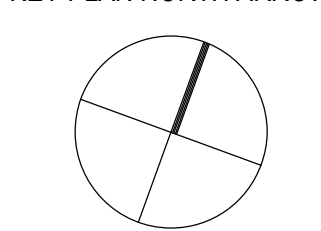
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KEYNOTE LEGEND:

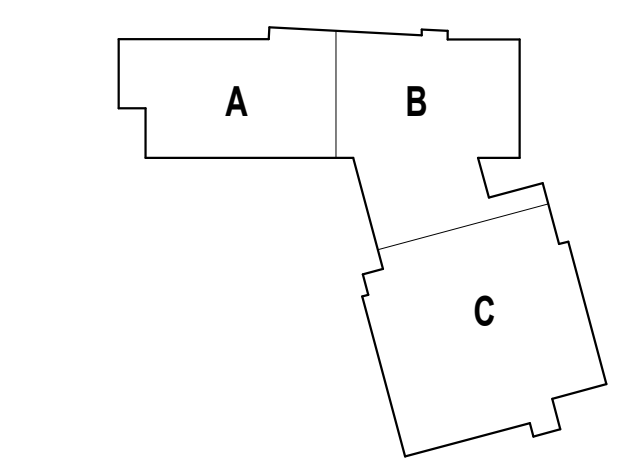
ADD-9 ADDENDUM #9 02.06.2024

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**STEEL SECTIONS AND DETAILS - 3**

DRAWN BY: JDB / MSS

REVIEWED BY: MGM / BP

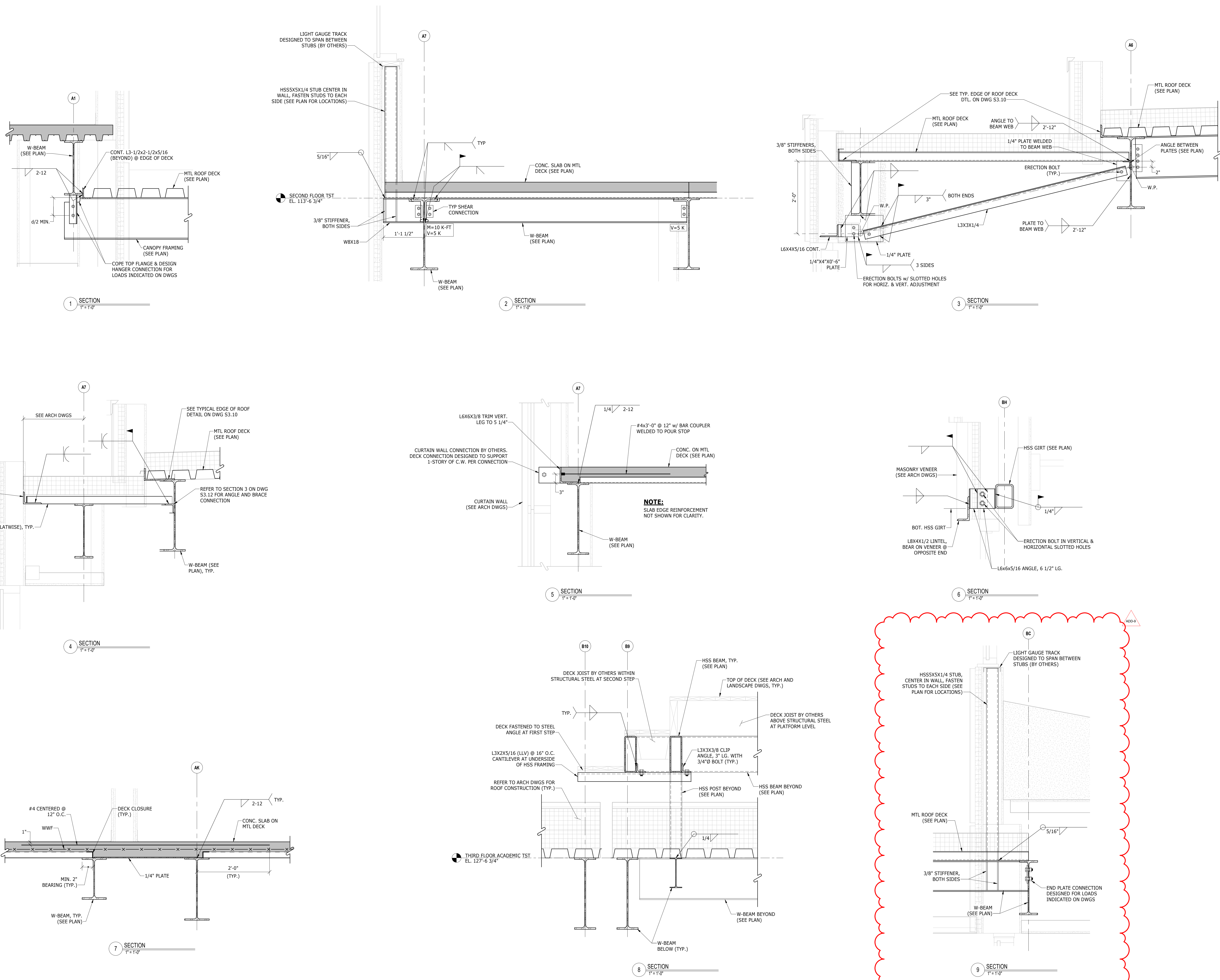
SCALE: AS INDICATED | DRAWING NUMBER:

JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

**S3.12**

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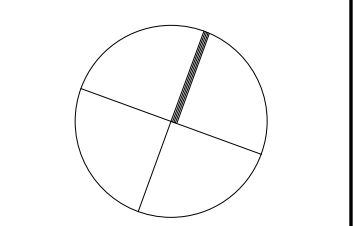


KEYNOTE LEGEND:

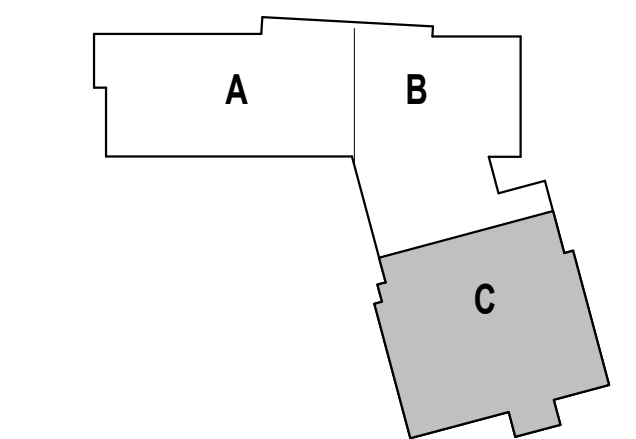
9	ADDENDUM 9	02/06/2024
6	ADDENDUM 6	01/23/2024
3	ADDENDUM 3	01/09/2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

## FIRE PROTECTION FIRST FLOOR PLAN - ZONE C

DRAWN BY: BSG

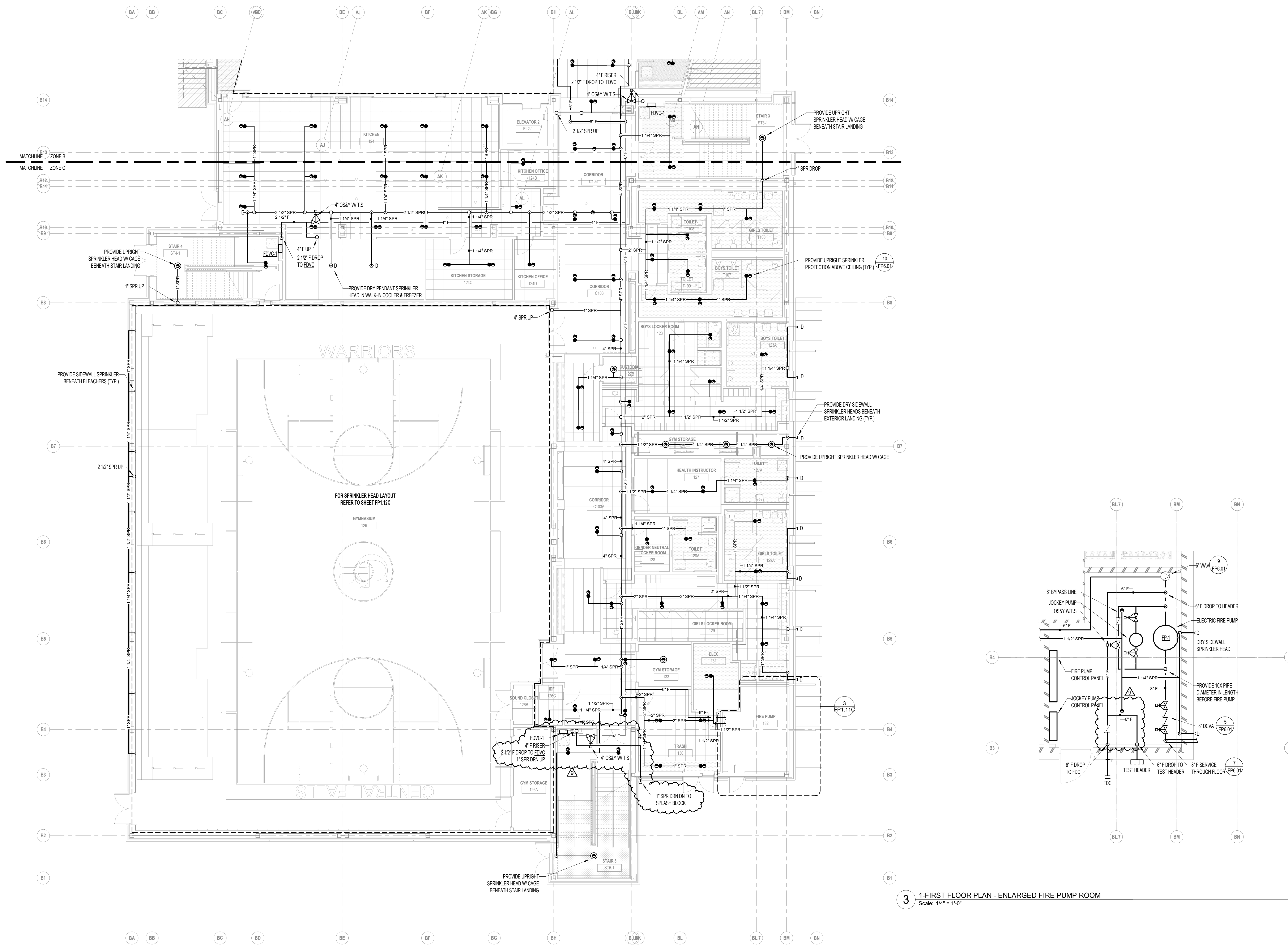
REVIEWED BY: AMD

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

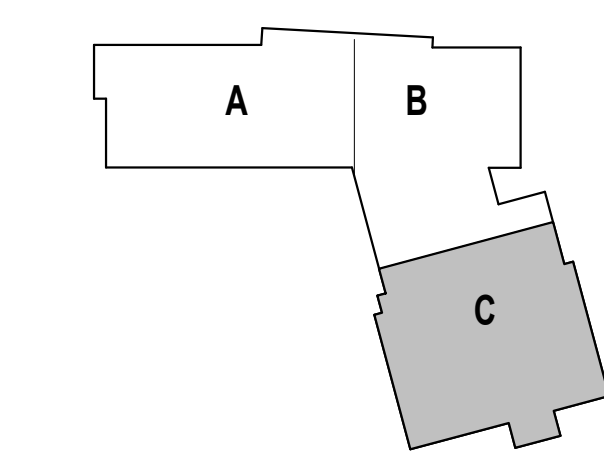
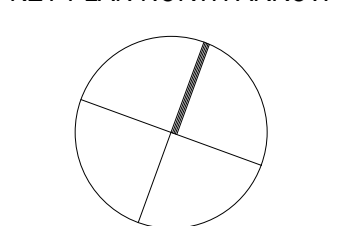
DATE: OCTOBER 13, 2023

**FP1.11C**

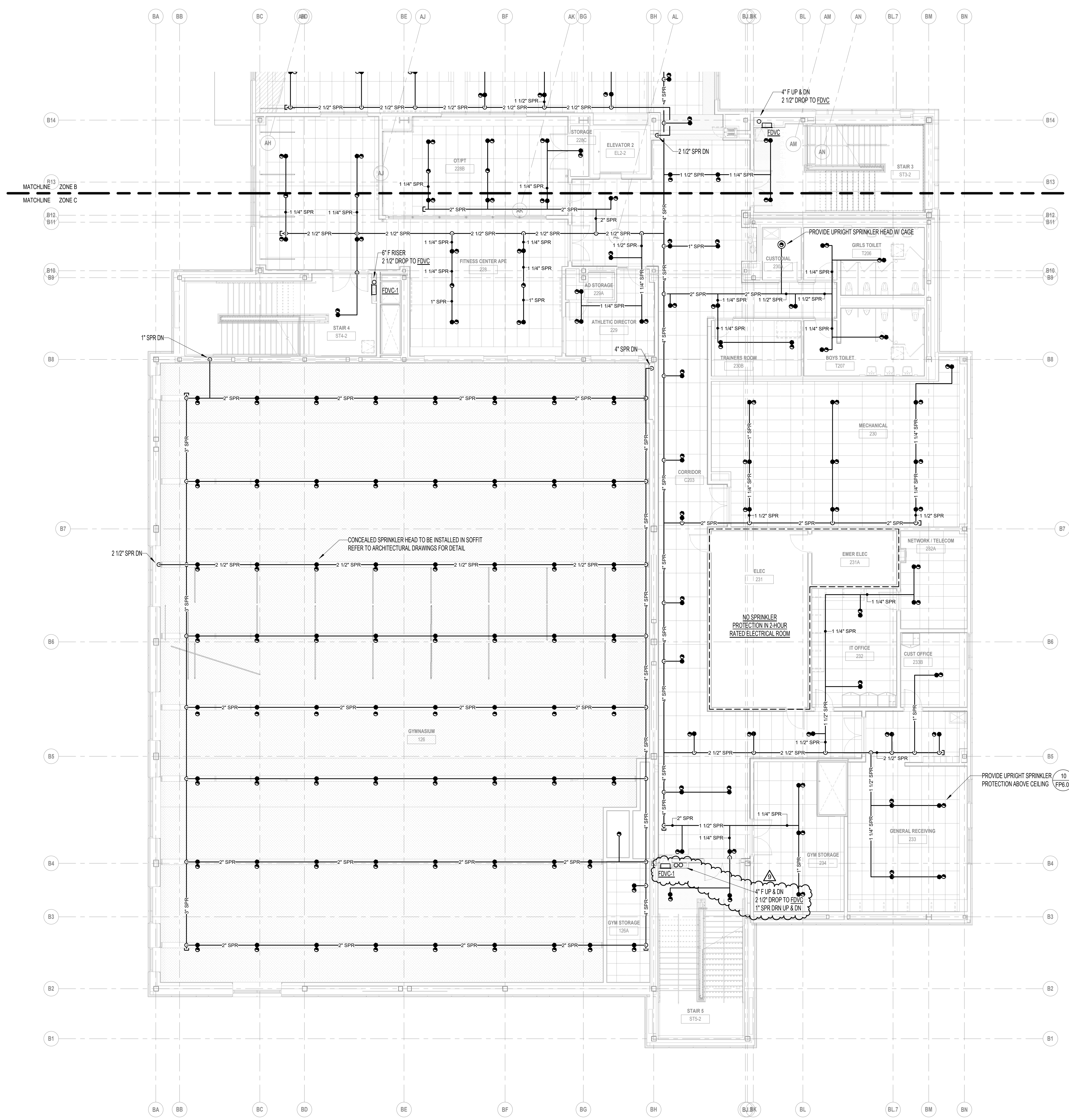


**3** 1-FIRST FLOOR PLAN - ENLARGED FIRE PUMP ROOM  
Scale: 1/4" = 1'-0"

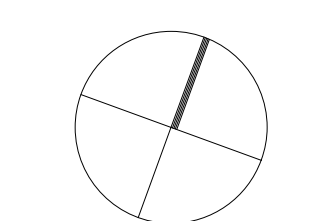
**1** FIRST FLOOR PLAN - ZONE C  
Scale: 1/8" = 1'-0"



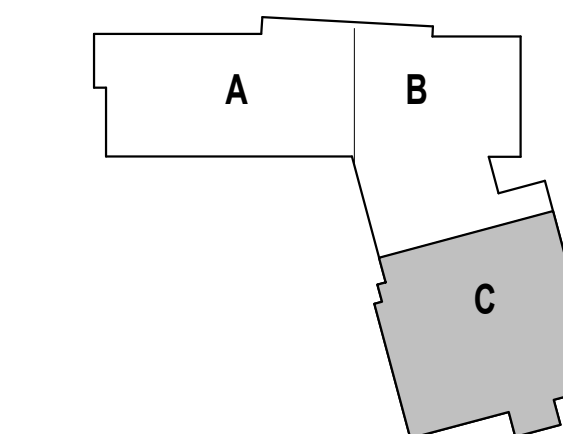
**FIRE PROTECTION  
SECOND FLOOR  
PLAN - ZONE C**



1 SECOND FLOOR PLAN - ZONE C  
1/8" = 1'-0"



KEYPLAN



DRAWING NAME:

**FIRE PROTECTION  
THIRD FLOOR  
PLAN - ZONE C**

DRAWN BY: BSG

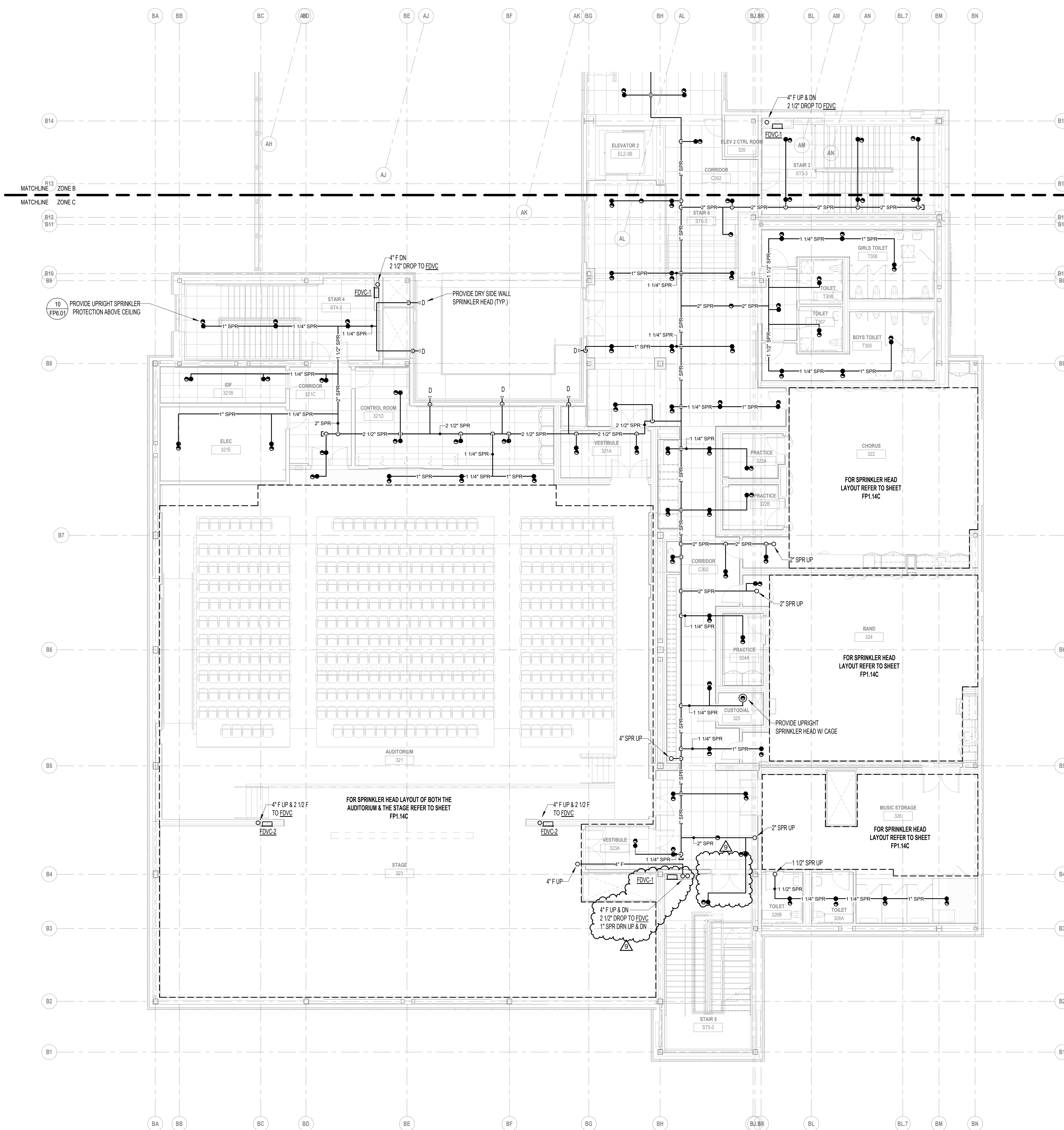
REVIEWED BY: AMD

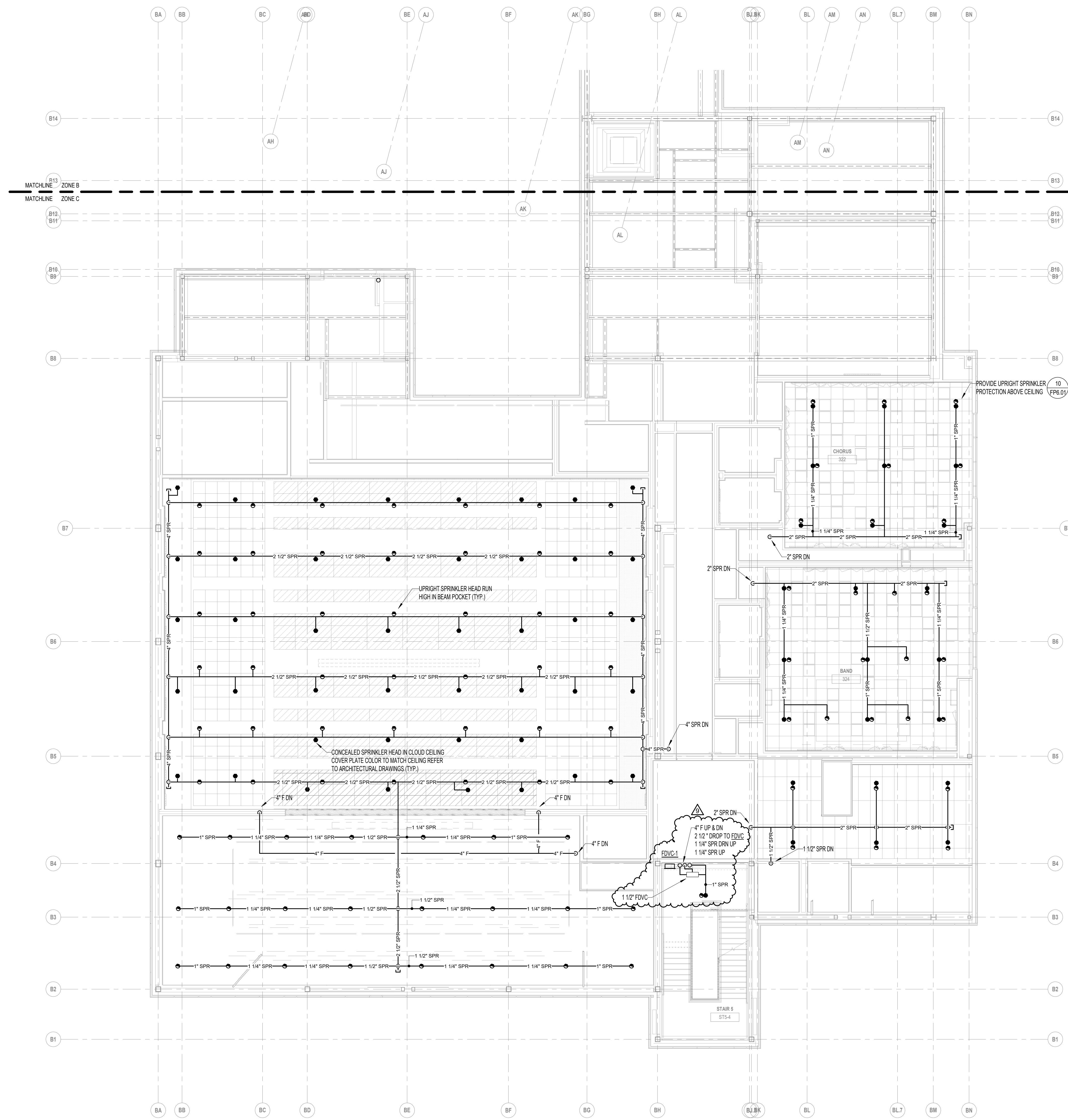
SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

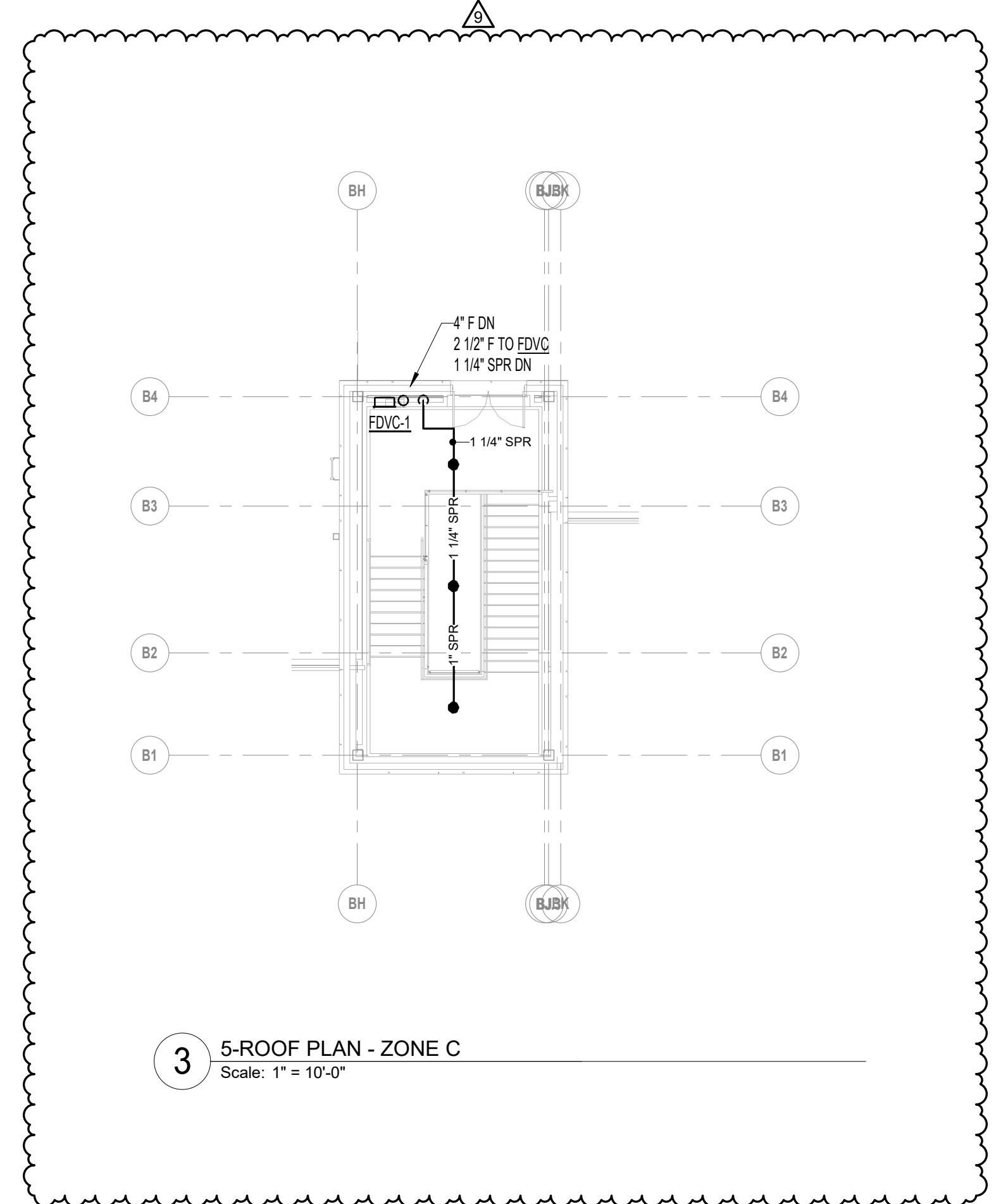
DATE: OCTOBER 13, 2023

**FP1.13C**



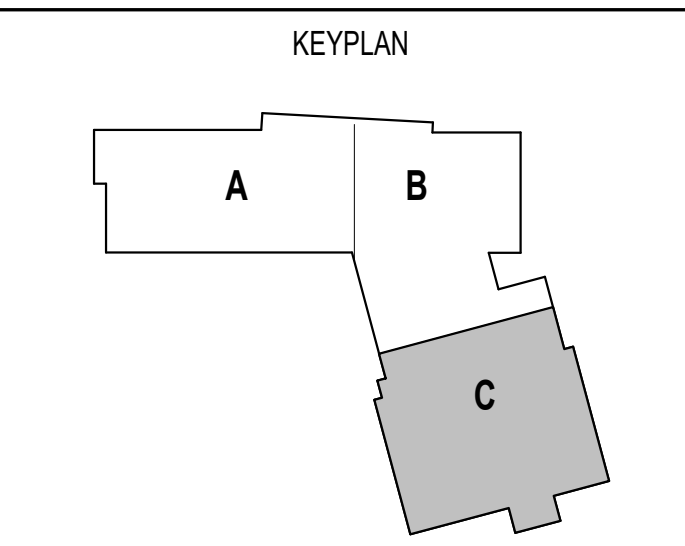
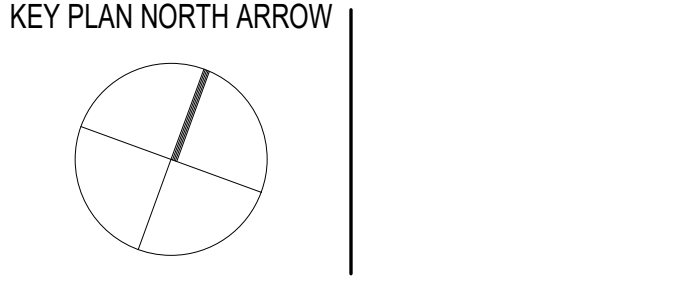


1 FOURTH FLOOR PLAN - ZONE C  
Scale: 1/8" = 1'-0"



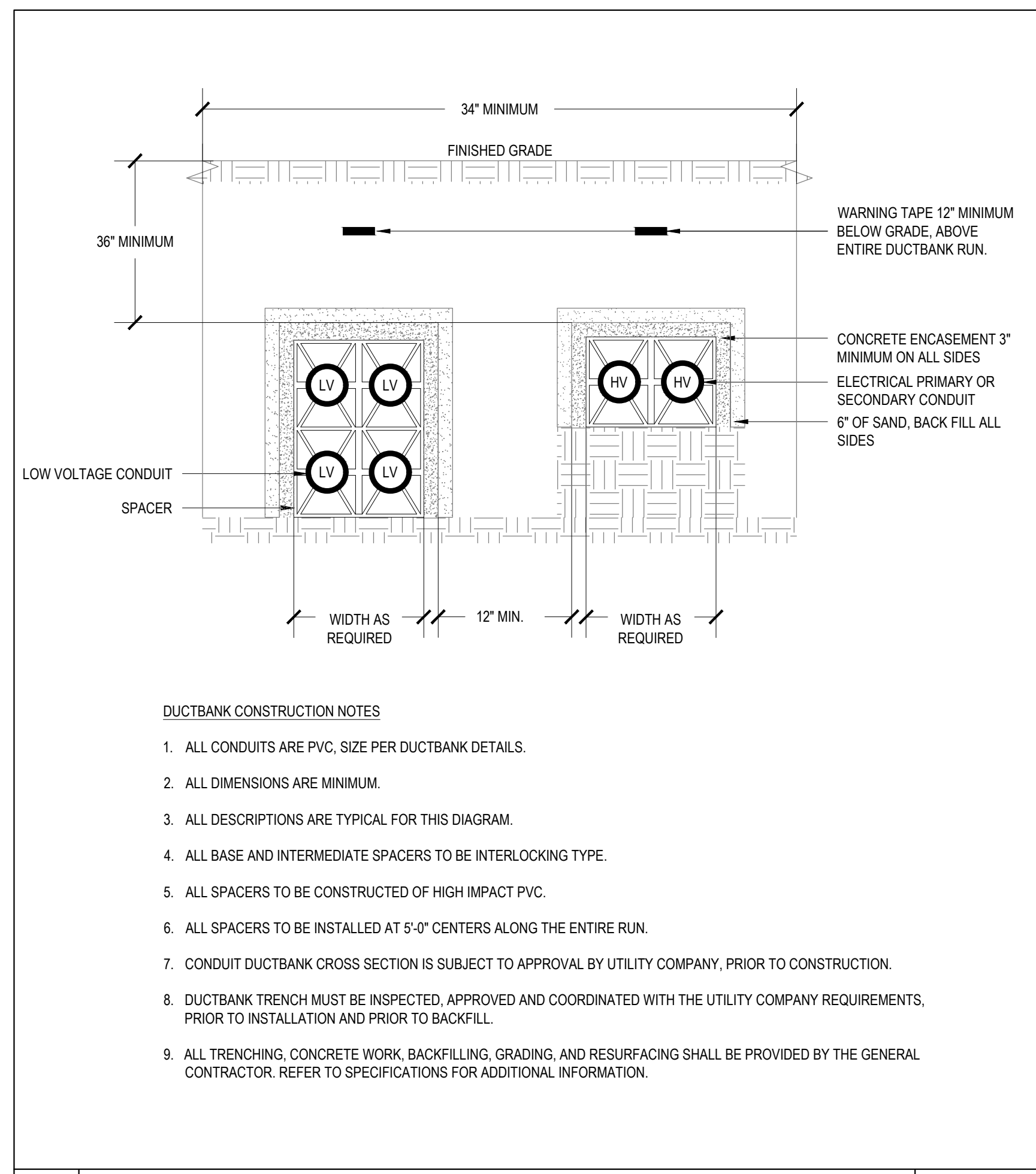
3 5-ROOF PLAN - ZONE C  
Scale: 1" = 10'-0"

KEYNOTE LEGEND:

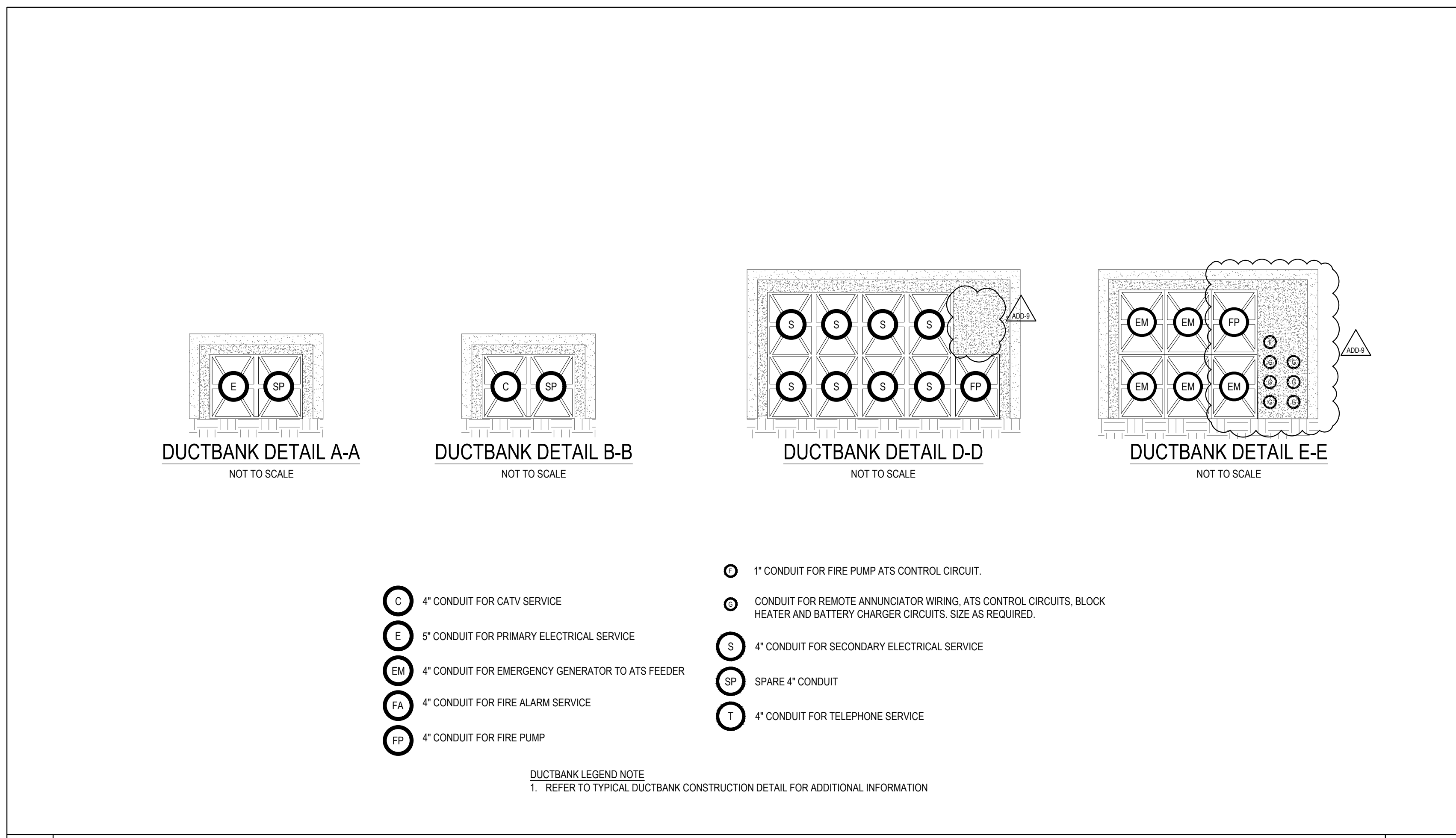


DRAWING NAME:  
**FIRE PROTECTION  
FOURTH FLOOR  
PLAN - ZONE C**

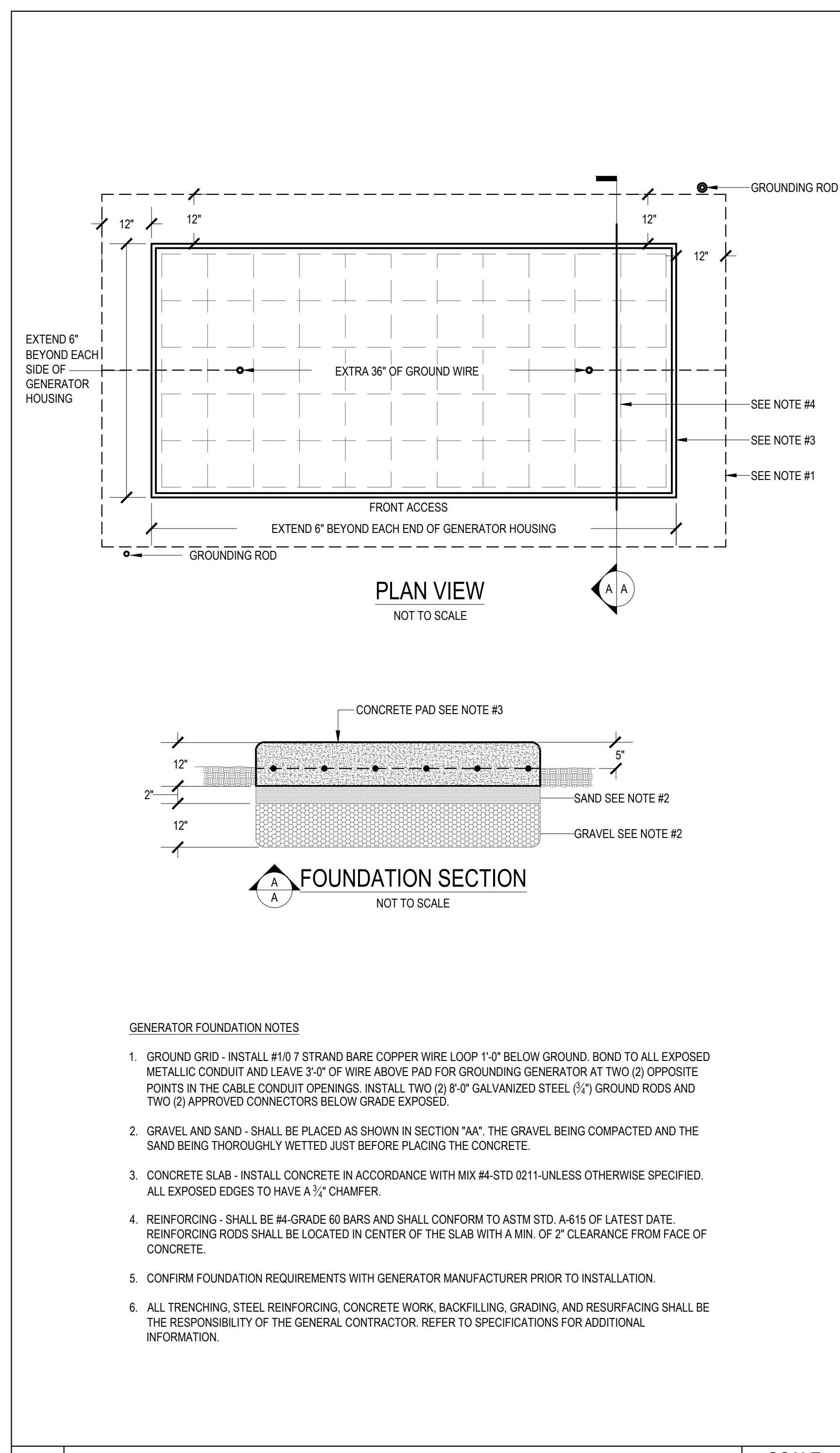
DRAWN BY: BSG  
REVIEWED BY: AMD  
SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **FP1.14C**



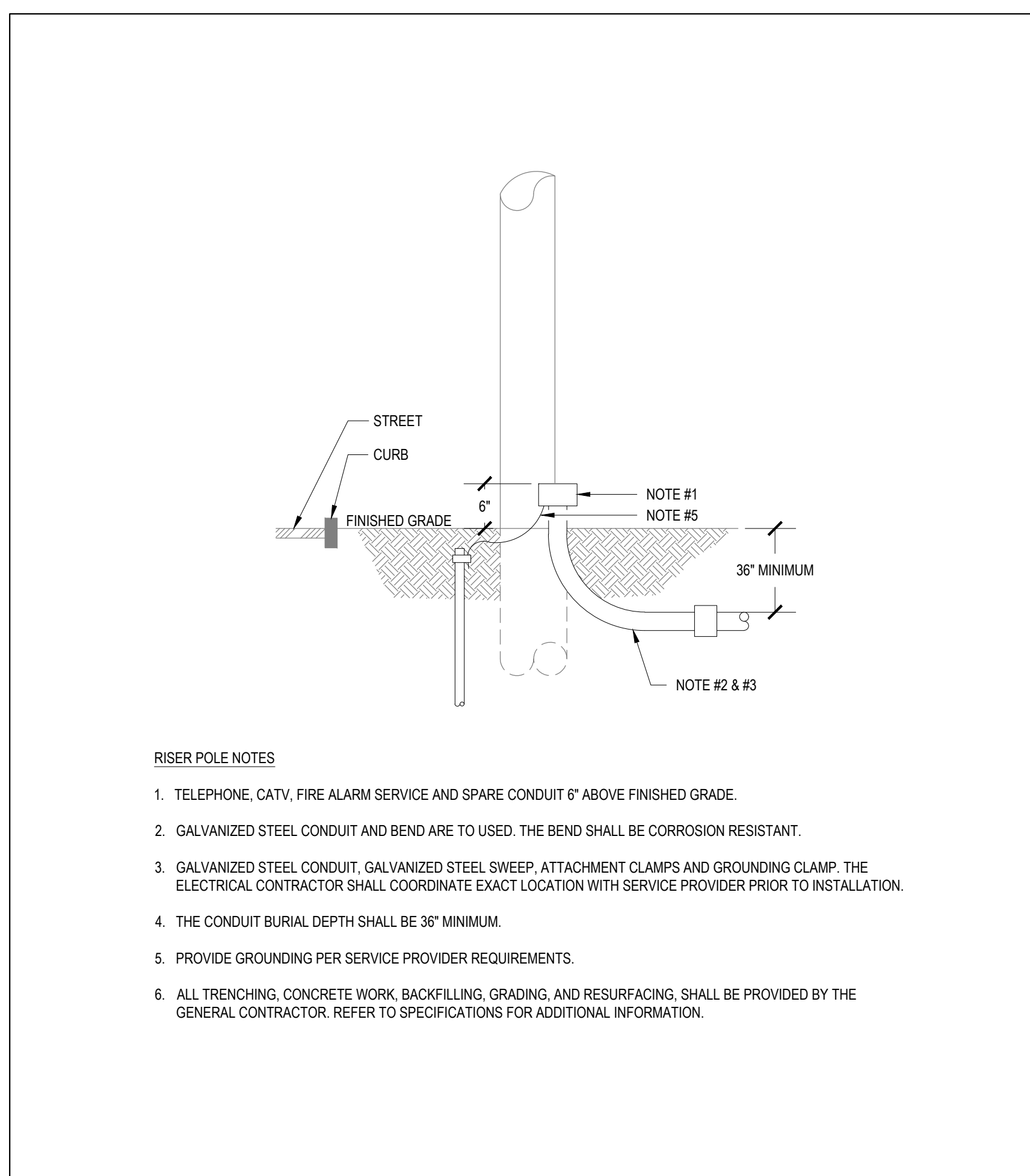
**1 TYPICAL DUCTBANK CONSTRUCTION DETAIL** SCALE NOT TO SCALE



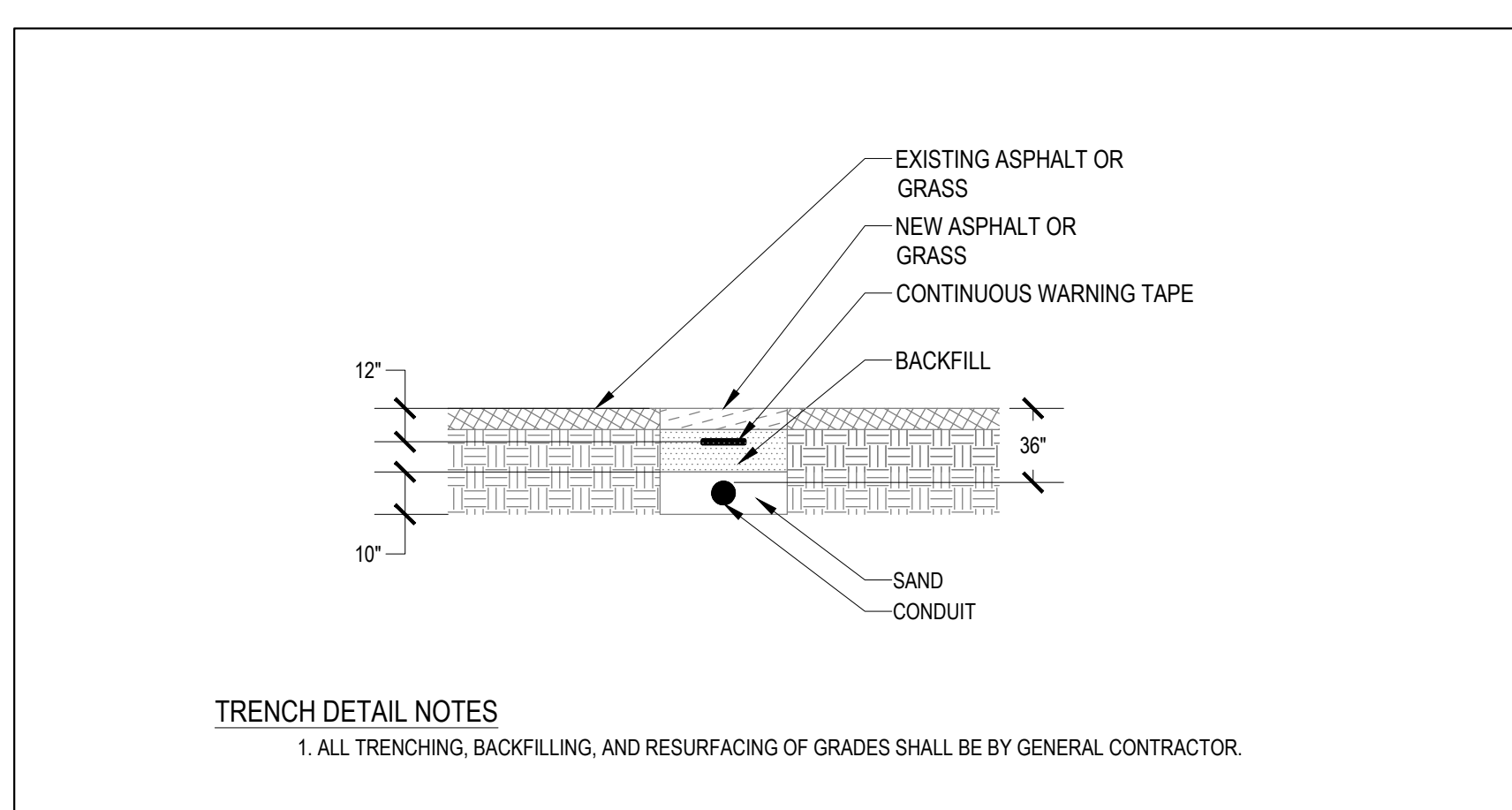
**2 DUCTBANK LEGEND DETAIL** SCALE NOT TO SCALE



**3 GENERATOR FOUNDATION DETAIL** SCALE NOT TO SCALE



**4 LOW VOLTAGE RISER POLE INSTALLATION DETAIL** SCALE NOT TO SCALE



**5 TRENCH DETAIL** SCALE NOT TO SCALE



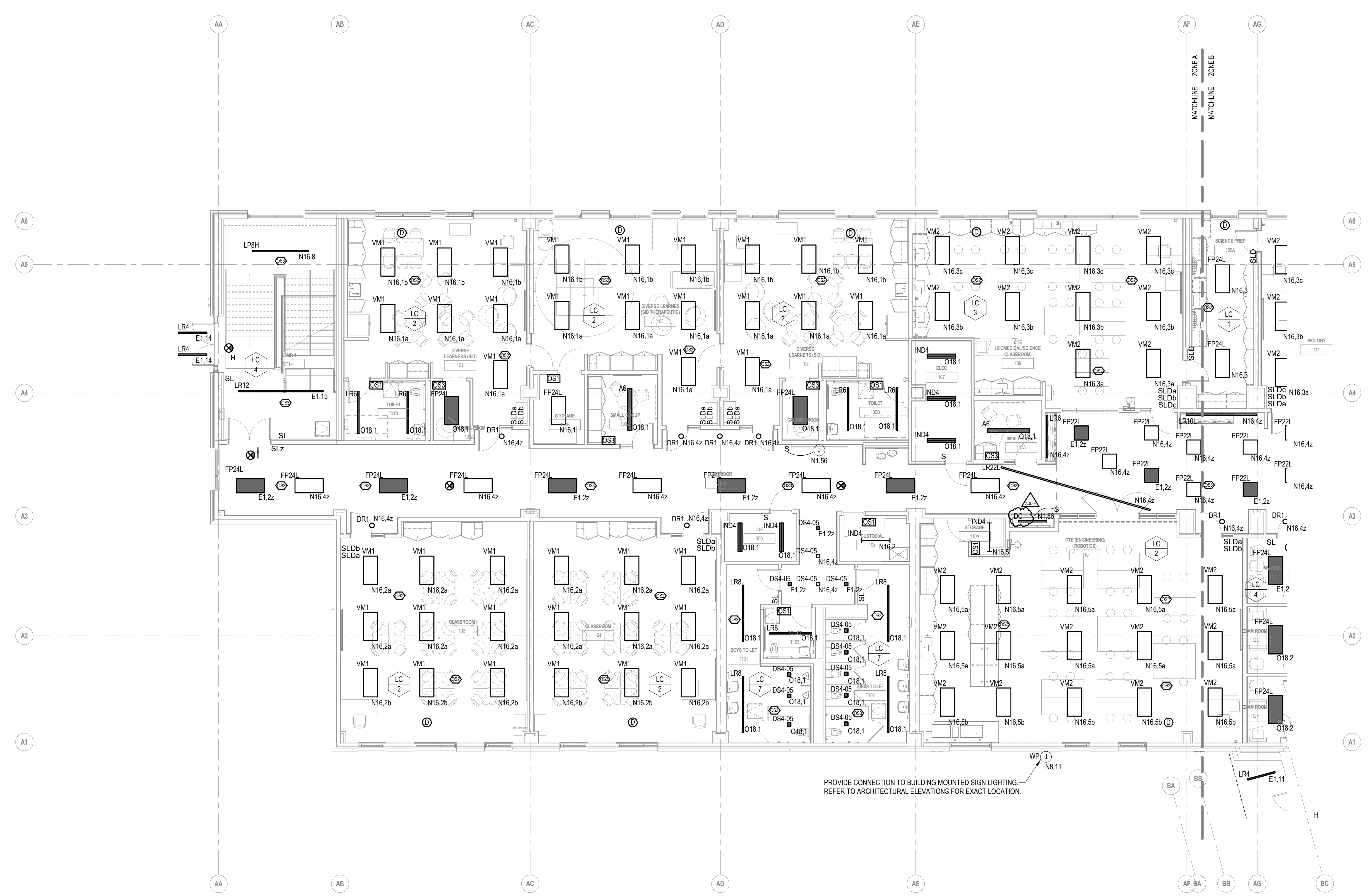
KEYNOTE LEGEND:

**277V480V PANEL KEY SCHEDULE**

KEY	PANEL	BRANCH
E1	E1.2A	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

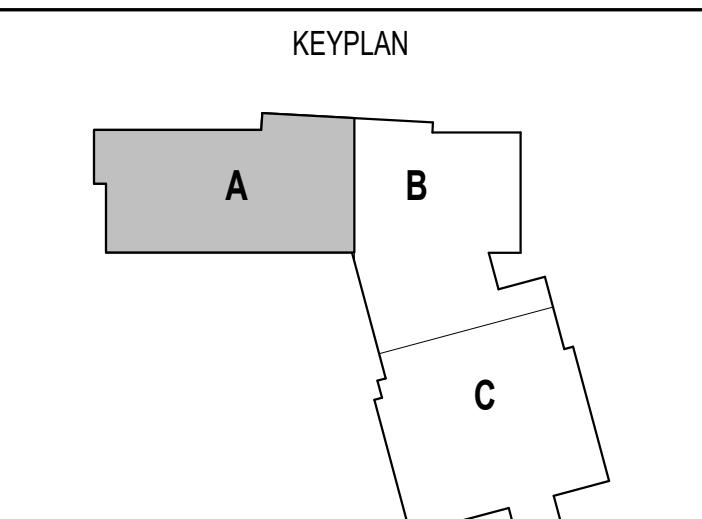
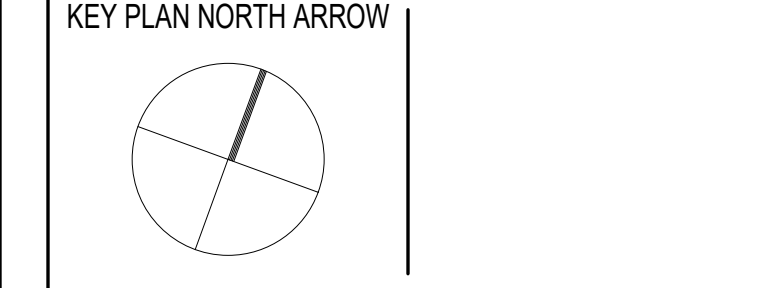
**208V120V PANEL KEY SCHEDULE**

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
C1	CP1A	NORMAL
C2	CP1C	NORMAL
C4	CP2A	NORMAL
C5	CP2C	NORMAL
C6	CP3A	NORMAL
C7	CP3C	NORMAL
C8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY



ADD-9	ADDENDUM 9	2/6/2024
ADD-8	ADDENDUM 8	1/30/2024
ADD-3	ADDENDUM 3	1/9/2024

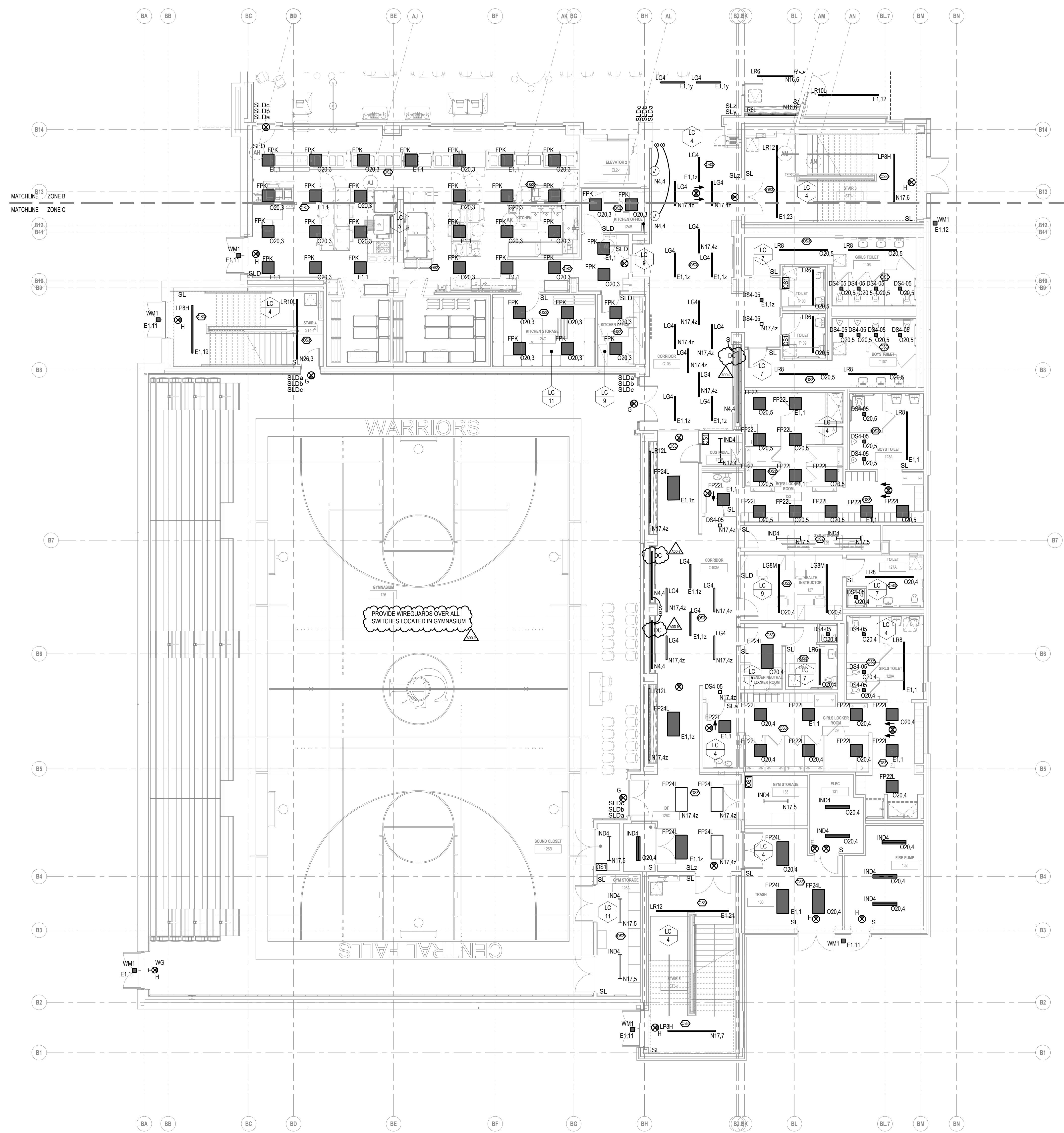
**100% CONSTRUCTION DOCUMENTS**



DRAWING NAME:

**ELECTRICAL  
FIRST FLOOR  
LIGHTING PLAN -  
ZONE A**

DRAWN BY: RBC/JAJ  
REVIEWED BY: RCB  
SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **E1.11A**



**277V/480V PANEL KEY SCHEDULE**

KEY	PANEL	BRANCH
E1	E1.24	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

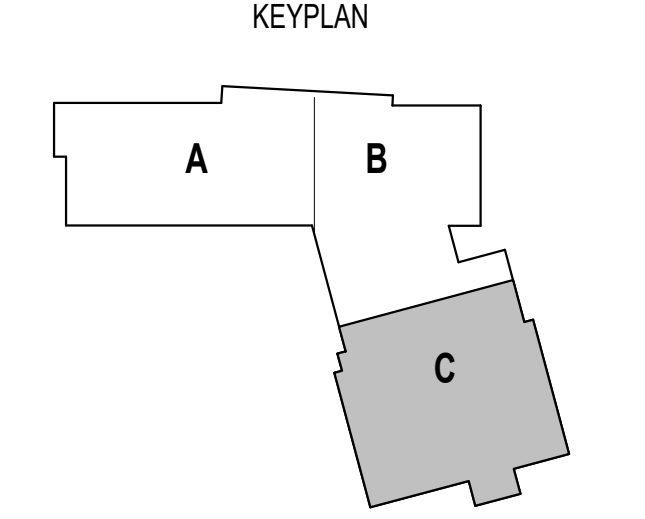
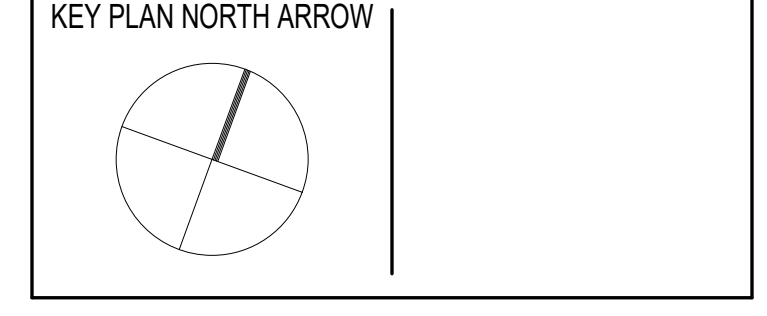
**208V/120V PANEL KEY SCHEDULE**

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
C1	CP1A	NORMAL
C2	CP1C	NORMAL
C4	CP2A	NORMAL
C5	CP2C	NORMAL
C6	CP3A	NORMAL
C7	CP3C	NORMAL
C8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY

KEYNOTE LEGEND:

ADD-9 ADDENDUM 9 2/6/2024  
 ADD-8 ADDENDUM 8 1/30/2024  
 ADD-6 ADDENDUM 6 1/23/2024  
 ADD-3 ADDENDUM 3 1/9/2024

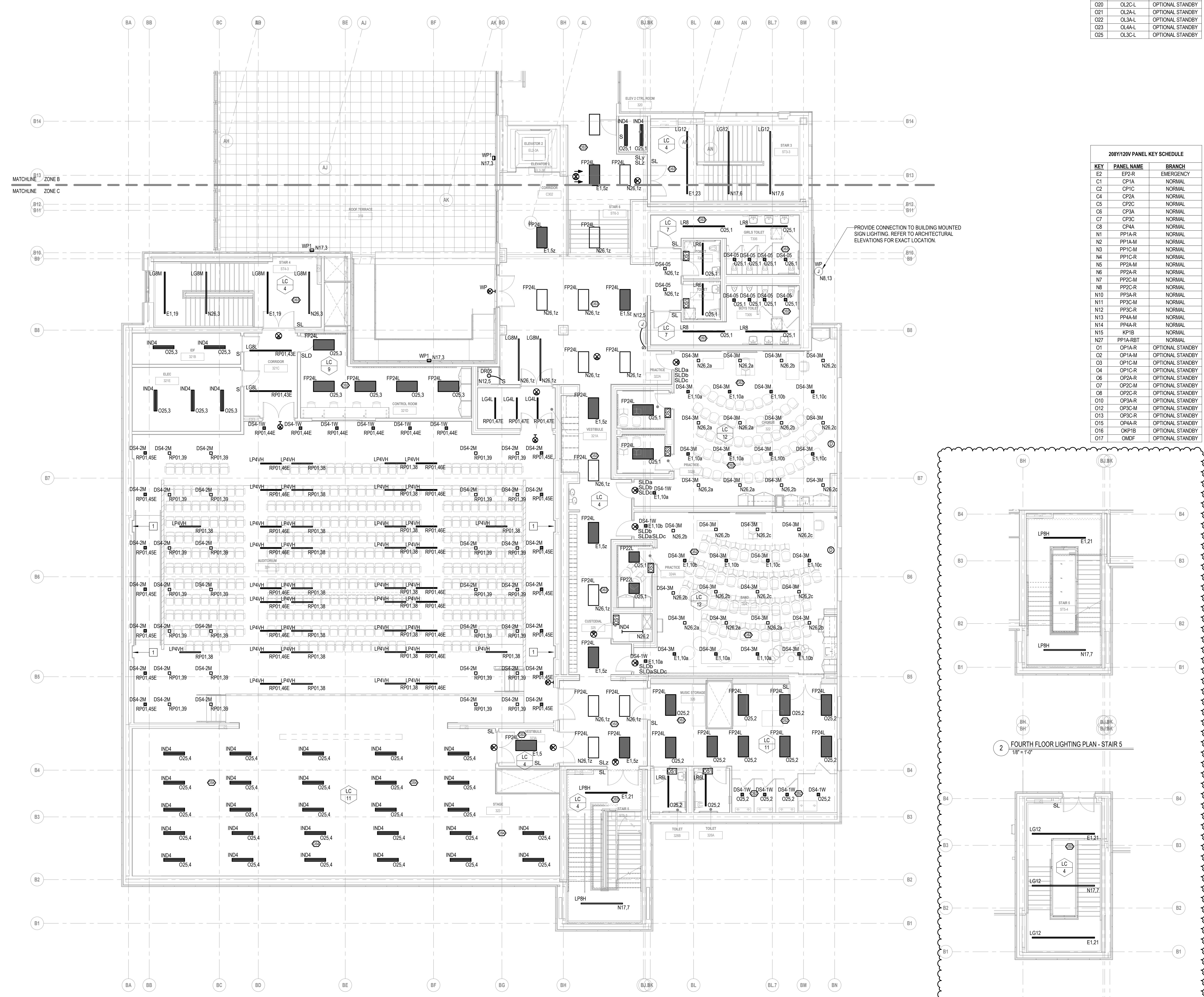
**100% CONSTRUCTION DOCUMENTS**



DRAWING NAME:  
**ELECTRICAL FIRST FLOOR LIGHTING PLAN - ZONE C**

DRAWN BY: RBC/JAJ  
 REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
 JOB NO.: 2202.02  
 DATE: OCTOBER 13, 2023 **E1.11C**



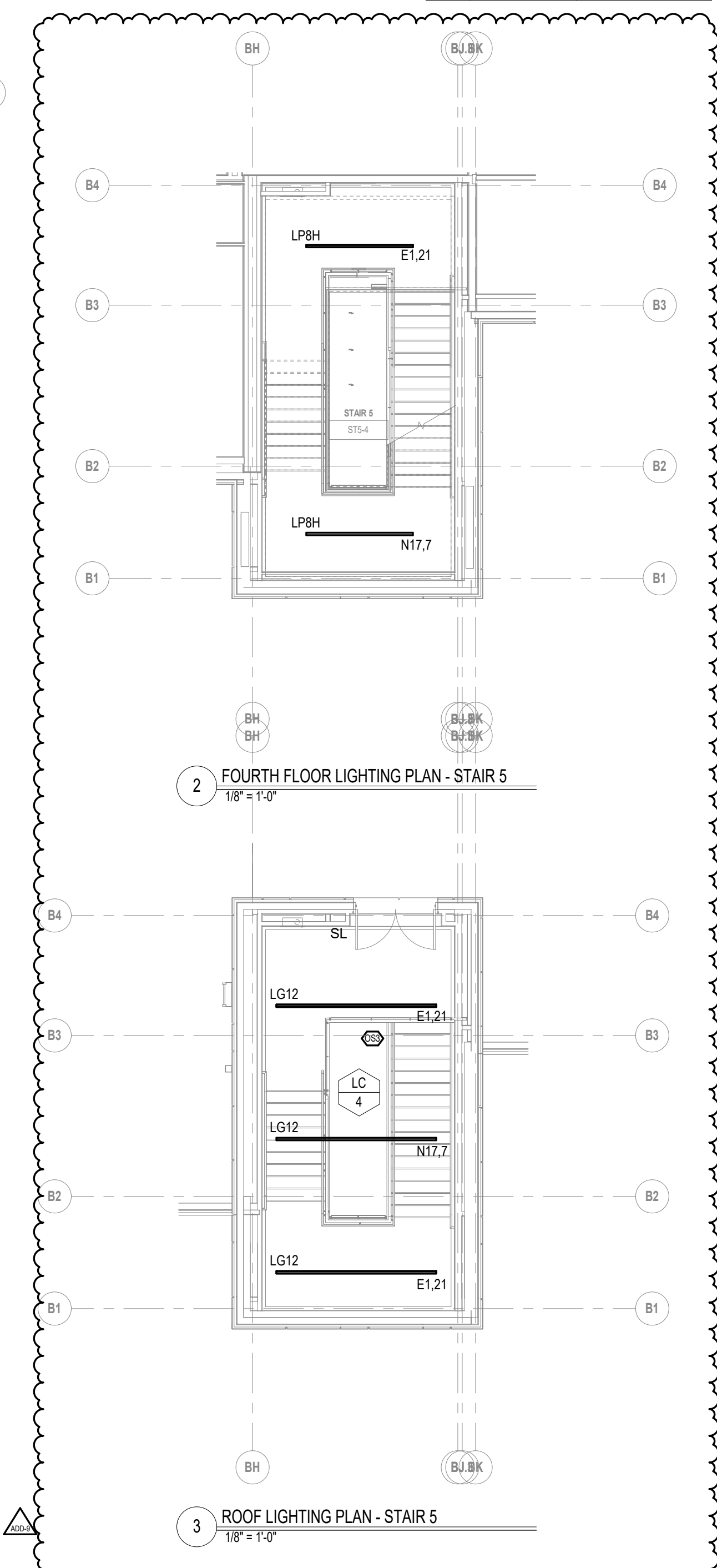
**277V/480V PANEL KEY SCHEDULE**

KEY	PANEL	BRANCH
E1	EL24	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

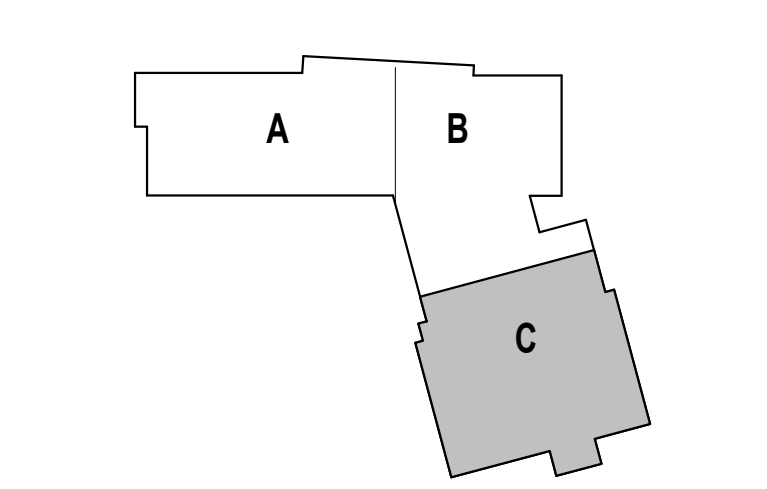
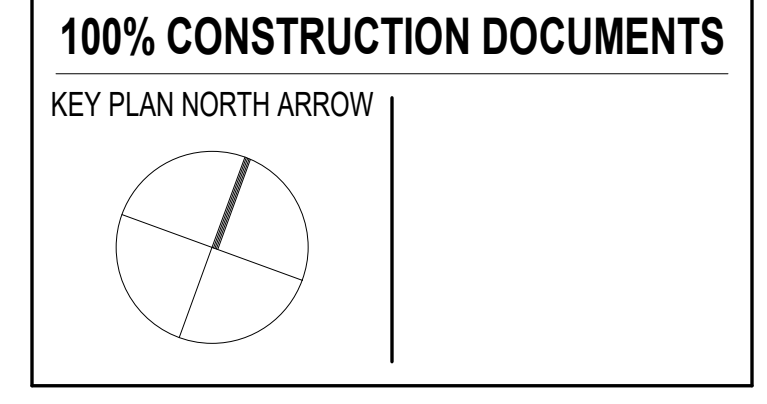
**208Y/120V PANEL KEY SCHEDULE**

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
O1	OP1A	NORMAL
O2	OP1C	NORMAL
O4	CP2A	NORMAL
O5	CP2C	NORMAL
O6	CP3A	NORMAL
O7	CP3C	NORMAL
O8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY

**KEYNOTE LEGEND:**  
 1 (2) TYPE LRAM LIGHTING FIXTURES INSTALLED VERTICALLY IN WALL. REFER TO ARCHITECTURAL DETAILS FOR PLACEMENT. CIRCUIT RP01.40



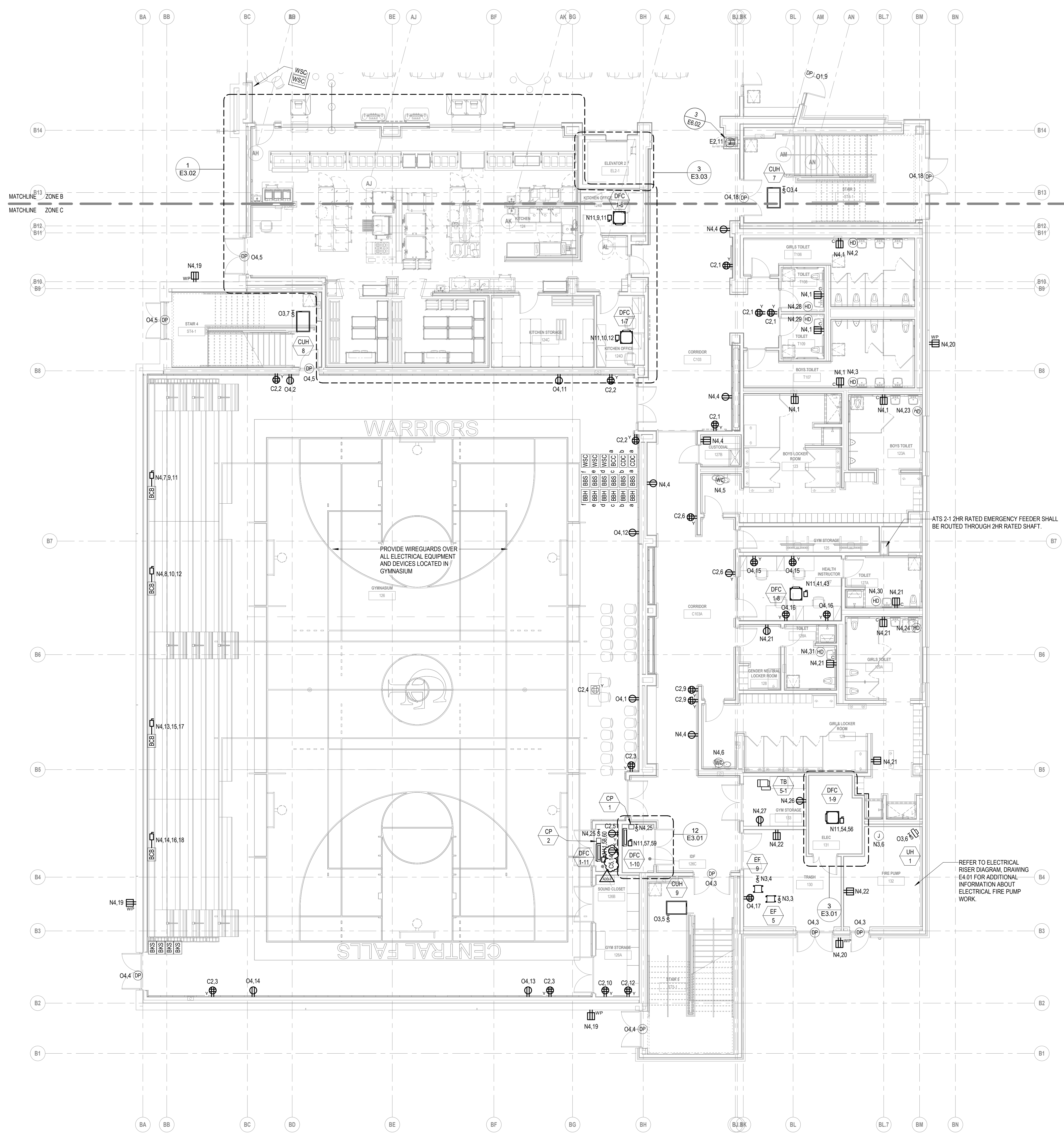
ADD-9 ADDENDUM 9 2/6/2024  
 ADD-8 ADDENDUM 8 1/30/2024  
 ADD-6 ADDENDUM 6 1/23/2024  
 ADD-3 ADDENDUM 3 1/9/2024



DRAWING NAME:  
**ELECTRICAL  
 THIRD FLOOR  
 LIGHTING PLAN -  
 ZONE C**

DRAWN BY: RBC/JAJ  
 REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
 JOB NO.: 2202.02  
 DATE: OCTOBER 13, 2023 **E1.13C**



**277V/480V PANEL KEY SCHEDULE**

KEY	PANEL	BRANCH
E1	E3.24	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

**208Y/120V PANEL KEY SCHEDULE**

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
O1	CP1A	NORMAL
O2	CP1C	NORMAL
O4	CP2A	NORMAL
O5	CP2C	NORMAL
O6	CP3A	NORMAL
O7	CP3C	NORMAL
O8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY

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 www.griffithandvary.com

**CENTRAL FALLS SCHOOL DISTRICT**  
 CENTRAL FALLS HIGH SCHOOL  
 10 HIGGINSON AVE, CENTRAL FALLS, RI

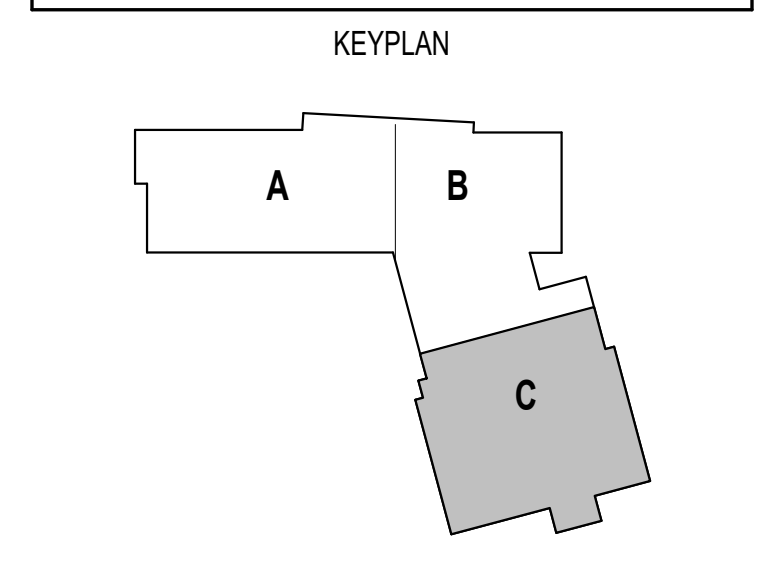
**GENERAL NOTES:**

- ELECTRICAL SUBCONTRACTOR SHALL WIRE ALL TERMINAL BOXES SHOWN ON THIS DRAWING TO N3.2.

ADD-9 ADDENDUM 9 2/6/2024  
 ADD-8 ADDENDUM 8 1/30/2024  
 ADD-7 ADDENDUM 7 1/26/2024  
 ADD-6 ADDENDUM 6 1/23/2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW



DRAWING NAME:  
**ELECTRICAL FIRST FLOOR POWER PLAN - ZONE C**

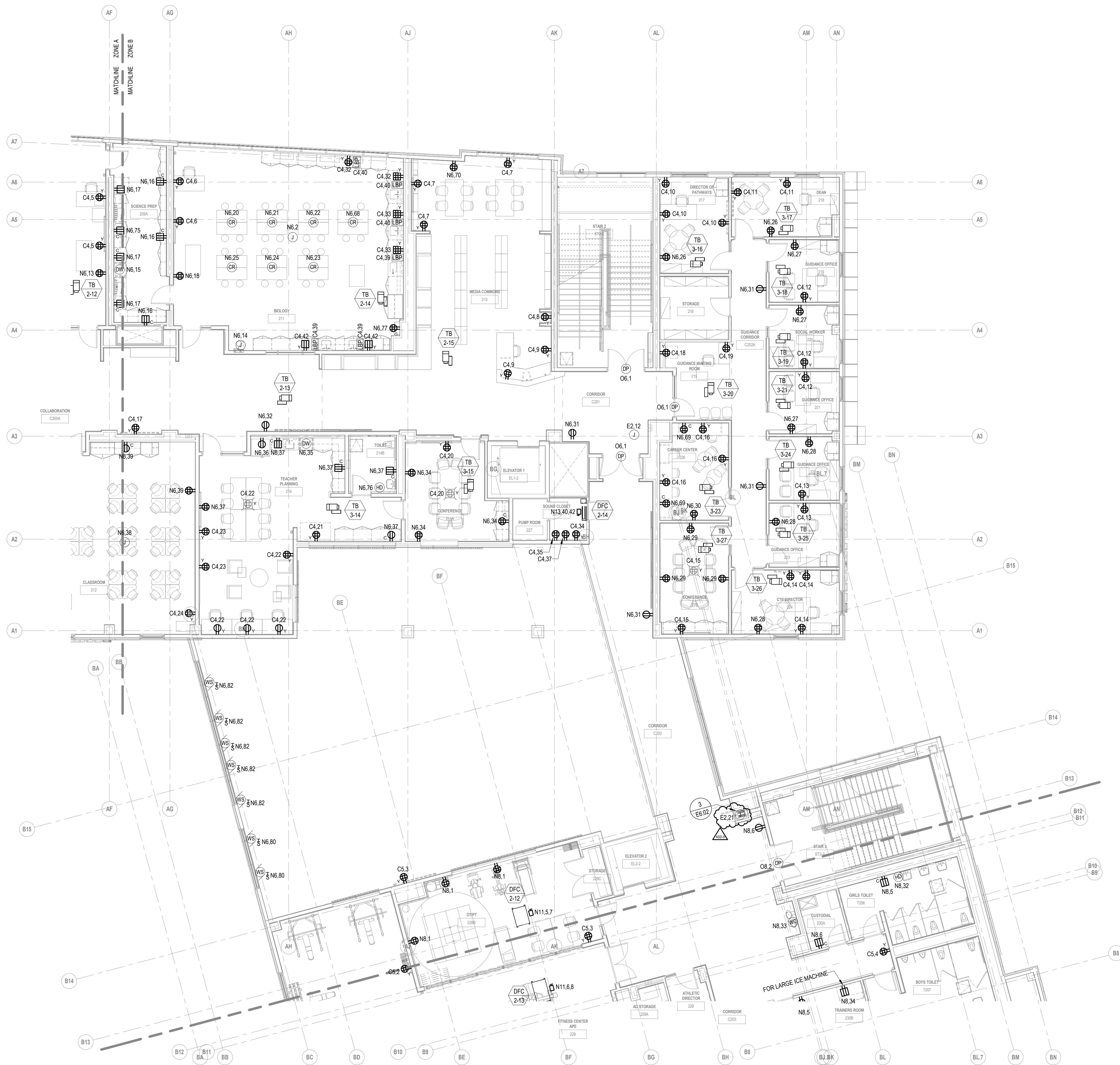
DRAWN BY: RBC/UAJ  
 REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
 JOB NO.: 2202.02  
 DATE: OCTOBER 13, 2023 **E2.11C**

1 FIRST FLOOR POWER PLAN - ZONE C

KEY	PANEL	BRANCH
E1	E2.4	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

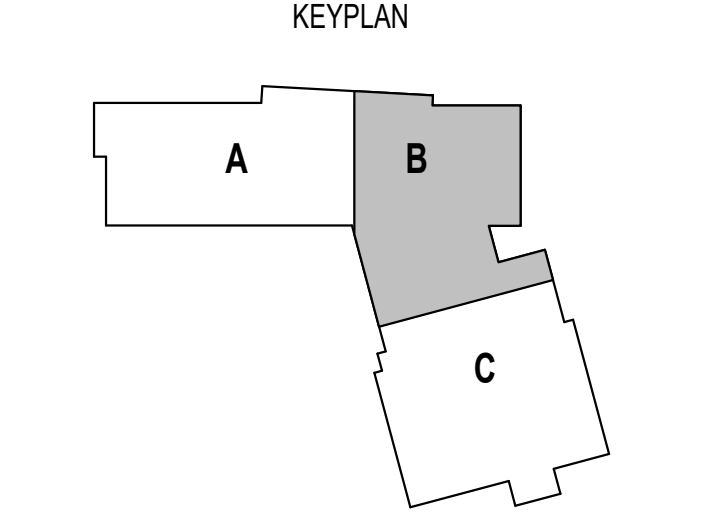
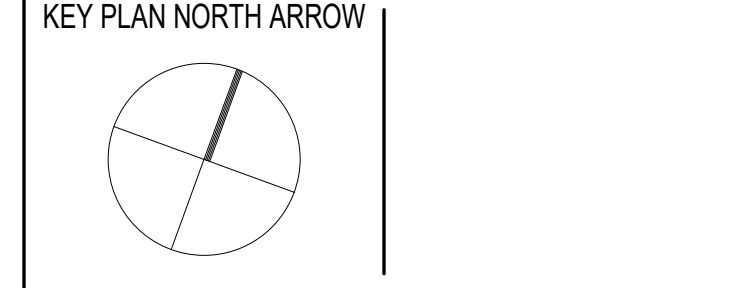
KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
C1	CP1A	NORMAL
C2	CP1C	NORMAL
C4	CP2A	NORMAL
C5	CP2C	NORMAL
C6	CP3A	NORMAL
C7	CP3C	NORMAL
C8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY



GENERAL NOTES:  
1. ELECTRICAL SUBCONTRACTOR SHALL WIRE ALL TERMINAL BOXES SHOWN ON THIS DRAWING TO N6.2.

ADD-9 ADDENDUM 9 2/6/2024  
ADD-8 ADDENDUM 8 1/30/2024  
ADD-7 ADDENDUM 7 1/26/2024

**100% CONSTRUCTION DOCUMENTS**



DRAWING NAME:  
**ELECTRICAL  
SECOND FLOOR  
POWER PLAN -  
ZONE B**

DRAWN BY: RBC/JAJ  
REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **E2.12B**

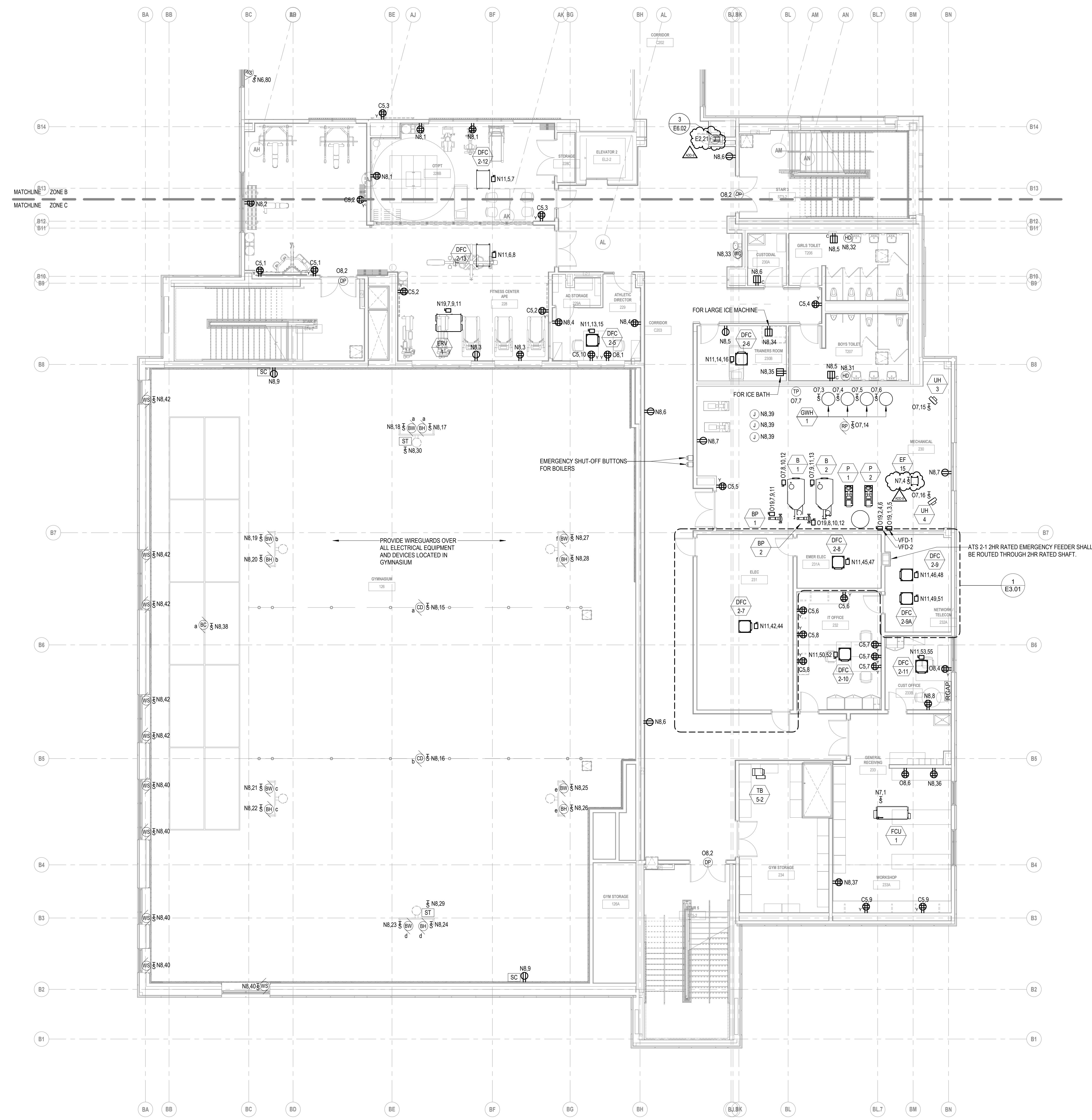
1 SECOND FLOOR POWER PLAN - ZONE B  
1/8" = 1'-0"

**277V/480V PANEL KEY SCHEDULE**

KEY	PANEL	BRANCH
E1	EL2-L	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

**208V/120V PANEL KEY SCHEDULE**

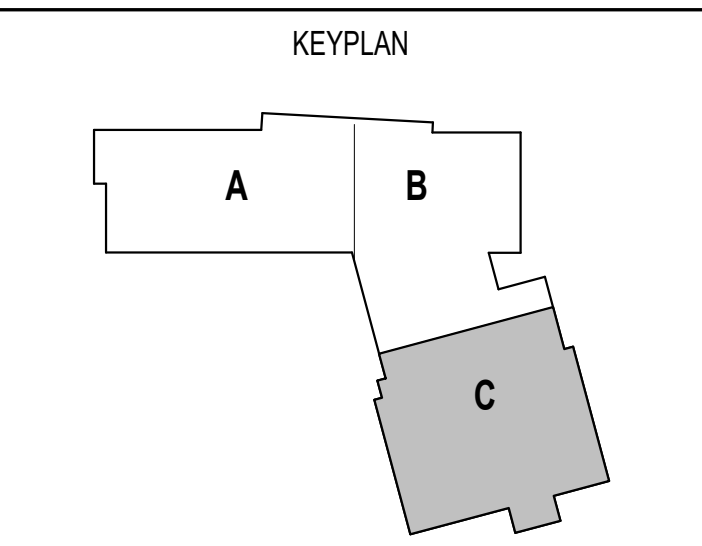
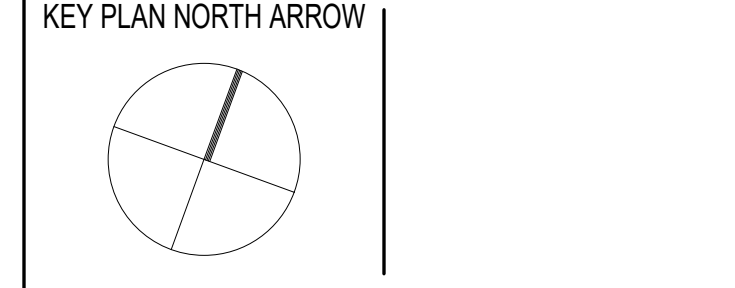
KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
O1	CP1A	NORMAL
O2	CP1C	NORMAL
O4	CP2A	NORMAL
O5	CP2C	NORMAL
O6	CP3A	NORMAL
O7	CP3C	NORMAL
O8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY



GENERAL NOTES:  
1. ELECTRICAL SUBCONTRACTOR SHALL WIRE ALL TERMINAL BOXES SHOWN ON THIS DRAWING TO N7.2.

ADD-9	ADDENDUM 9	2/6/2024
ADD-8	ADDENDUM 8	1/30/2024
ADD-7	ADDENDUM 7	1/26/2024
ADD-6	ADDENDUM 6	1/23/2024

**100% CONSTRUCTION DOCUMENTS**

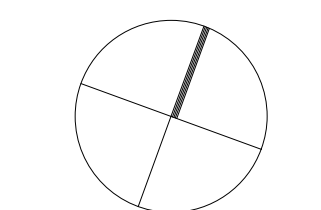


DRAWING NAME:  
**ELECTRICAL SECOND FLOOR POWER PLAN - ZONE C**

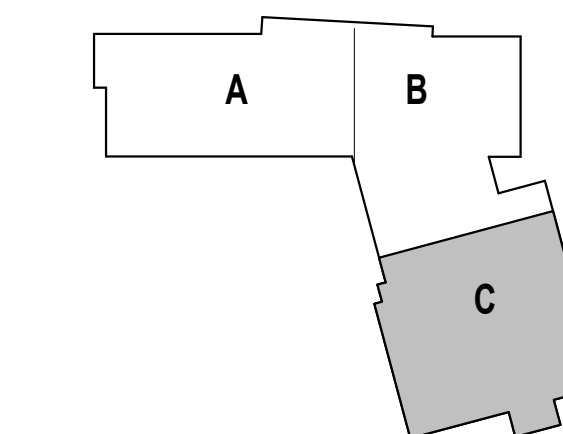
DRAWN BY: RBC/JAJ  
REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02 | **E2.12C**  
DATE: OCTOBER 13, 2023

1 SECOND FLOOR POWER PLAN - ZONE C  
1/8" = 1'-0"



KEYPLAN

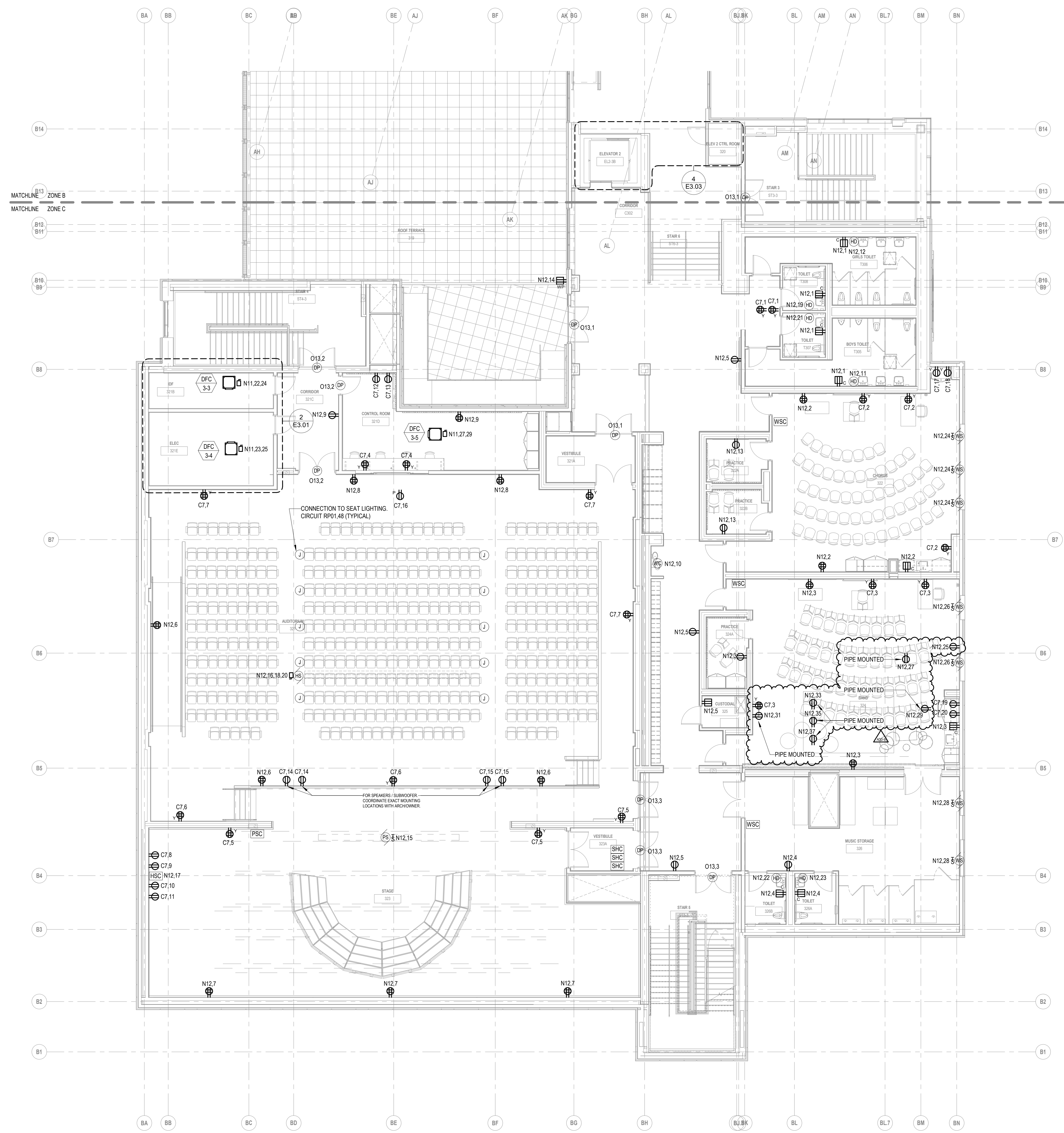


**277V/480V PANEL KEY SCHEDULE**

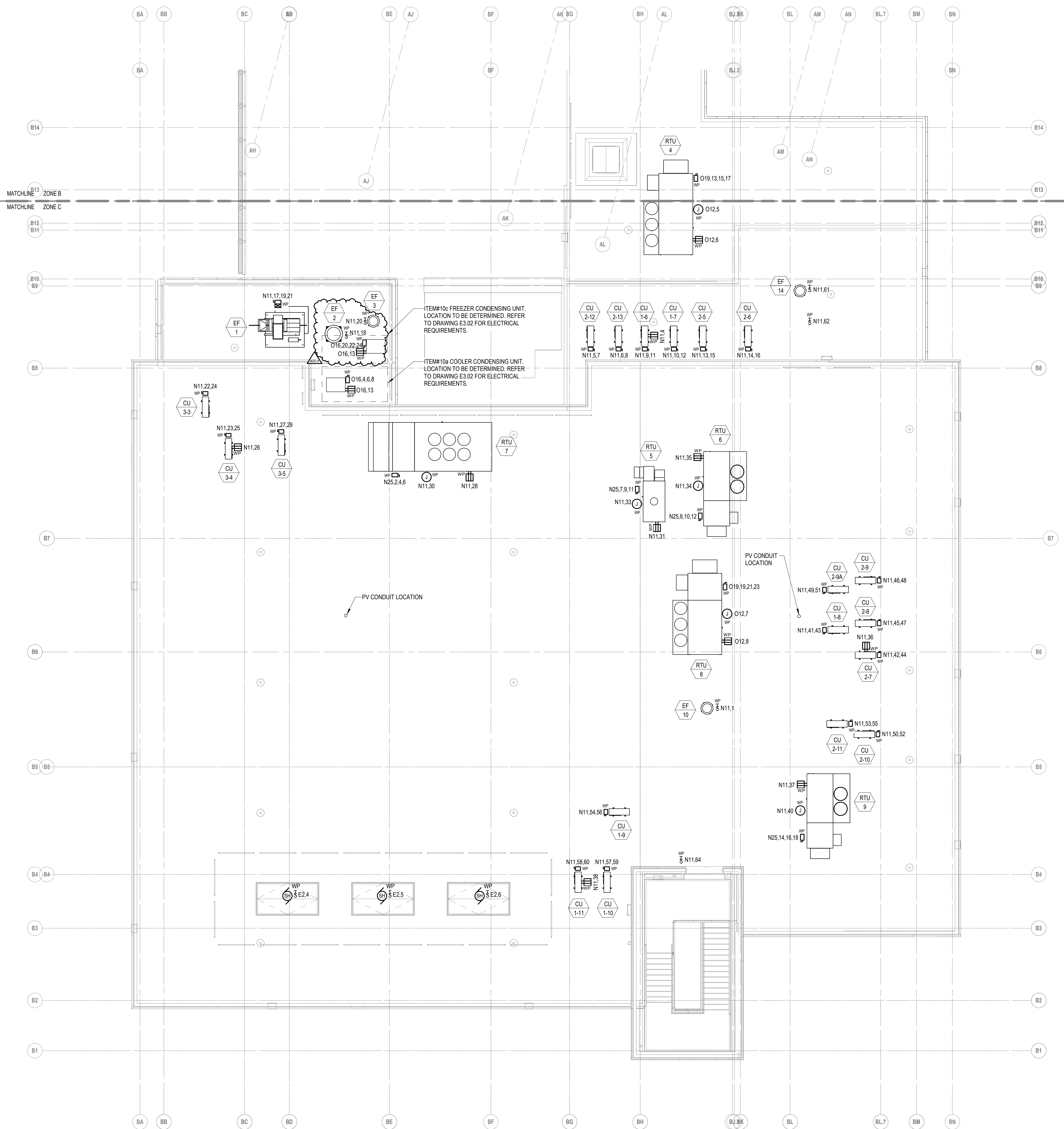
KEY	PANEL	BRANCH
E1	EL2-L	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

**208V/120V PANEL KEY SCHEDULE**

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
C1	CP1A	NORMAL
C2	CP1C	NORMAL
C4	CP2A	NORMAL
C5	CP2C	NORMAL
C6	CP3A	NORMAL
C7	CP3C	NORMAL
C8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY



1 THIRD FLOOR POWER PLAN - ZONE C  
1/8" = 1'-0"



**277V/480V PANEL KEY SCHEDULE**

KEY	PANEL	BRANCH
E1	E1.24	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP3C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

**208Y/120V PANEL KEY SCHEDULE**

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
O1	CP1A	NORMAL
O2	CP1C	NORMAL
O4	CP2A	NORMAL
O5	CP2C	NORMAL
O6	CP3A	NORMAL
O7	CP3C	NORMAL
O8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	PP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY

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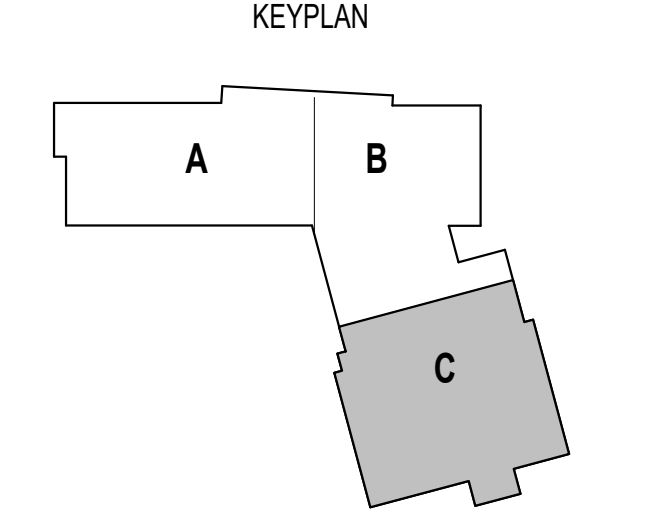
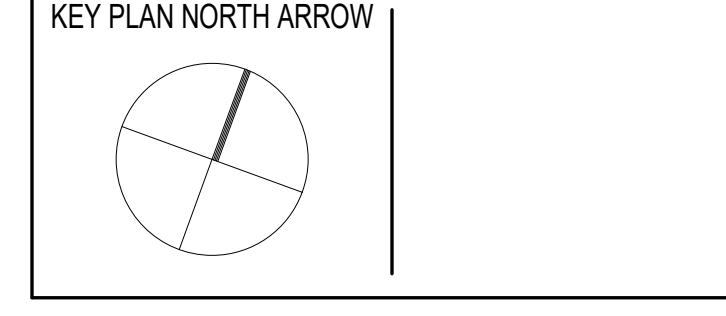
KEYNOTE LEGEND:

**GENERAL NOTES**

1. PROVIDE WIRING AS REQUIRED PER APPROVED MECHANICAL SHOP DRAWINGS VIA ITC FROM THE TERMINAL BLOCK OF CONDENSING UNITS TO THE TERMINAL BLOCK OF ASSOCIATED SPLIT TYPE AIR CONDITIONERS.

ADD-9 ADDENDUM 9 2/6/2024  
ADD-8 ADDENDUM 8 1/30/2024  
ADD-7 ADDENDUM 7 1/26/2024

**100% CONSTRUCTION DOCUMENTS**



DRAWING NAME:

**ELECTRICAL  
ROOF POWER  
PLAN - ZONE C**

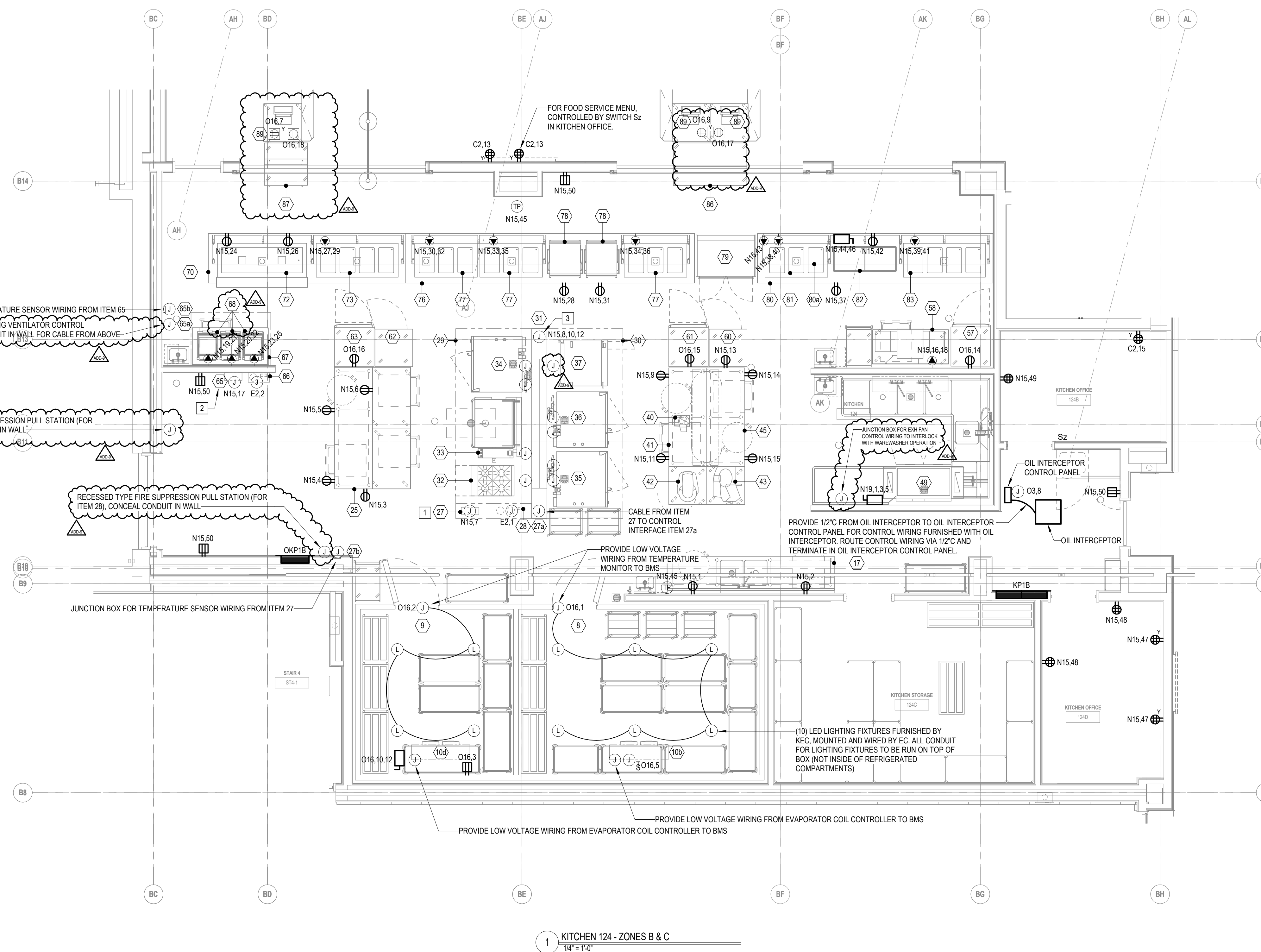
DRAWN BY: RBC/JAJ  
REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **E2.15C**

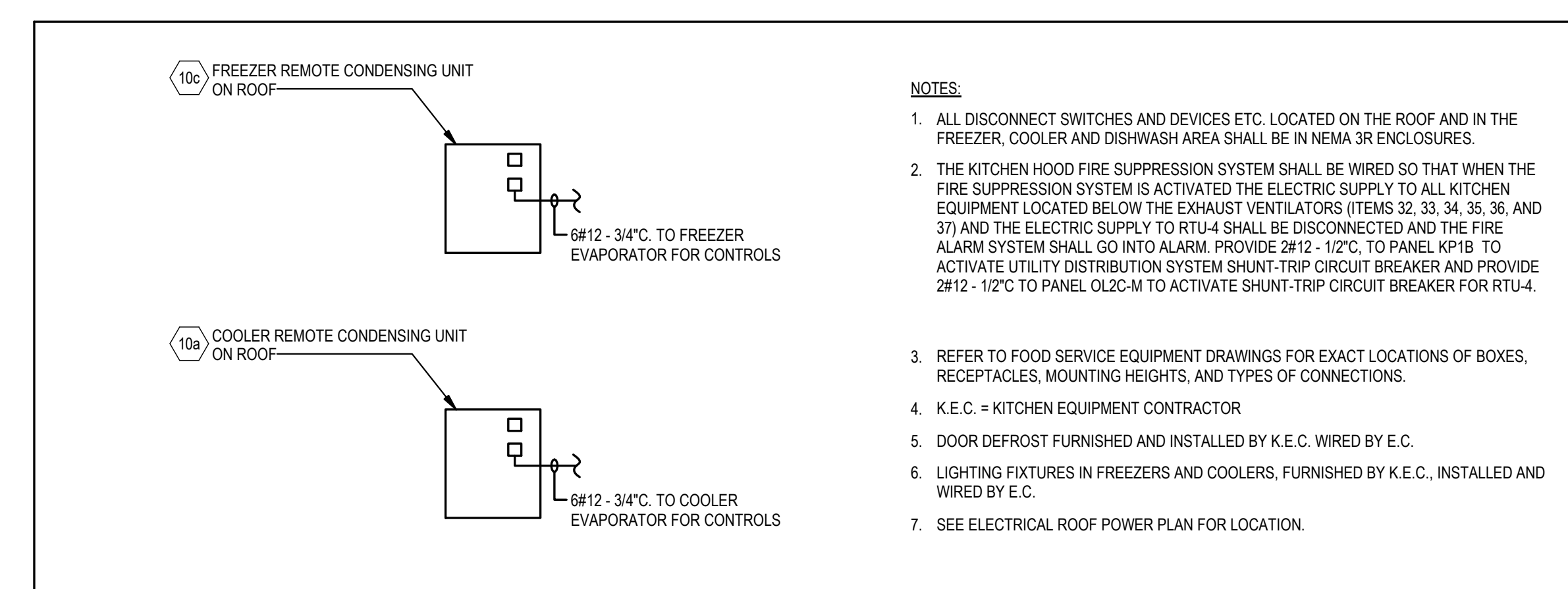


KEY	PANEL	BRANCH
E1	E2.4	EMERGENCY
N16	LP1A-L	NORMAL
N17	LP2C-L	NORMAL
N18	LP2C-SL	NORMAL
N19	LP2C-M	NORMAL
N20	LP2A-L	NORMAL
N21	LP3A-L	NORMAL
N23	LP4A-L	NORMAL
N24	LP4A-M	NORMAL
N25	LP2C-M	NORMAL
N26	LP3C-L	NORMAL
O18	OL1A-L	OPTIONAL STANDBY
O19	OL2C-M	OPTIONAL STANDBY
O20	OL2C-L	OPTIONAL STANDBY
O21	OL2A-L	OPTIONAL STANDBY
O22	OL3A-L	OPTIONAL STANDBY
O23	OL4A-L	OPTIONAL STANDBY
O25	OL3C-L	OPTIONAL STANDBY

KEY	PANEL NAME	BRANCH
E2	EP2-R	EMERGENCY
C1	CP1A	NORMAL
C2	CP1C	NORMAL
C4	CP2A	NORMAL
C5	CP2C	NORMAL
C6	CP3A	NORMAL
C7	CP3C	NORMAL
C8	CP4A	NORMAL
N1	PP1A-R	NORMAL
N2	PP1A-M	NORMAL
N3	PP1C-M	NORMAL
N4	PP1C-R	NORMAL
N5	PP2A-M	NORMAL
N6	PP2A-R	NORMAL
N7	PP2C-M	NORMAL
N8	PP2C-R	NORMAL
N10	PP3A-R	NORMAL
N11	PP3C-M	NORMAL
N12	PP3C-R	NORMAL
N13	PP4A-M	NORMAL
N14	PP4A-R	NORMAL
N15	KP1B	NORMAL
N27	PP1A-RBT	NORMAL
O1	OP1A-R	OPTIONAL STANDBY
O2	OP1A-M	OPTIONAL STANDBY
O3	OP1C-M	OPTIONAL STANDBY
O4	OP1C-R	OPTIONAL STANDBY
O6	OP2A-R	OPTIONAL STANDBY
O7	OP2C-M	OPTIONAL STANDBY
O8	OP2C-R	OPTIONAL STANDBY
O10	OP3A-R	OPTIONAL STANDBY
O12	OP3C-M	OPTIONAL STANDBY
O13	OP3C-R	OPTIONAL STANDBY
O15	OP4A-R	OPTIONAL STANDBY
O16	OKP1B	OPTIONAL STANDBY
O17	OMDF	OPTIONAL STANDBY



1 KITCHEN 124 - ZONES B & C  
3/4" = 1'-0"



**KEYNOTE LEGEND:**

- 15 A CIRCUIT - 120/1 DFA FOR CONN TO VENTILATOR CONTROL AND HOOD LIGHTS AT ITEM 29 AND 30; MICROSWITCH WIRING FROM FIRE SUPPRESSION SYSTEM (ITEM 28); EC TO PROVIDE CATS CONNECTION TO REMOTE TOUCH SCREEN (ITEM 27a - CABLE SUPPLIED WITH SYSTEM); EC TO PROVIDE HIGH VOLTAGE CONNS FROM VFD TO EXH FAN; EC TO PROVIDE WIRING TO TEMP SENSORS AT HOOD; EC TO PROVIDE WIRING TO ROOM TEMP SENSOR (ITEM 27b); EC TO PROVIDE WIRING FROM BUILDING MANAGEMENT SYSTEM REMOTE CONTROL.
- 15 A CIRCUIT - 120/1 DFA FOR CONN TO VENTILATOR CONTROL AND HOOD LIGHTS AT ITEM 67; MICROSWITCH WIRING FROM FIRE SUPPRESSION SYSTEM (ITEM 65); EC TO PROVIDE CATS CONNECTION TO REMOTE TOUCH SCREEN (ITEM 65a - CABLE SUPPLIED WITH SYSTEM); EC TO PROVIDE START/STOP RELAY SIGNAL WIRING TO EXH FAN; EC TO PROVIDE WIRING TO TEMP SENSORS AT HOOD; EC TO PROVIDE WIRING TO ROOM TEMP SENSOR (ITEM 66b); EC TO PROVIDE WIRING FROM BUILDING MANAGEMENT SYSTEM REMOTE CONTROL.
- MAKE ALL FIELD CONNECTIONS FOR ITEMS 32, 33, 34, 35, 36, AND 37 FROM UTILITY DISTRIBUTION SYSTEM ITEM 31; PROVIDE THE FOLLOWING WIRING FOR EACH PIECE OF EQUIPMENT CONNECTION TO UTILITY DISTRIBUTION SYSTEM ITEM 31:  
- ITEM 32 - 2#12 - 1/2" C,  
- ITEM 33 - 2#12 - 1/2" C,  
- ITEM 34 - (2) 2#12 - 1/2" C,  
- ITEM 35 - (2) 2#12 - 1/2" C,  
- ITEM 36 - (2) 2#12 - 1/2" C,  
- ITEM 37 - 2#12 - 1/2" C.

ADD-9 ADDENDUM 9 2/6/2024  
ADD-8 ADDENDUM 8 1/30/2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW

KEYPLAN

DRAWING NAME:

## ELECTRICAL KITCHEN PART PLAN

DRAWN BY: GV  
REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **E3.02**



LED LIGHTING FIXTURE SCHEDULE (1 OF 2)

TYPICAL LIGHTING NOTES  
 1. MOUNTING ABBREVIATIONS: "R" = RECESSED IN CEILING, "S" = SURFACE, "M" = WALL, "P" = PENDANT, "GR" = GROUND, "U" = UNIVERSAL.  
 2. LIGHTING FIXTURES SHALL BE FURNISHED COMPLETE WITH ALL HARDWARE, LAMPS, HANGERS, ACCESSORIES, ETC. FOR A COMPLETE AND PROPER INSTALLATION. VERIFY ROOM SURFACE CONSTRUCTION/FINISH TYPES PRIOR TO THE RELEASE OF ANY LIGHTING FIXTURES TO ENSURE PROPER MOUNTING PROVISIONS AND FIXTURES FITTINGS. REFER TO ARCHITECTURAL DRAWINGS/ELEVATIONS.  
 3. VERIFY ALL LIGHTING FIXTURE MOUNTING HEIGHTS AND LOCATIONS WITH ARCHITECTURAL DRAWINGS/ELEVATIONS PRIOR TO THE START OF ROUGHING. PENDANT FIXTURES SHALL BE MINIMUM 12" FROM TOP OF FIXTURE TO CEILING UNLESS OTHERWISE NOTED.  
 4. ALL LAMPS, BALLASTS, LED SOURCES, DRIVERS, AND CONTROLS SHALL MEET THE LATEST UTILITY CO. INCENTIVE REQUIREMENTS. REFER TO THE LATEST PROGRAM REQUIREMENTS DOCUMENTATION AND COORDINATE WITH UTILITY CO. TO ENSURE COMPLIANCE.  
 5. EXIT SIGNS SHALL BE TYPICALLY MOUNTED ON CEILINGS WHERE VISIBLE OR ON WALL WHERE CEILING MOUNTING IS NOT PRACTICAL. PRIOR TO ROUGHING COORDINATE WITH ARCHITECTURAL DRAWINGS/ELEVATIONS FOR SPECIFIC MOUNTING DIRECTION AND FOR LOCATION.  
 6. LIGHTING FIXTURES TO BE CONTROLLED BY DAYLIGHT HARVESTING SYSTEM SHALL BE PROVIDED WITH 0-10 VOLT DIMMING DRIVERS.  
 7. WHEN SUBMITTING TO ENGINEER FOR REVIEW THE LIGHTING FIXTURE SUBMITTALS SHALL CONSIST OF THE FOLLOWING: LIGHTING FIXTURE CUT SHEET, LIGHTING FIXTURE BALLAST/DRIVER CUT SHEET, AND LIGHTING FIXTURE LAMP/LED CUT SHEET FOR EACH FIXTURE. GROUPED CUT SHEETS WILL NOT BE ALLOWED. WHEN SUBMITTING ON LED PRODUCTS PROVIDE LIGHTING FACTS, LM-79, AND LM-80 TEST REPORTS FOR REVIEW.  
 8. THE MANUFACTURERS AND CATALOG NUMBERS IDENTIFIED IN THIS LIGHTING FIXTURE SCHEDULE ARE INTENDED TO ESTABLISH A GENERAL LEVEL OF QUALITY, CONFIGURATION, MATERIALS, AND APPEARANCE REQUIRED. THIS IS NOT A PROPRIETARY SPECIFICATION AND IT SHOULD BE NOTED THAT "OR EQUAL" APPLIES TO ALL LIGHTING FIXTURES DENOTED HEREIN. IT IS UNDERSTOOD THAT ALL MANUFACTURERS WILL HAVE MINOR VARIATIONS IN CONFIGURATION, APPEARANCE, AND PRODUCT SPECIFICATIONS AND SUCH MINOR VARIATIONS SHALL NOT ELIMINATE SUCH MANUFACTURERS AS AN APPROVED EQUAL.  
 9. CONNECT EMERGENCY BATTERY UNITS AND EXIT SIGNS WITH BACK-UP BATTERY TO NEAREST UNSWITCHED LIGHTING CIRCUIT FOR CHARGING OF EMERGENCY BATTERIES IN UNITS.  
 10. PROVIDE TWO ADDITIONAL WIRES TO DIMMING RACK IN ADDITION TO POWER WIRING WHERE 0-10 VOLT DIMMING DRIVERS ARE SPECIFIED FOR CONTROL.  
 11. AS REQUIRED BY LEED VERSION 4, INTERIOR LIGHTING, OPTION 2, LIGHTING QUALITY, LIGHTING FIXTURES SHALL HAVE A LUMINANCE OF LESS THAN 2.500 CANDELA/METER SQUARED BETWEEN 45 AND 90 DEGREES FROM NADIR.  
 12. AS REQUIRED BY LEED VERSION 4, INTERIOR LIGHTING, OPTION 2, LIGHTING QUALITY, LIGHTING FIXTURES SHALL HAVE A MINIMUM COLOR RENDERING INDEX (CRI) OF 80.  
 13. AS REQUIRED BY LEED VERSION 4, INTERIOR LIGHTING, OPTION 2, LIGHTING QUALITY, LIGHTING FIXTURES SHALL HAVE A MINIMUM RATED LIFE (OR L70 FOR LED SOURCES) OF AT LEAST 24,000 HOURS.

TYPE	MANUFACTURER	CATALOG NUMBER	VOLTAGE	MOUNTING	WATTAGE	TOTAL LUMENS	COLOR TEMP.	DIMMING (%)	DESCRIPTION/REMARKS	COLOR FINISH
A4	CORELITE CONTINUA	CTA-F-7525-50L835-1D-UNV-STD-CBA-AC48-XX-4	UNV	P	38	5061	3500K	0-10V (1%)	4' LINEAR PENDANT, 75% UP, 25% DOWN INDIRECT/DIRECT LIGHTING FIXTURE, WITH TIR OPTICS, AND ADJUSTABLE AIRCRAFT CABLE SUSPENSION.	CBA
A4L	CORELITE CONTINUA	CTA-F-7525-40L835-1D-UNV-STD-CBA-AC48-XX-4	UNV	P	30	3993	3500K	0-10V (1%)	4' LINEAR PENDANT, 75% UP, 25% DOWN INDIRECT/DIRECT LIGHTING FIXTURE, WITH TIR OPTICS, AND ADJUSTABLE AIRCRAFT CABLE SUSPENSION.	CBA
A6	CORELITE CONTINUA	CTA-F-7525-50L835-1D-UNV-STD-CBA-AC48-XX-6	UNV	P	30	3993	3500K	0-10V (1%)	6' LINEAR PENDANT, 75% UP, 25% DOWN INDIRECT/DIRECT LIGHTING FIXTURE, WITH TIR OPTICS, AND ADJUSTABLE AIRCRAFT CABLE SUSPENSION.	X
A8	CORELITE CONTINUA	CTA-F-7525-50L835-1D-UNV-STD-CBA-AC48-XX-8	UNV	P	76	10122	3500K	0-10V (1%)	8' LINEAR PENDANT, 75% UP, 25% DOWN INDIRECT/DIRECT LIGHTING FIXTURE, WITH TIR OPTICS, AND ADJUSTABLE AIRCRAFT CABLE SUSPENSION.	X
A8L	CORELITE CONTINUA	CTA-F-7525-40L835-1D-UNV-STD-CBA-AC48-XX-8	UNV	P	60	7986	3500K	0-10V (1%)	8' LINEAR PENDANT, 75% UP, 25% DOWN INDIRECT/DIRECT LIGHTING FIXTURE, WITH TIR OPTICS, AND ADJUSTABLE AIRCRAFT CABLE SUSPENSION.	X
DC	NOVA FLEX	NF-PRO-0-60-24V-3500K NF-PS-80W-24V-0-10V NF-CH-601711M2M	UNV	S	1.5FT	103FT	3500K	0-10V (1%)	FLEXIBLE LED COVE LIGHTING FIXTURE. PROVIDE LIGHTING FIXTURES INTERCONNECTED END TO END, LENGTH AS SHOWN ON DRAWINGS, IN 2.39" X .68" RECESSED, LENSED, ALUMINUM CHANNEL.	CBA
DR1	COOPER HALO	HC4100010-HM40529835-41WDH	UNV	R	10	1000	3500K	0-10V (1%)	4" ROUND 75 DEGREE WIDE BEAM DOWNLIGHT, SEMI-SPECULAR CLEAR REFLECTOR AND FLANGE.	CBA
DR05	COOPER HALO	HC4100010-HM40529835-41WDH	UNV	R	6.1	500	3500K	0-10V (1%)	4" ROUND 75 DEGREE WIDE BEAM DOWNLIGHT, SEMI-SPECULAR CLEAR REFLECTOR AND FLANGE.	CBA
DS4-05	COOPER PORTFOLIO	LD5Q4C-05-9035-D010-SQ1H	UNV	R	7.8	500	3500K	0-10V (1%)	4" SQUARE DOWNLIGHT, MEDIUM DISTRIBUTION, SEMI-SPECULAR CLEAR REFLECTOR WITH FLANGE, 90 CRI.	CBA
DS4-1W	COOPER PORTFOLIO	LD5Q4C-10-9035-D010-SQ1H	UNV	R	10.5	1000	3500K	0-10V (1%)	4" SQUARE DOWNLIGHT, WIDE DISTRIBUTION, SEMI-SPECULAR CLEAR REFLECTOR WITH FLANGE, 90 CRI.	CBA
DS4-2M	COOPER PORTFOLIO	LD5Q4C-20-9035-D010-SQ1H	UNV	R	22.6	2000	3500K	0-10V (1%)	4" SQUARE DOWNLIGHT, MEDIUM DISTRIBUTION, SEMI-SPECULAR CLEAR REFLECTOR WITH FLANGE, 90 CRI.	CBA
DS4-3M	COOPER PORTFOLIO	LD5Q4C-20-9035-D010-SQ1H	UNV	R	34	3000	3500K	0-10V (1%)	4" SQUARE DOWNLIGHT, MEDIUM DISTRIBUTION, SEMI-SPECULAR CLEAR REFLECTOR WITH FLANGE, 90 CRI.	CBA
FP22L	COOPER METALUX	22FP2135C	UNV	R	20.7	2205	3500K	0-10V (1%)	2" X 2", RECESSED, GRID, EDGE LIT FLAT PANEL.	CBA
FP24H	COOPER METALUX	24FP6435C	UNV	R	60.3	6091	3500K	0-10V (1%)	2" X 4", RECESSED, GRID, EDGE LIT FLAT PANEL.	CBA
FP24L	COOPER METALUX	24FP3135C	UNV	R	29.3	3533	3500K	0-10V (1%)	2" X 4", RECESSED, GRID, EDGE LIT FLAT PANEL.	CBA
FPK	COOPER FAIL-SAFE	FSP-22-42-35-CA125	UNV	R	38.3	4330	3500K	0-10V (1%)	2" X 2", RECESSED, GRID, SEALED FLAT PANEL LIGHTING FIXTURE, .125" ACRYLIC LENS, WET LOCATION RATED.	CBA
IND4	COOPER METALUX	4SNLED-LDS-37SL-UW-INV-L835-CD1-U	UNV	U	31	3812	3500K	0-10V (1%)	2.75" WIDE, 4" STRIP, FULL FROST WIDE DIFFUSE MATTE ACRYLIC LENS, SURFACE MOUNT OR CHAIN HUNG.	CBA
LG4	COOPER NEORAY	S122DR-S675D835-XXX4F0-1-UDD-F-W	UNV	R	27.2	2700	3500K	0-10V (1%)	2" X 4" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG4L	COOPER NEORAY	S122DR-S290D835-XXX4F0-1-UDD-F-W	UNV	R	12	1160	3500K	0-10V (1%)	2" X 4" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG4VH	COOPER NEORAY	S122DR-S885D835-XXX4F0-1-UDD-F-W	UNV	R	35.6	3460	3500K	0-10V (1%)	2" X 4" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG6H	COOPER NEORAY	S122DR-S675D835-XXX4F0-1-UDD-F-W	UNV	R	40.8	4050	3500K	0-10V (1%)	2" X 6" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG6M	COOPER NEORAY	S122DR-S485D835XXX6F0-1-UDD-F-W	UNV	R	28.8	2910	3500K	0-10V (1%)	2" X 6" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG8L	COOPER NEORAY	S122DR-S290D835XXX8F0-1-UDD-F-W	UNV	R	24	2320	3500K	0-10V (1%)	2" X 8" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG8M	COOPER NEORAY	S122DR-S675D835-XXX8F0-1-UDD-F-W	UNV	R	54.4	5400	3500K	0-10V (1%)	2" X 8" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG12	COOPER NEORAY	S122DR-S675D835XXX12F0-1-UDD-F-W	UNV	R	81.6	8100	3500K	0-10V (1%)	2" X 12" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LG14	COOPER NEORAY	S122DR-S290D835XXX14F0-1-UDD-F-W	UNV	R	42	4060	3500K	0-10V (1%)	2" X 14" RECESSED, GRID, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LP4VH	COOPER NEORAY	S122DR-C865D935-C10-XX-CBA-4F0-1-UDD-F-CBA	UNV	P	35.2	3460	3500K	0-10V (1%)	2" X 4" PENDANT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER, 90 CRI.	CBA
LP6H	COOPER NEORAY	S122DR-C675D935-C10-XX-CBA-4F0-1-UDD-F-CBA	UNV	P	40.2	4050	3500K	0-10V (1%)	2" X 6" PENDANT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER, 90 CRI.	CBA
LP8H	COOPER NEORAY	S122DR-C675D835-C4-XX-CBA-8F0-1-UDD-F-CBA	UNV	P	53.6	5400	3500K	0-10V (1%)	2" X 8" PENDANT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LP12H	COOPER NEORAY	S122DR-C675D835-C4-XX-CBA-12F0-1-UDD-F-CBA	UNV	P	80.4	8100	3500K	0-10V (1%)	2" X 12" PENDANT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR2	COOPER NEORAY	S122DR-S675D835-XXX2F0-1-UDD-F-W	UNV	R	12.1	1350	3500K	0-10V (1%)	2" X 2" RECESSED, GYPSUM BOARD MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR4	COOPER NEORAY	S122DR-S675D835-XXX4F0-1-UDD-F-W	UNV	R	24.2	2700	3500K	0-10V (1%)	2" X 4" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR4M	COOPER NEORAY	S122DR-S675D935-XXX4F0-1-UDD-F-W	UNV	R	24.2	2700	3500K	0-10V (1%)	2" X 4" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER, 90 CRI.	CBA
LR6	COOPER NEORAY	S122DR-S675D835-XXX6F0-1-UDD-F-W	UNV	R	40.8	4050	3500K	0-10V (1%)	2" X 6" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR6L	COOPER NEORAY	S122DR-S290D835-XXX6F0-1-UDD-F-W	UNV	R	18	1740	3500K	0-10V (1%)	2" X 6" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA

LED LIGHTING FIXTURE SCHEDULE (2 OF 2)

TYPE	MANUFACTURER	CATALOG NUMBER	VOLTAGE	MOUNTING	WATTAGE	TOTAL LUMENS	COLOR TEMP.	DIMMING (%)	DESCRIPTION/REMARKS	COLOR FINISH
LR8	COOPER NEORAY	S122DR-S675D835-XXX8F0-1-UDD-F-W	UNV	R	54.4	5400	3500K	0-10V (1%)	2" X 8" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR8L	COOPER NEORAY	S122DR-S290D835-XXX8F0-1-UDD-F-W	UNV	R	24	2320	3500K	0-10V (1%)	2" X 8" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR10L	COOPER NEORAY	S122DR-S290D835-XXX10F0-1-UDD-F-W	UNV	R	30	2900	3500K	0-10V (1%)	2" X 10" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR12	COOPER NEORAY	S122DR-S675D835-XXX12F0-1-UDD-F-W	UNV	R	80.4	8100	3500K	0-10V (1%)	2" X 12" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR12L	COOPER NEORAY	S122DR-S290D835-XXX12F0-1-UDD-F-W	UNV	R	36	3480	3500K	0-10V (1%)	2" X 12" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR20L	COOPER NEORAY	S122DR-S290D835-XXX20F0-1-UDD-F-W	UNV	R	60	5800	3500K	0-10V (1%)	2" X 20" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR22L	COOPER NEORAY	S122DR-S290D835-XXX22F0-1-UDD-F-W	UNV	R	66	6380	3500K	0-10V (1%)	2" X 22" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR24L	COOPER NEORAY	S122DR-S290D835-XXX24F0-1-UDD-F-W	UNV	R	72	6960	3500K	0-10V (1%)	2" X 24" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR28L	COOPER NEORAY	S122DR-S290D835-XXX28F0-1-UDD-F-W	UNV	R	84	8120	3500K	0-10V (1%)	2" X 28" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR30L	COOPER NEORAY	S122DR-S290D835-XXX30F0-1-UDD-F-W	UNV	R	90	8700	3500K	0-10V (1%)	2" X 30" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR32L	COOPER NEORAY	S122DR-S290D835-XXX32F0-1-UDD-F-W	UNV	R	96	9280	3500K	0-10V (1%)	2" X 32" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR36L	COOPER NEORAY	S122DR-S290D835-XXX36F0-1-UDD-F-W	UNV	R	108	10440	3500K	0-10V (1%)	2" X 36" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH FLUSH DIFFUSER.	CBA
LR66	COOPER NEORAY	S123RDR-S1000D835-XXX66F0-1-UDD-F-W	UNV	R	587.4	66000	3500K	0-10V (1%)	3" X 66" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH REGRESSED DIFFUSER.	CBA
LR74	COOPER NEORAY	S123RDR-S1000D835-XXX74F0-1-UDD-F-W	UNV	R	658.6	74000	3500K	0-10V (1%)	3" X 74" RECESSED, GYPSUM BOARD CEILING MOUNT, LINEAR, DIRECT LIGHTING FIXTURE, WITH REGRESSED DIFFUSER.	CBA
R5	ALW LIGHTING	MR1-5-D5-SS-MIN80-3500-0-10V1%-LENS-MIN80-3500K-0-10V1%-LENS-CBA-UNV	UNV	P	116	7950	3500K	0-10V (1%)	5" DIAMETER RING DIRECT/INDIRECT PENDANT LIGHTING FIXTURE, 1.5" WALL, ACRYLIC LENS.	CBA
SQ4	ALW LIGHTING	LS2PD-4-HI90-3500-0-10V1%-EXTIR-CBA-UNV	UNV	P	72.2	8000	3500K	0-10V (1%)	4" X 4" SQUARE, DIRECT PENDANT LIGHTING FIXTURE, FULLY ILLUMINATED MITERED CORNERS, 2" WIDTH, ACRYLIC LENS.	X
VM1	COOPER METALUX	24C22-40-UNV-L835-CD1-U	UNV	R	31.6	4000	3500K	0-10V (1%)	2" X 4" VOLUMETRIC LIGHTING FIXTURE WITH FROSTED ACRYLIC LENS, RECESSED, GRID.	X
VM2	COOPER METALUX	24C22-55-UNV-L835-CD1-U	UNV	R	43	5500	3500K	0-10V (1%)	2" X 4" VOLUMETRIC LIGHTING FIXTURE WITH FROSTED ACRYLIC LENS, RECESSED, GRID.	X
VP	EATON ALL-PRO	VT1730	UNV	S	17.7	1450	3500K	-	WEATHERPROOF, JELLY JAR, DIE CAST ALUMINUM HOUSING AND GUARD, VAPORTIGHT LIGHTING FIXTURE, WITH FROSTED GLASS.	-
WM1	LIGMAN LIGHTING	UGI-31641-10W-T4-W30-CBA-120227V-DIM	UNV	W	10	820	3000K	ELVTRIAC	8" LENGTH X 4.3" DEEP RECTANGULAR EXTERIOR LIGHTING FIXTURE.	CBA
WP1	NLS LIGHTING	NV-W-T4-16L-1-30K-UNV-WM-CBA-FSP-20	UNV	W	56	5970	3000K	0-10V	EXTERIOR WALL PACK LIGHTING FIXTURE, WITH INTEGRAL MOTION SENSOR AND PHOTOCELL.	CBA
⊙	SIGNTEX INC	CRSBB-1RMB-XX-TW-DG	UNV	U	-	-	-	-	SINGLE FACE EDGE LIT EXIT SIGN, WITH RED LETTERS ON MIRROR BACKGROUND, BRUSHED ALUMINUM HOUSING, AND ARROWS AS INDICATED ON PLAN, UNIVERSAL, FIELD CONVERTIBLE. "E" INDICATES TOP OF EXIT SIGN SHALL BE 18" ABOVE FINISHED FLOOR.	-
⊙	SIGNTEX INC	CRSBB-2RMB-XX-TW-DG	UNV	U	-	-	-	-	DOUBLE FACE EDGE LIT EXIT SIGN, WITH RED LETTERS ON MIRROR BACKGROUND, BRUSHED ALUMINUM HOUSING, AND ARROWS AS INDICATED ON PLAN, UNIVERSAL, FIELD CONVERTIBLE.	-
⊙ H WG	SIGNTEX INC	CAE-BB-1RMB-XX-TW-DG	UNV	U	-	-	-	-	SINGLE FACE EDGE LIT EXIT SIGN, WITH RED LETTERS ON MIRROR BACKGROUND, BRUSHED ALUMINUM HOUSING, AND ARROWS AS INDICATED ON PLAN, UNIVERSAL, FIELD CONVERTIBLE, INTERNATIONAL HANDICAP SYMBOL. "WG" INDICATES PROVIDE WIREGRAD. SEE NOTE 9.	-
⊙ G	SIGNTEX INC	RPR-NB-1-R-BA-TW-PF1	UNV	U	-	-	-	-	SINGLE FACE VANDAL RESISTANT EXIT SIGN, WITH RED LETTERS, BRUSHED ALUMINUM HOUSING AND FACE, POLYCARBONATE LENS, AND ARROWS AS INDICATED ON PLAN, UNIVERSAL, FIELD CONVERTIBLE. SEE NOTE 9.	-
⊙ WF	SIGNTEX INC	BPW-NB-1-R-W	UNV	U	-	-	-	-	SINGLE FACE WET LOCATION EXIT SIGN, WITH RED LETTERS, THERMOPLASTIC, UNIVERSAL, REFER TO NOTE #9.	-

LED SITE LIGHTING FIXTURE SCHEDULE

NOTES:  
 1. LIGHTING FIXTURES SHALL BE FURNISHED COMPLETE WITH ALL HARDWARE, LAMPS, HANGERS, ACCESSORIES, ETC. FOR A COMPLETE AND PROPER INSTALLATION.  
 2. THE MANUFACTURERS AND CATALOG NUMBERS IDENTIFIED IN THIS LIGHTING FIXTURE SCHEDULE ARE INTENDED TO ESTABLISH A GENERAL LEVEL OF QUALITY, CONFIGURATION, MATERIALS, AND APPEARANCE REQUIRED. THIS IS NOT A PROPRIETARY SPECIFICATION AND IT SHOULD BE NOTED THAT "OR EQUAL" APPLIES TO ALL LIGHTING FIXTURES DENOTED HEREIN. IT IS UNDERSTOOD THAT ALL MANUFACTURERS WILL HAVE MINOR VARIATIONS IN CONFIGURATION, APPEARANCE, AND PRODUCT SPECIFICATIONS AND SUCH MINOR VARIATIONS SHALL NOT ELIMINATE SUCH MANUFACTURERS AS AN APPROVED EQUAL.  
 3. LIGHTING FIXTURES SHALL CONFORM TO THE REQUIREMENTS OF THE ELECTRIC UTILITY CO. REBATE PROGRAM, WHERE APPLICABLE.  
 4. MOUNTING ABBREVIATIONS: "RW" = RECESSED IN WALL, "SW" = SURFACE/WALL, "P" = POLE, "G" = GROUND, "PT" = POST TOP  
 5. REFER TO TECHNOLOGY DRAWINGS, COORDINATE EXACT MOUNTING LOCATION AND ORIENTATION OF ALL CAMERAS AND ASSOCIATED MOUNTING ARMS WITH ARCHITECT/ENGINEER PRIOR TO INSTALLATION.  
 6. POLE LENGTH SHALL BE AS REQUIRED SO THAT BOTTOM OF LIGHTING FIXTURE IS AT 30" ABOVE FINISHED GRADE, TAKING INTO ACCOUNT LIGHTING FIXTURE, ARM, POLE BASE, AND CONCRETE POLE BASE. PROVIDE ELEVATION INCLUDING ALL DIMENSIONS DURING SUBMITTAL PHASE FOR REVIEW.  
 7. POLE LENGTH SHALL BE AS REQUIRED SO THAT BOTTOM OF LIGHTING FIXTURE IS AT 12" ABOVE FINISHED GRADE, TAKING INTO ACCOUNT LIGHTING FIXTURE, ARM, POLE BASE, AND CONCRETE POLE BASE. PROVIDE ELEVATION INCLUDING ALL DIMENSIONS DURING SUBMITTAL PHASE FOR REVIEW.  
 8. LIGHTING FIXTURE WILL DIM TO 50% POWER, 50% LIGHT OUTPUT, PER DIMMING PROFILE. IF MOTION IS DETECTED DURING THE TIME THAT THE LIGHTING FIXTURE IS OPERATING AT 50%, THE LIGHTING FIXTURE GOES TO 100% POWER AND LIGHT OUTPUT. THE LIGHTING FIXTURE REMAINS ON HIGH UNTIL NO MOTION IS DETECTED FOR THE DURATION PERIOD, AFTER WHICH THE LIGHTING FIXTURE RETURNS TO LOW. DURATION PERIOD IS SET AT FACTORY TO 15 MINUTES.

TYPE	MANUFACTURER	CATALOG NUMBER	VOLTAGE	MOUNTING	WATTAGE	TOTAL LUMENS	COLOR TEMP.	DIMMING (%)	BUG	DISTRIBUTION TYPE	DESCRIPTION/REMARKS	COLOR FINISH
SL1-T3	NLS LIGHTING	VSS-1-T3-32L-1-30K7-UNV-CBA-PC-FSP-20-RPA5	UNV	P	106	10600	3000K	0-10V	B2 U2 G2	III	SINGLE HEAD PARKINGROAD SITE LIGHTING FIXTURE, PHOTOCELL, ARM, ON 20'-0" (SEE NOTE 6), 6" ROUND STEEL POLE. COLOR/FINISH BY ARCHITECT. PROVIDE INTEGRAL MOTION SENSOR (SEE NOTE 8), PROVIDE WITH 3" X 5" HANDHOLE.	CBA
SL1-T4	NLS LIGHTING	VSS-1-T4-32L-1-30K7-UNV-CBA-PC-FSP-20-RPA5	UNV	P	106	10812	3000K	0-10V	B2 U2 G2	IV	SINGLE HEAD PARKINGROAD SITE LIGHTING FIXTURE, PHOTOCELL, ARM, ON 20'-0" (SEE NOTE 6), 6"	

**SWITCHBOARD SWBD1 SCHEDULE**

3000A, 277/480V, 3Ø, 4W, 100,000 SHORT CIRCUIT A.I.C., FLOOR MOUNTED, WITH SURGE PROTECTION DEVICE

CIRCUIT BREAKER		LOAD	FEEDER AND CONDUIT SIZE	NOTES
NUMBER	TRIP (A)			
1	3000/3	MAIN CIRCUIT BREAKER	SEE NOTES	32#600KCMIL - (8) 4" C DUCTBANK D-D (COPPER FEEDER)
2	60/3	ATS-2-1	60A/4	-
3	125/3	TRANSFORMER TRP01	SEE TRANSFORMER SCHEDULE	-
4	400/3	FUTURE PV SYSTEM	-	-
5	175/3	TRANSFORMER TKP1B	SEE TRANSFORMER SCHEDULE	-
6	-	-	-	-
7	175/3	TRANSFORMER TPP1A	SEE TRANSFORMER SCHEDULE	-
8	-	-	-	-
9	175/3	TRANSFORMER TPP4A	SEE TRANSFORMER SCHEDULE	-
10	175/3	TRANSFORMER TPP3C	SEE TRANSFORMER SCHEDULE	-
11	175/3	TRANSFORMER TPP3A	SEE TRANSFORMER SCHEDULE	-
12	225/3	TRANSFORMER TPP2C	SEE TRANSFORMER SCHEDULE	-
13	225/3	TRANSFORMER TPP2A	SEE TRANSFORMER SCHEDULE	-
14	50/3	TRANSFORMER TCP4A	SEE TRANSFORMER SCHEDULE	-
15	50/3	TRANSFORMER TCP3C	SEE TRANSFORMER SCHEDULE	-
16	50/3	TRANSFORMER TCP3A	SEE TRANSFORMER SCHEDULE	-
17	50/3	TRANSFORMER TCP2C	SEE TRANSFORMER SCHEDULE	-
18	70/3	TRANSFORMER TCP2A	SEE TRANSFORMER SCHEDULE	-
19	50/3	TRANSFORMER TCP1A	SEE TRANSFORMER SCHEDULE	-
20	60/3	PANELBOARD LP4A-L	60A/4	-
21	400/3	PANELBOARD LP4A-M	400A/4	-
22	60/3	PANELBOARD LP3C-L	60A/4	-
23	300/3	PANELBOARD LP3C-M	300A/4	-
24	60/3	PANELBOARD LP3A-L	60A/4	-
25	400/3	SPARE	-	-
26	60/3	PANELBOARD LP2C-L	60A/4	-
27	60/3	PANELBOARD LP2C-SL	60A/4	-
28	200/3	PANELBOARD LP2C-M	200A/4	-
29	60/3	PANELBOARD LP2A-L	60A/4	-
30	60/3	PANELBOARD LP1A-L	60A/4	-
31	1000/3	ATS1-1	1000A/4	-

**DISTRIBUTION PANELBOARD OEDP1 SCHEDULE**

1000A, 277/480V, 3Ø, 4W, 100,000 SHORT CIRCUIT A.I.C., FLOOR MOUNTED, WITH SURGE PROTECTION DEVICE

CIRCUIT BREAKER		LOAD	FEEDER AND CONDUIT SIZE	NOTES
NUMBER	TRIP (A)			
1	1000/3	MAIN CIRCUIT BREAKER	1000A/4	-
2	70/3	TRANSFORMER TOMDF	SEE TRANSFORMER SCHEDULE	-
3	125/3	SPARE	-	-
4	100/3	SPARE	-	-
5	60/3	PANELBOARD OL1A-L	60A/4	-
6	70/3	TRANSFORMER TOP1A	SEE TRANSFORMER SCHEDULE	-
7	60/3	PANELBOARD OL2A-L	60A/4	-
8	50/3	TRANSFORMER TOP2A	SEE TRANSFORMER SCHEDULE	-
9	60/3	PANELBOARD OL2C-L	60A/4	-
10	300/3	PANELBOARD OL2C-M	300A/4	-
11	70/3	TRANSFORMER TOP2C	SEE TRANSFORMER SCHEDULE	-
12	60/3	PANELBOARD OL3A-L	60A/4	-
13	100/3	SPARE	-	-
14	50/3	TRANSFORMER TOP3A	SEE TRANSFORMER SCHEDULE	-
15	60/3	PANELBOARD OL3C-L	60A/4	-
16	100/3	SPARE	-	-
17	70/3	TRANSFORMER TOP3C	SEE TRANSFORMER SCHEDULE	-
18	60/3	PANELBOARD OL4A-L	60A/4	-
19	100/3	SPARE	-	-
20	50/3	TRANSFORMER TOP4A	SEE TRANSFORMER SCHEDULE	-
21	50/3	TRANSFORMER TOKP1B	SEE TRANSFORMER SCHEDULE	-

**FEEDER AND CONDUIT SCHEDULE**

NOTE: ALL CONDUCTORS REFERENCED IN THIS SCHEDULE ARE COPPER, UNLESS OTHERWISE NOTED.

FEEDER (3W+G) AND CONDUIT SIZE SYMBOL	FEEDER (3W+G) AND CONDUIT SIZE	FEEDER (4W+G) AND CONDUIT SIZE SYMBOL	FEEDER (4W+G) AND CONDUIT SIZE	FEEDER (4W+G) AND CONDUIT SIZE SYMBOL	FEEDER (4W+G) AND CONDUIT SIZE	AMPERE RATING
20A/3	3#12 + 1#12G - 3/4" C	20A/4	4#12 + 1#12G - 3/4" C			20A
30A/3	3#10 + 1#10G - 3/4" C	30A/4	4#10 + 1#10G - 3/4" C	30A/5	5#10 + 1#10G - 3/4" C	30A
60A/3	3#8 + 1#10G - 3/4" C	60A/4	4#8 + 1#10G - 1" C	60A/5	5#8 + 1#10G - 1" C	60A
60A/3	3#8 + 1#10G - 1" C	60A/4	4#8 + 1#10G - 1" C	60A/5	5#8 + 1#10G - 1" C	60A
70A/3	3#4 + 1#8G - 1" C	70A/4	4#4 + 1#8G - 1-1/2" C			70A
100A/3	3#3 + 1#8G - 1-1/2" C	100A/4	4#2 + 1#8G - 1-1/2" C	100A/5	5#2 + 1#8G - 1-1/2" C	100A
125A/3	3#20 + 1#4G - 2" C ALUMINUM CONDUCTORS	125A/4	4#20 + 1#4G - 2" C ALUMINUM CONDUCTORS			125A
150A/3	3#30 + 1#4G - 2" C ALUMINUM CONDUCTORS	150A/4	4#30 + 1#4G - 2" C ALUMINUM CONDUCTORS	150A/5	5#30 + 1#4G - 2-1/2" C ALUMINUM CONDUCTORS	150A
175A/3	3#40 + 1#4G - 2" C ALUMINUM CONDUCTORS	175A/4	4#40 + 1#4G - 2-1/2" C ALUMINUM CONDUCTORS			175A
200A/3	3#250KCMIL + 1#4G - 2-1/2" C ALUMINUM CONDUCTORS	200A/4	4#250KCMIL + 1#4G - 2-1/2" C ALUMINUM CONDUCTORS	200A/5	5#250KCMIL + 1#4G - 3" C ALUMINUM CONDUCTORS	200A
225A/3	3#300KCMIL + 1#2G - 2-1/2" C ALUMINUM CONDUCTORS	225A/4	4#300KCMIL + 1#2G - 2-1/2" C ALUMINUM CONDUCTORS			225A
250A/3	3#250KCMIL + 1#2G - 2-1/2" C ALUMINUM CONDUCTORS	250A/4	4#250KCMIL + 1#2G - 3" C ALUMINUM CONDUCTORS	250A/5	5#250KCMIL + 1#2G - 3-1/2" C ALUMINUM CONDUCTORS	250A
300A/3	3#500KCMIL + 1#2G - 3" C ALUMINUM CONDUCTORS	300A/4	4#500KCMIL + 1#2G - 3" C ALUMINUM CONDUCTORS	300A/5	5#500KCMIL + 1#2G - 4" C ALUMINUM CONDUCTORS	300A
350A/3	3#40 + 2#1G - (2) 2-1/2" C ALUMINUM CONDUCTORS	350A/4	4#40 + 2#1G - (2) 2-1/2" C ALUMINUM CONDUCTORS			350A
400A/3	4#250KCMIL + 2#1G - (2) 2-1/2" C ALUMINUM CONDUCTORS	400A/4	4#250KCMIL + 2#1G - (2) 2-1/2" C ALUMINUM CONDUCTORS	400A/5	5#250KCMIL + 2#1G - (2) 3" C ALUMINUM CONDUCTORS	400A
500A/3	5#500KCMIL + 2#10G - (2) 2-1/2" C ALUMINUM CONDUCTORS	500A/4	5#400KCMIL + 2#10G - (2) 3" C ALUMINUM CONDUCTORS			500A
600A/3	6#500KCMIL + 2#20G - (2) 3" C ALUMINUM CONDUCTORS	600A/4	6#500KCMIL + 2#20G - (2) 3-1/2" C ALUMINUM CONDUCTORS	600A/5	7#500KCMIL + 2#20G - (2) 4" C ALUMINUM CONDUCTORS	600A
800A/3	8#400KCMIL + 3#30G - (3) 2-1/2" C ALUMINUM CONDUCTORS	800A/4	8#400KCMIL + 3#30G - (3) 3" C ALUMINUM CONDUCTORS	800A/5	9#400KCMIL + 3#30G - (3) 3-1/2" C ALUMINUM CONDUCTORS	800A
1000A/3	9#600KCMIL + 3#40G - (3) 3" C ALUMINUM CONDUCTORS	1000A/4	9#600KCMIL + 4#40G - (4) 3" C ALUMINUM CONDUCTORS			1000A
1200A/3	12#500KCMIL + 4#250KCMIL G - (4) 3" C ALUMINUM CONDUCTORS	1200A/4	16#500KCMIL + 4#250KCMIL G - (4) 3-1/2" C ALUMINUM CONDUCTORS			1200A
1600A/3	15#500KCMIL + 5#350KCMIL G - (5) 3" C ALUMINUM CONDUCTORS	1600A/4	24#500KCMIL + 5#350KCMIL G - (6) 3" C ALUMINUM CONDUCTORS			1600A
2000A/3	18#500KCMIL + 6#400KCMIL G - (6) 3" C ALUMINUM CONDUCTORS	2000A/4	28#500KCMIL + 7#400KCMIL G - (7) 3-1/2" C ALUMINUM CONDUCTORS			2000A
2500A/3	24#500KCMIL + 8#500KCMIL G - (8) 3" C ALUMINUM CONDUCTORS	2500A/4	36#500KCMIL + 9#500KCMIL G - (9) 4" C ALUMINUM CONDUCTORS			2500A
3000A/3	30#500KCMIL + 9#600KCMIL G - (9) 4" C ALUMINUM CONDUCTORS	3000A/4	40#600KCMIL + 10#600KCMIL G - (10) 4" C ALUMINUM CONDUCTORS			3000A

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PANELBOARD: KP1B

N15 400 A 208Y/120V, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.

PANELBOARD: OKP1B

O16 100 A 208Y/120V, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.

PANELBOARD: OMDP

O17 175 A 208Y/120, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.

PANELBOARD: LP2A-L

N20 60 A 277Y/480V, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.

PANELBOARD: PP2A-M

N5 60 A 208Y/120, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.

PANELBOARD: OP2A-R

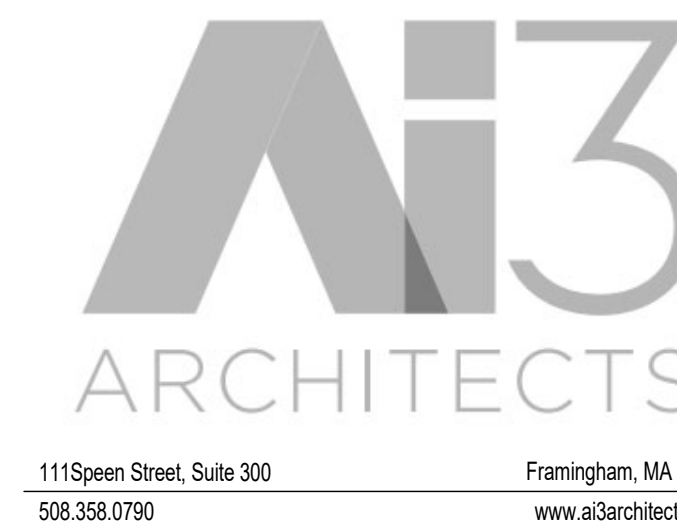
O6 100 A 208Y/120, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.

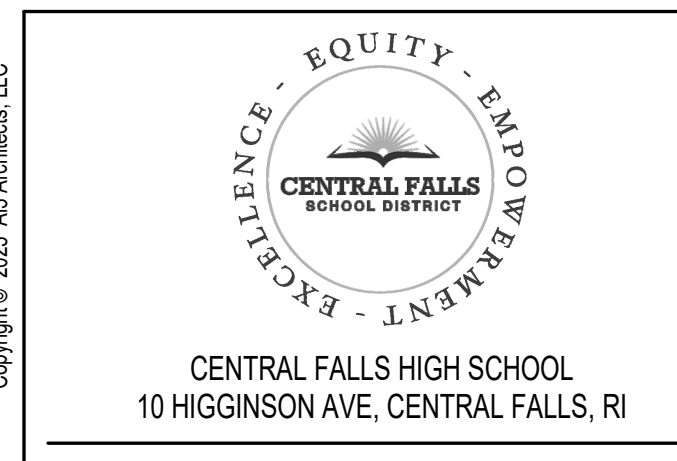
PANELBOARD: OL2A-L

O21 60 A 277Y/480V, 3PH, 4W, 60HZ

Table with columns: CKT. NO., LOAD DESCRIPTION, NOTE, WIRE SIZE, CIRCUIT BREAKER, CIRCUIT BREAKER SIZE, NOTE, LOAD DESCRIPTION, CKT. NO. Includes general notes and a detailed circuit list.



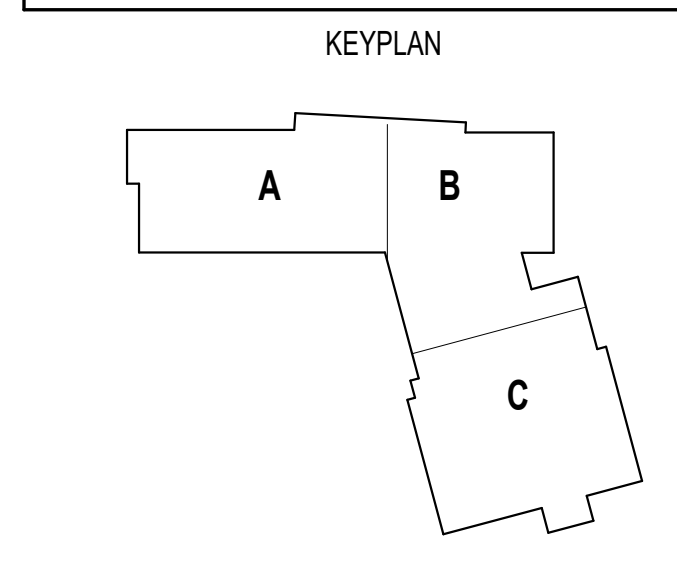
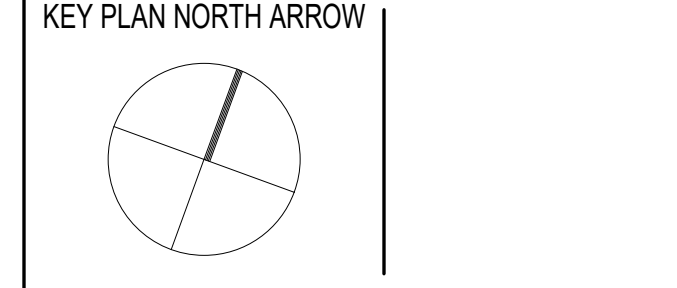
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KEYNOTE LEGEND:

ADD-9 ADDENDUM 9 2/6/2024 ADD-8 ADDENDUM 8 1/30/2024

100% CONSTRUCTION DOCUMENTS



DRAWING NAME: ELECTRICAL PANEL SCHEDULES DRAWN BY: RBC REVIEWED BY: RCB SCALE: AS NOTED DRAWING NUMBER: 2202.02 JOB NO.: E5.06 DATE: OCTOBER 13, 2023

PANELBOARD: CP2A										C4 175 A 208Y/120, 3PH, 4W, 60HZ																			
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED					SHUNT TRIP MAIN LC = VIA LIGHTING CONTROL PANEL					GENERAL NOTES:					MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED					SHUNT TRIP MAIN LC = VIA LIGHTING CONTROL PANEL					GENERAL NOTES:				
AIC: 65k					200% RATED NEUTRAL L = PROVIDE LOCK ON CB					1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND U.O.N.					AIC: 65k					200% RATED NEUTRAL L = PROVIDE LOCK ON CB					1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND U.O.N.				
BUS AMPS RATING: 225 A					SINGLE TUB PANEL IG = ISOLATED GROUND					2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.					BUS AMPS RATING: 400 A					SINGLE TUB PANEL IG = ISOLATED GROUND					2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.				
					FEED THRU LUGS P = GFPE - 30mA TRIP					3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.										FEED THRU LUGS P = GFPE - 30mA TRIP					3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.				
					100% RATED MAIN BREAKER G = GFCEI - 5mA TRIP															100% RATED MAIN BREAKER G = GFCEI - 5mA TRIP									
					GROUND FAULT MAIN C.B. S = SHUNT TRIP															GROUND FAULT MAIN C.B. S = SHUNT TRIP									
					COMPUTER PANEL A = ARC FAULT CIRCUIT BREAKER															COMPUTER PANEL A = ARC FAULT CIRCUIT BREAKER									
					SURGE PROTECTION DEVICE 4 = 4W + G															SURGE PROTECTION DEVICE 4 = 4W + G									
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.													
1	RECEPTACLES		12	20 A	1		RECEPTACLES	2	RECEPTACLES		12	20 A	1	RECEPTACLES	4														
3	RECEPTACLES		12	20 A	1		RECEPTACLES	6	RECEPTACLES		12	20 A	1	RECEPTACLES	8														
5	RECEPTACLES		12	20 A	1		RECEPTACLES	10	RECEPTACLES		12	20 A	1	RECEPTACLES	12														
7	RECEPTACLES		12	20 A	1		RECEPTACLES	14	RECEPTACLES		12	20 A	1	RECEPTACLES	16														
9	RECEPTACLES		12	20 A	1		RECEPTACLES	18	RECEPTACLES		12	20 A	1	RECEPTACLES	20														
11	RECEPTACLES		12	20 A	1		RECEPTACLES	22	RECEPTACLES		12	20 A	1	RECEPTACLES	24														
13	RECEPTACLES		12	20 A	1		RECEPTACLES	26	RECEPTACLES		12	20 A	1	RECEPTACLES	28														
15	RECEPTACLES		12	20 A	1		RECEPTACLES	30	RECEPTACLES		12	20 A	1	RECEPTACLES	32														
17	RECEPTACLES		12	20 A	1		RECEPTACLES	34	RECEPTACLES		12	20 A	1	RECEPTACLES	36														
19	RECEPTACLES		12	20 A	1		RECEPTACLES	38	RECEPTACLES		12	20 A	1	RECEPTACLES	40														
21	COPIER		10	20 A	1		COPIER	42	COPIER		10	20 A	1	COPIER	44														
23	RECEPTACLES		10	20 A	1		RECEPTACLES	46	RECEPTACLES		10	20 A	1	RECEPTACLES	48														
25	RECEPTACLES		12	20 A	1		RECEPTACLES	50	RECEPTACLES		12	20 A	1	RECEPTACLES	52														
27	RECEPTACLES		12	20 A	1		RECEPTACLES	54	RECEPTACLES		12	20 A	1	RECEPTACLES	56														
29	RECEPTACLES		12	20 A	1		RECEPTACLES	58	RECEPTACLES		12	20 A	1	RECEPTACLES	60														
31	RECEPTACLES		10	20 A	1		RECEPTACLES	62	RECEPTACLES		10	20 A	1	RECEPTACLES	64														
33	RECEPTACLES		10	20 A	1		RECEPTACLES	66	RECEPTACLES		10	20 A	1	RECEPTACLES	68														
35	AUDIO RACK EQUIPMENT		6	20 A	1		RECEPTACLES	70	RECEPTACLES		6	20 A	1	RECEPTACLES	72														
37	AUDIO RACK EQUIPMENT		6	20 A	1		RECEPTACLES	74	RECEPTACLES		6	20 A	1	RECEPTACLES	76														
39	RECEPTACLES		10	20 A	1		RECEPTACLES	78	RECEPTACLES		10	20 A	1	RECEPTACLES	80														
41	RECEPTACLES		12	20 A	1		RECEPTACLES	82	RECEPTACLES		12	20 A	1	RECEPTACLES	84														
43	SPARE		--	20 A	1		SPARE	86	SPARE		--	20 A	1	SPARE	88														
45	SPARE		--	20 A	1		SPARE	90	SPARE		--	20 A	1	SPARE	92														
47	SPARE		--	20 A	1		SPARE	94	SPARE		--	20 A	1	SPARE	96														
49	SPARE		--	20 A	1		SPARE	98	SPARE		--	20 A	1	SPARE	100														
51	SPARE		--	20 A	1		SPARE	102	SPARE		--	20 A	1	SPARE	104														
53	SPARE		--	20 A	1		SPARE	106	SPARE		--	20 A	1	SPARE	108														
55	SPARE		--	20 A	1		SPARE	110	SPARE		--	20 A	1	SPARE	112														
57	SPARE		--	20 A	1		SPARE	114	SPARE		--	20 A	1	SPARE	116														
59	SPARE		--	20 A	1		SPARE	118	SPARE		--	20 A	1	SPARE	120														
61	SPARE		--	20 A	1		SPARE	122	SPARE		--	20 A	1	SPARE	124														
63	SPARE		--	20 A	1		SPARE	126	SPARE		--	20 A	1	SPARE	128														
65	SPARE		--	20 A	1		SPARE	130	SPARE		--	20 A	1	SPARE	132														
67	SPARE		--	20 A	1		SPARE	134	SPARE		--	20 A	1	SPARE	136														
69	SPARE		--	20 A	1		SPARE	138	SPARE		--	20 A	1	SPARE	140														
71	SPARE		--	20 A	1		SPARE	142	SPARE		--	20 A	1	SPARE	144														
73	SPARE		--	20 A	1		SPARE	146	SPARE		--	20 A	1	SPARE	148														
75	SPARE		--	20 A	1		SPARE	150	SPARE		--	20 A	1	SPARE	152														
77	SPARE		--	20 A	1		SPARE	154	SPARE		--	20 A	1	SPARE	156														
79,81	CP1C	SEE RSR	60 A	3		SEE ZHF SCH	ZHFCP2A	80,82																					

PANELBOARD: PP2A-R										N6 400 A 208Y/120, 3PH, 4W, 60HZ																			
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED					SHUNT TRIP MAIN LC = VIA LIGHTING CONTROL PANEL					GENERAL NOTES:					MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED					SHUNT TRIP MAIN LC = VIA LIGHTING CONTROL PANEL					GENERAL NOTES:				
AIC: 65k					200% RATED NEUTRAL L = PROVIDE LOCK ON CB					1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND U.O.N.					AIC: 65k					200% RATED NEUTRAL L = PROVIDE LOCK ON CB					1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND U.O.N.				
BUS AMPS RATING: 400 A					SINGLE TUB PANEL IG = ISOLATED GROUND					2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.					BUS AMPS RATING: 600 A					SINGLE TUB PANEL IG = ISOLATED GROUND					2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.				
					FEED THRU LUGS P = GFPE - 30mA TRIP					3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.										FEED THRU LUGS P = GFPE - 30mA TRIP					3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N.				
					100% RATED MAIN BREAKER G = GFCEI - 5mA TRIP															100% RATED MAIN BREAKER G = GFCEI - 5mA TRIP									
					GROUND FAULT MAIN C.B. S = SHUNT TRIP															GROUND FAULT MAIN C.B. S = SHUNT TRIP									
					COMPUTER PANEL A = ARC FAULT CIRCUIT BREAKER															COMPUTER PANEL A = ARC FAULT CIRCUIT BREAKER									
					SURGE PROTECTION DEVICE 4 = 4W + G															SURGE PROTECTION DEVICE 4 = 4W + G									
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.													
1	RECEPTACLES		12	20 A	1		RECEPTACLES	2	RECEPTACLES		12	20 A	1	RECEPTACLES	4														
3	RECEPTACLES		12	20 A	1		RECEPTACLES	6	RECEPTACLES		12	20 A	1	RECEPTACLES	8														
5	RECEPTACLES		12	20 A	1		RECEPTACLES	10	RECEPTACLES		12	20 A	1	RECEPTACLES	12														
7	CORD REEL		12	20 A	1		CORD REEL	14	CORD REEL		12	20 A	1	CORD REEL	16														
9	CORD REEL		12	20 A	1		CORD REEL	18	CORD REEL		12	20 A	1	CORD REEL	20														
11	CORD REEL		12	20 A	1		CORD REEL	22	CORD REEL		12	20 A	1	CORD REEL	24														
13	RECEPTACLES		12	20 A	1		RECEPTACLES	26	RECEPTACLES		12	20 A	1	RECEPTACLES	28														
15	DISHWASHER		10	20 A	1		RECEPTACLES	30	RECEPTACLES		10	20 A	1	RECEPTACLES	32														
17	RECEPTACLES		12	20 A	1		RECEPTACLES	34	RECEPTACLES		12	20 A	1	RECEPTACLES	36														
19	RANGE HOOD		10	20 A	1		RECEPTACLES	38	RECEPTACLES		10	20 A	1	RECEPTACLES	40														
21	CORD REEL		8	20 A	1		CORD REEL	42	CORD REEL		8	20 A	1	CORD REEL	44														
23	CORD REEL		8	20 A	1		CORD REEL	46	CORD REEL		8	20 A	1	CORD REEL	48														
25	CORD REEL		10	20 A	1		CORD REEL	50	CORD REEL		10	20 A	1	CORD REEL	52														
27	RECEPTACLES		8	20 A	1		RECEPTACLES	54	RECEPTACLES		8	20 A	1	RECEPTACLES	56														
29	RECEPTACLES		8	20 A	1		RECEPTACLES	58	RECEPTACLES		8	20 A	1	RECEPTACLES	60														
31	RECEPTACLES		10	20 A	1		RECEPTACLES	62	RECEPTACLES		10	20 A	1	RECEPTACLES	64														
33	WATER COOLER		12	20 A	1		RECEPTACLES	66	RECEPTACLES		12	20 A	1	RECEPTACLES	68														
35	DISHWASHER		10	20 A	1		REFRIGERATOR	70	REFRIGERATOR		10	20 A	1	REFRIGERATOR	72														
37	RECEPTACLES		10	20 A	1		REFRIGERATOR	74	REFRIGERATOR		10	20 A	1	REFRIGERATOR	76														
39	RECEPTACLES		10	20 A	1		REFRIGERATOR	78	REFRIGERATOR		10	20 A	1	REFRIGERATOR	80														
41	RECEPTACLES		12	20 A	1		REFRIGERATOR	82	REFRIGERATOR		12	20 A	1	REFRIGERATOR	84														
43	HAND DRYER		10	20 A	1		REFRIGERATOR	86	REFRIGERATOR		10	20 A	1	REFRIGERATOR	88														
45	DISHWASHER		10	20 A	1		REFRIGERATOR	90	REFRIGERATOR		10	20 A	1	REFRIGERATOR	92														
47,49	COOKTOP		8	50 A	2		REFRIGERATOR	94	REFRIGERATOR		8	50 A	2	REFRIGERATOR	96														
51	RECEPTACLES		12	20 A	1		REFRIGERATOR	98	REFRIGERATOR		12	20 A	1	REFRIGERATOR	100														
53	RECEPTACLES		12	20 A	1		REFRIGERATOR	102	REFRIGERATOR		12	20 A	1	REFRIGERATOR	104														
55	REFRIGERATOR		10	20 A	1		REFRIGERATOR	106	REFRIGERATOR		10	20 A	1	REFRIGERATOR	108														
57	RECEPTACLES		20	A			REFRIGERATOR	110	REFRIGERATOR		20	A		REFRIGERATOR	112														
59,61	WALL OVEN		10	20 A	2		REFRIGERATOR	114	REFRIGERATOR		10	20 A	2	REFRIGERATOR	116														
63,65	ELECTRIC DRYER		8	30 A	2		REFRIGERATOR	118	REFRIGERATOR		8	30 A	2	REFRIGERATOR	120														
67	HAND DRYER		10	20 A	1		REFRIGERATOR	122	REFRIGERATOR		10	20 A	1	REFRIGERATOR	124														
69	RECEPTACLES		8	20 A	1		REFRIGERATOR	126	REFRIGERATOR		8	20 A	1	REFRIGERATOR	128														
71,73	COOKTOP		8	50 A	2		REFRIGERATOR	130	REFRIGERATOR		8	50 A	2	REFRIGERATOR	132														
75	DISTILLER EQUIP		12	20 A	1		REFRIGERATOR	134	REFRIGERATOR		12	20 A	1	REFRIGERATOR	136														
77	GOGGLE CABINET		12	20 A	1		REFRIGERATOR	138	REFRIGERATOR		12	20 A	1	REFRIGERATOR	140														
79	SPARE		--	20 A	1		REFRIGERATOR	142	REFRIGERATOR		--	20 A																	

PANELBOARD: OP2C-R O8 60 A 208Y/120, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1	ATHLETIC DIRECTORS RECEPT	12	20 A	1				DOOR POWER	2		
3	GEN. BATTERY CHARGER	6	20 A	1				RECEPTACLES	4		
5,7	GEN. JACKET WATER BLOCK HEATER	3	30 A	2				RECEPTACLES	6		
9	SPARE	--	20 A	1				SPARE	8		
11	SPARE	--	20 A	1				SPARE	10		
13	SPARE	--	20 A	1				SPARE	12		
15	SPARE	--	20 A	1				SPARE	14		
17	SPARE	--	20 A	1				SPARE	16		
19	SPARE	--	20 A	1				SPARE	18		
21	SPARE	--	20 A	1				SPARE	20		
23	SPARE	--	20 A	1				SPARE	22		
25	SPARE	--	20 A	1				SPARE	24		
27	SPARE	--	20 A	1				SPARE	26		
29	SPARE	--	20 A	1				SPARE	28		
31	SPARE	--	20 A	1				SPARE	30		
33	SPARE	--	20 A	1				SPARE	32		
35	SPARE	--	20 A	1				SPARE	34		
37	SPARE	--	20 A	1				SPARE	36		
39	SPARE	--	20 A	1				SPARE	38		
41	SPARE	--	20 A	1				SPARE	40		
								ZHFOP2C	38,40		
								ZHF SCH	42		

PANELBOARD: CP2C C5 100 A 208Y/120, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1	RECEPTACLES	1	20 A	1				RECEPTACLES	2		
3	RECEPTACLES	1	20 A	1				RECEPTACLES	4		
5	RECEPTACLES	1	20 A	1				RECEPTACLES	6		
7	RECEPTACLES	1	20 A	1				RECEPTACLES	8		
9	RECEPTACLES	1	20 A	1				RECEPTACLES	10		
11	RECEPTACLES	1	20 A	1				RECEPTACLES	12		
13	SPARE	--	20 A	1				RECEPTACLES	14		
15	SPARE	--	20 A	1				RECEPTACLES	16		
17	SPARE	--	20 A	1				SPARE	18		
19	SPARE	--	20 A	1				SPARE	20		
21	SPARE	--	20 A	1				SPARE	22		
23	SPARE	--	20 A	1				SPARE	24		
25	SPARE	--	20 A	1				SPARE	26		
27	SPARE	--	20 A	1				SPARE	28		
29	SPARE	--	20 A	1				SPARE	30		
31	SPARE	--	20 A	1				SPARE	32		
33	SPARE	--	20 A	1				SPARE	34		
35	SPARE	--	20 A	1				SPARE	36		
37	SPARE	--	20 A	1				SPARE	38		
39	SPARE	--	20 A	1				SPARE	40		
41	SPARE	--	20 A	1				SPARE	42		
								ZHFC2C	38,40		
								ZHF SCH	42		

PANELBOARD: LP2C-L N17 60 A 277Y/480V, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1	LIGHTING	12	20 A	1				RECEPTACLES	2		
3	LIGHTING	LC	20 A	1				RECEPTACLES	4		
5	LIGHTING	12	20 A	1				RECEPTACLES	6		
7	LIGHTING	12	20 A	1				RECEPTACLES	8		
9	SPARE	--	20 A	1				RECEPTACLES	10		
11	SPARE	--	20 A	1				RECEPTACLES	12		
13	SPARE	--	20 A	1				RECEPTACLES	14		
15	SPARE	--	20 A	1				RECEPTACLES	16		
17	SPARE	--	20 A	1				SPARE	18		
19	SPARE	--	20 A	1				SPARE	20		
21	SPARE	--	20 A	1				SPARE	22		
23	SPARE	--	20 A	1				SPARE	24		
25	SPARE	--	20 A	1				SPARE	26		
27	SPARE	--	20 A	1				SPARE	28		
29	SPARE	--	20 A	1				SPARE	30		
31	SPARE	--	20 A	1				SPARE	32		
33	SPARE	--	20 A	1				SPARE	34		
35	SPARE	--	20 A	1				SPARE	36		
37	SPARE	--	20 A	1				SPARE	38		
39	SPARE	--	20 A	1				SPARE	40		
41	SPARE	--	20 A	1				SPARE	42		

PANELBOARD: LP2C-SL N18 60 A 277Y/480V, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1	SITE LIGHTING	LC	12	20 A	1			SITE LIGHTING	2		
3	SITE LIGHTING	LC	12	20 A	1			SITE LIGHTING	4		
5	SITE LIGHTING	LC	12	20 A	1			SITE LIGHTING	6		
7	SITE LIGHTING	LC	10	20 A	1			FLAG POLE LIGHTING	8		
9	SITE LIGHTING	LC	12	20 A	1			SPARE	10		
11	SPARE	--	20 A	1				SPARE	12		
13	SPARE	--	20 A	1				SPARE	14		
15	SPARE	--	20 A	1				SPARE	16		
17	SPARE	--	20 A	1				SPARE	18		
19	SPARE	--	20 A	1				SPARE	20		
21	SPARE	--	20 A	1				SPARE	22		
23	SPARE	--	20 A	1				SPARE	24		
25	SPARE	--	20 A	1				SPARE	26		
27	SPARE	--	20 A	1				SPARE	28		
29	SPARE	--	20 A	1				SPARE	30		
31	SPARE	--	20 A	1				SPARE	32		
33	SPARE	--	20 A	1				SPARE	34		
35	SPARE	--	20 A	1				SPARE	36		
37	SPARE	--	20 A	1				SPARE	38		
39	SPARE	--	20 A	1				SPARE	40		
41	SPARE	--	20 A	1				SPARE	42		

PANELBOARD: LP2C-M N19 200 A 277Y/480V, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1,3,5	WAREWASHER		2	90 A	3			TRASH COMPACTOR	2,4,6		
7,9,11	ERV-1		12	20 A	3			NPWH-1	8,10,12		
13	SPARE	--	20 A	1				SPARE	14		
15	SPARE	--	20 A	1				SPARE	16		
17	SPARE	--	20 A	1				SPARE	18		
19	SPARE	--	20 A	1				SPARE	20		
21	SPARE	--	20 A	1				SPARE	22		
23	SPARE	--	20 A	1				SPARE	24		
25	SPARE	--	20 A	1				SPARE	26		
27	SPARE	--	20 A	1				SPARE	28		
29	SPARE	--	20 A	1				SPARE	30		
31	SPARE	--	20 A	1				SPARE	32		
33	SPARE	--	20 A	1				SPARE	34		
35	SPARE	--	20 A	1				SPARE	36		
37	SPARE	--	20 A	1				SPARE	38		
39	SPARE	--	20 A	1				SPARE	40		
41	SPARE	--	20 A	1				SPARE	42		

PANELBOARD: OL2C-L O20 60 A 277Y/480V, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1	LIGHTING	12	20 A	1				LIGHTING	2		
3	LIGHTING	12	20 A	1				LIGHTING	4		
5	LIGHTING	12	20 A	1				LIGHTING	6		
7	SPARE	--	20 A	1				SPARE	8		
9	SPARE	--	20 A	1				SPARE	10		
11	SPARE	--	20 A	1				SPARE	12		
13	SPARE	--	20 A	1				SPARE	14		
15	SPARE	--	20 A	1				SPARE	16		
17	SPARE	--	20 A	1				SPARE	18		
19	SPARE	--	20 A	1				SPARE	20		
21	SPARE	--	20 A	1				SPARE	22		
23	SPARE	--	20 A	1				SPARE	24		
25	SPARE	--	20 A	1				SPARE	26		
27	SPARE	--	20 A	1				SPARE	28		
29	SPARE	--	20 A	1				SPARE	30		
31	SPARE	--	20 A	1				SPARE	32		
33	SPARE	--	20 A	1				SPARE	34		
35	SPARE	--	20 A	1				SPARE	36		
37	SPARE	--	20 A	1				SPARE	38		
39	SPARE	--	20 A	1				SPARE	40		
41	SPARE	--	20 A	1				SPARE	42		

PANELBOARD: OL2C-M O19 300 A 277Y/480V, 3PH, 4W, 60HZ											
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCEI - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL		
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER	WIRE SIZE	NOTE	LOAD DESCRIPTION	CKT. NO.		
1,3,5	PUMP P-1 VIA VFD-1	10	30 A	3				PUMP P-2 VIA VFD-2	2,4,6		
7,9,11	BOILER PUMP BP-1	12	20 A	3				BOILER PUMP BP-2	8,10,12		
13,15,17	RTU-4	S	1	110 A	3			ELEVATOR 2	14,16,18		
19,21,23	RTU-8	2	90 A	3				SPARE	20		
25	SPARE	--	20 A	1				SPARE	22		
27	SP										



CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

KEYNOTE LEGEND:

PANELBOARD: OP3A-R O10 100 A 208Y/120, 3PH, 4W, 60HZ									
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL X SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCE - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL.
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER SIZE	WIRE NOTE	LOAD DESCRIPTION	CKT. NO.	
1	DOOR POWER		8	20 A	1		IDF RACK RECEPTACLE	2	
3	IDF RACK RECEPTACLE		10	30 A	1		IDF RACK RECEPTACLE	4	
5	IDF RACK RECEPTACLE		10	30 A	1		SECURITY J-BOX	6	
7	SECURITY J-BOX		12	20 A	1		ATC CIRCUIT	8	
9	RECEPTACLES		12	20 A	1		RECEPTACLES	10	
11	SPARE		--	20 A	1		SPARE	12	
13	SPARE		--	20 A	1		SPARE	14	
15	SPARE		--	20 A	1		SPARE	16	
17	SPARE		--	20 A	1		SPARE	18	
19	SPARE		--	20 A	1		SPARE	20	
21	SPARE		--	20 A	1		SPARE	22	
23	SPARE		--	20 A	1		SPARE	24	
25	SPARE		--	20 A	1		SPARE	26	
27	SPARE		--	20 A	1		SPARE	28	
29	SPARE		--	20 A	1		SPARE	30	
31	SPARE		--	20 A	1		SPARE	32	
33	SPARE		--	20 A	1		SPARE	34	
35	SPARE		--	20 A	1		SPARE	36	
37	SPARE		--	20 A	1		SPARE	38	
39	SPARE		--	20 A	1		ZHFOP3A	38,40	
41	SPARE		--	20 A	1			42	

PANELBOARD: PP3C-D 400 A 208Y/120, 3PH, 4W, 60HZ									
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCE - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL.
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER SIZE	WIRE NOTE	LOAD DESCRIPTION	CKT. NO.	
1,3,5	PP3C-M		SEE RSR	300 A	3		PP3C-R	2,4,6	
7	SPARE		--	20 A	1		SPARE	8	
9	SPARE		--	20 A	1		SPARE	10	
11	SPARE		--	20 A	1		SPARE	12	
13	SPARE		--	20 A	1		SPARE	14	
15	SPARE		--	20 A	1		SPARE	16	
17	SPARE		--	20 A	1		SPARE	18	
19	SPARE		--	20 A	1		SPARE	20	
21	SPARE		--	20 A	1		SPARE	22	
23	SPARE		--	20 A	1		SPARE	24	
25	SPARE		--	20 A	1		SPARE	26	
27	SPARE		--	20 A	1		SPARE	28	
29	SPARE		--	20 A	1		SPARE	30	
31	SPARE		--	20 A	1		SPARE	32	
33	SPARE		--	20 A	1		SPARE	34	
35	SPARE		--	20 A	1		SPARE	36	
37	SPARE		--	20 A	1		SPARE	38	
39	SPARE		--	20 A	1		SPARE	40	
41	SPARE		--	20 A	1		SPARE	42	

PANELBOARD: PP3C-R N12 100 A 208Y/120, 3PH, 4W, 60HZ									
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCE - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL.
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER SIZE	WIRE NOTE	LOAD DESCRIPTION	CKT. NO.	
1	RECEPTACLES		10	20 A	1		RECEPTACLES	2	
3	RECEPTACLES		10	20 A	1		RECEPTACLES	4	
5	RECEPTACLES		10	20 A	1		RECEPTACLES	6	
7	RECEPTACLES		10	20 A	1		RECEPTACLES	8	
9	RECEPTACLES		12	20 A	1		WATER COOLER	10	
11	HAND DRYER		10	20 A	1		HAND DRYER	12	
13	RECEPTACLES		10	20 A	1		RECEPTACLES	14	
15	PROJECTION SCREEN		12	20 A	1			16,18	
17	HOIST CONTROLLER		12	20 A	1		HOIST	20	
19	HAND DRYER		G	6	20 A	1		22	
21	HAND DRYER		G	6	20 A	1		22	
23	HAND DRYER		G	6	20 A	1		24	
25	DMX OPTO SPLITTER		10	20 A	1		MOTORIZED SHADES	26	
27	RECEPTACLES		10	20 A	1		MOTORIZED SHADES	28	
29	RECEPTACLES		10	20 A	1		SPARE	30	
31	RECEPTACLES		10	20 A	1		SPARE	32	
33	RECEPTACLES		10	20 A	1		SPARE	34	
35	RECEPTACLES		10	20 A	1		SPARE	36	
37	RECEPTACLES		10	20 A	1		SPARE	38	
39	SPARE		--	20 A	1		SPARE	40	
41	SPARE		--	20 A	1		SPARE	42	

PANELBOARD: PP3C-M N11 300 A 208Y/120, 3PH, 4W, 60HZ									
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCE - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL.
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER SIZE	WIRE NOTE	LOAD DESCRIPTION	CKT. NO.	
1	EF-10		10	20 A	1		SPARE	2	
3	SPARE		--	20 A	1		ROOF RECEPTACLE	4	
5,7	CU-2-12 / DFC-2-12		2	40 A	8		CU-2-13 / DFC-2-13	6,8	
9,11	CU-1-6 / DFC-1-6		10	30 A	2		CU-1-7 / DFC-1-7	10,12	
13,15	CU-2-5 / DFC-2-5		10	30 A	2		CU-2-6 / DFC-2-6	14,16	
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83	SPARE		--	20 A	1		SPARE	78	
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							SPARE	84	

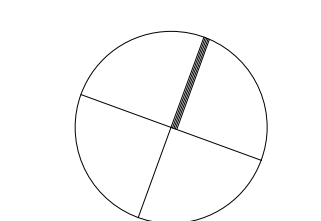


PANELBOARD: CP3C C7 100 A 208Y/120, 3PH, 4W, 60HZ									
MAINS TYPE: MAIN CIRCUIT BREAKER MOUNTING: SURFACE MOUNTED			SHUNT TRIP MAIN 200% RATED NEUTRAL SINGLE TUB PANEL FEED THRU LUGS 100% RATED MAIN BREAKER GROUND FAULT MAIN C.B. COMPUTER PANEL SURGE PROTECTION DEVICE			LC = VIA LIGHTING CONTROL PANEL L = PROVIDE LOCK ON CB IG = ISOLATED GROUND P = GFPE - 30mA TRIP G = GFCE - 5mA TRIP S = SHUNT TRIP A = ARC FAULT CIRCUIT BREAKER 4 = 4W + G			GENERAL NOTES: 1. FOR SINGLE POLE CIRCUIT BREAKERS, PROVIDE 2 WIRES + GROUND, U.O.N. 2. FOR TWO POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 3. FOR THREE POLE CIRCUIT BREAKERS, PROVIDE 3 WIRES + GROUND, U.O.N. 4. WIRE SIZES AS SHOWN ON PANEL.
CKT. NO.	LOAD DESCRIPTION	NOTE	WIRE SIZE	CIRCUIT BREAKER	CIRCUIT BREAKER SIZE	WIRE NOTE	LOAD DESCRIPTION	CKT. NO.	
1	RECEPTACLES		10	20 A	1		RECEPTACLES	2	
3	RECEPTACLES		10	20 A	1		RECEPTACLES	4	
5	RECEPTACLES		10	20 A	1		RECEPTACLES	6	
7	RECEPTACLES		10	20 A	1		AUDIO RACK EQUIPMENT	8	
9	LIGHTING RACK EQUIPMENT		8	20 A	1		AUDIO RACK EQUIPMENT	10	
11	LIGHTING RACK EQUIPMENT		8	20 A	1		AUDIO RACK EQUIPMENT	12	
13	AUDIO RACK EQUIPMENT		10	20 A	1		SPEAKERS / SUBWOOFER	14	
15	SPEAKERS / SUBWOOFER		8	20 A	1		PROJECTOR	16	
17	AUDIO RACK EQUIPMENT		6	20 A	1		AUDIO RACK EQUIPMENT	18	
19	AUDIO RACK EQUIPMENT		6	20 A	1		AUDIO RACK EQUIPMENT	20	
21	SPARE		--	20 A	1		SPARE	22	
23	SPARE		--	20 A	1		SPARE	24	
25	SPARE		--	20 A	1		SPARE	26	
27	SPARE		--	20 A	1		SPARE	28	
29	SPARE		--	20 A	1		SPARE	30	
31	SPARE		--	20 A	1		SPARE	32	
33	SPARE		--	20 A	1		SPARE	34	
35	SPARE		--	20 A	1		SPARE	36	
37	SPARE		--	20 A	1		SPARE	38	
39	SPARE		--	20 A	1		ZHFCP3C	38,40	
41	SPARE		--	20 A	1			42	

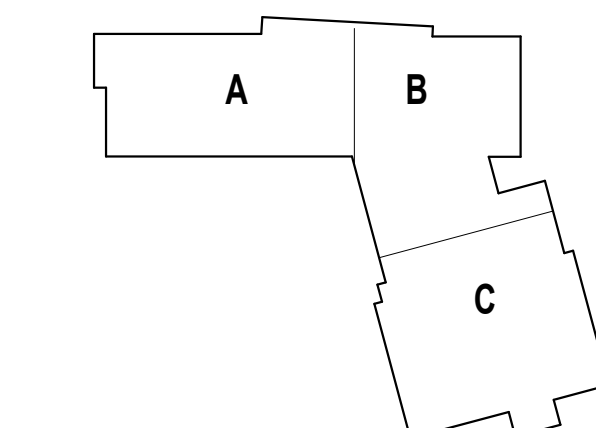
ADD-9 ADDENDUM 9 2/6/2024  
ADD-8 ADDENDUM 8 1/30/2024

100% CONSTRUCTION DOCUMENTS

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**ELECTRICAL  
PANEL  
SCHEDULES**

DRAWN BY: RBC

REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:

JOB NO.: 2202.02

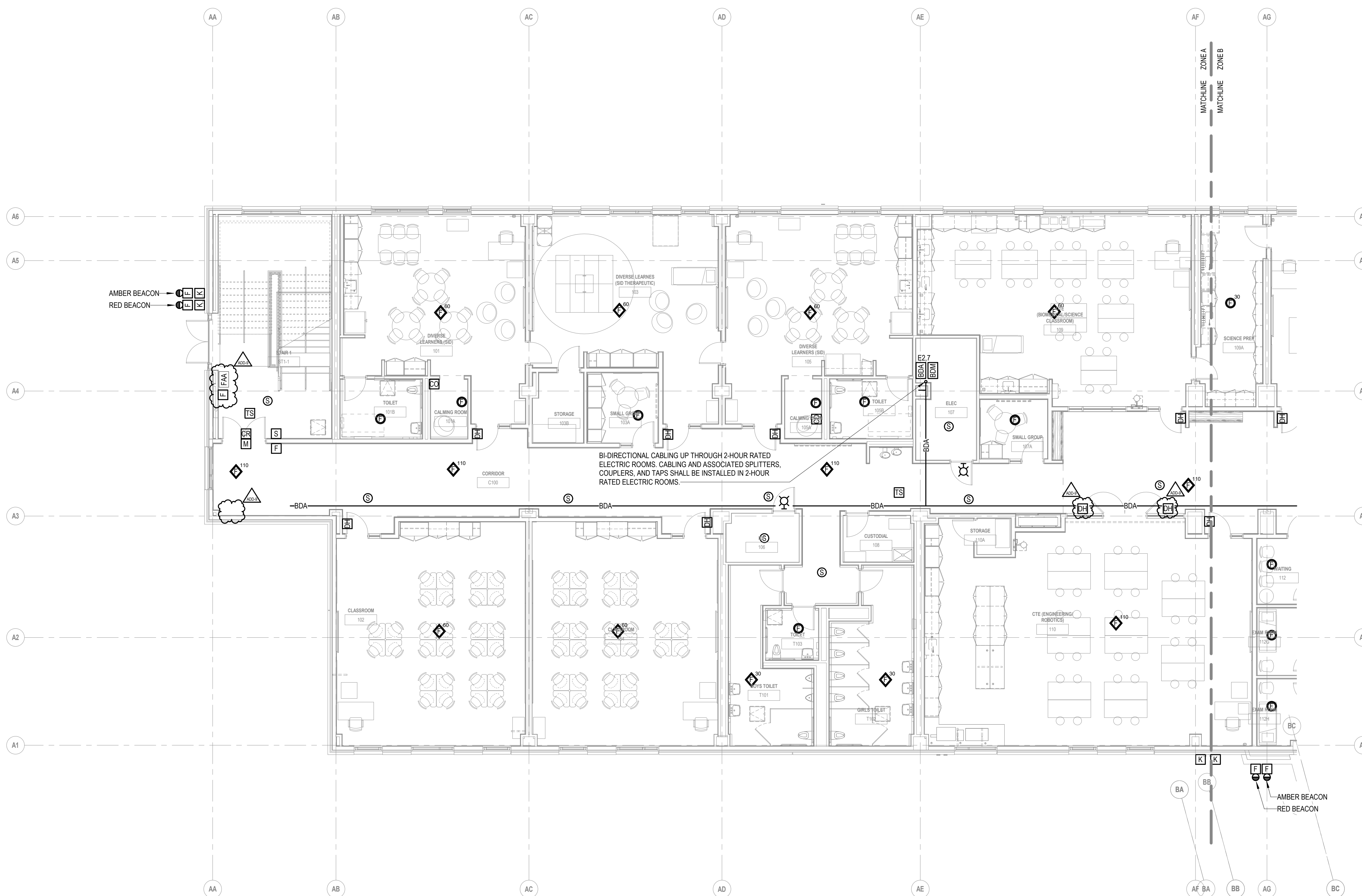
DATE: OCTOBER 13, 2023

**E5.10**



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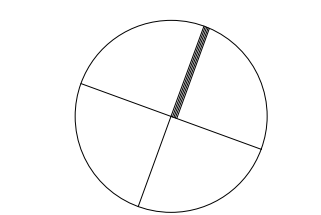
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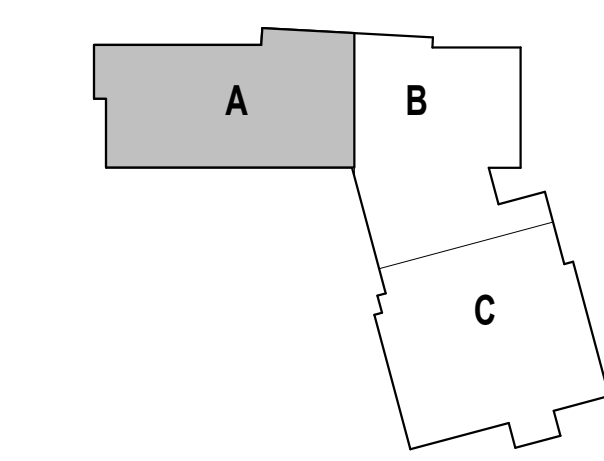
ADD-9	ADDENDUM 9	2/6/2024
ADD-8	ADDENDUM 8	1/30/2024
ADD-7	ADDENDUM 7	1/26/2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW



KEYPLAN



1 FIRST FLOOR FIRE ALARM PLAN - ZONE A  
1/8" = 1'-0"

DRAWING NAME:	
<b>ELECTRICAL FIRST FLOOR FIRE ALARM PLAN - ZONE A</b>	
DRAWN BY:	RBC/JAJ
REVIEWED BY:	RCB
SCALE:	AS NOTED   DRAWING NUMBER:
JOB NO.:	2202.02
DATE:	OCTOBER 13, 2023
<b>EF3.11A</b>	



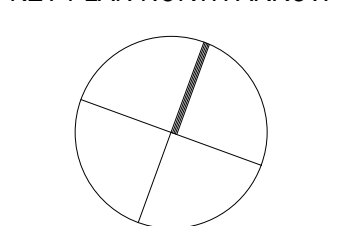
CENTRAL FALLS HIGH SCHOOL  
10 HIGGINSON AVE, CENTRAL FALLS, RI

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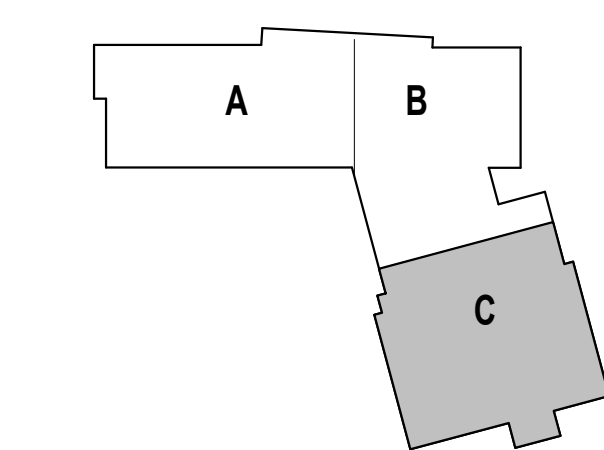
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ADD-8	ADDENDUM 8	1/30/2024
ADD-7	ADDENDUM 7	1/26/2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:

**ELECTRICAL  
FIRST FLOOR FIRE  
ALARM PLAN -  
ZONE C**

DRAWN BY: RBC/JAJ

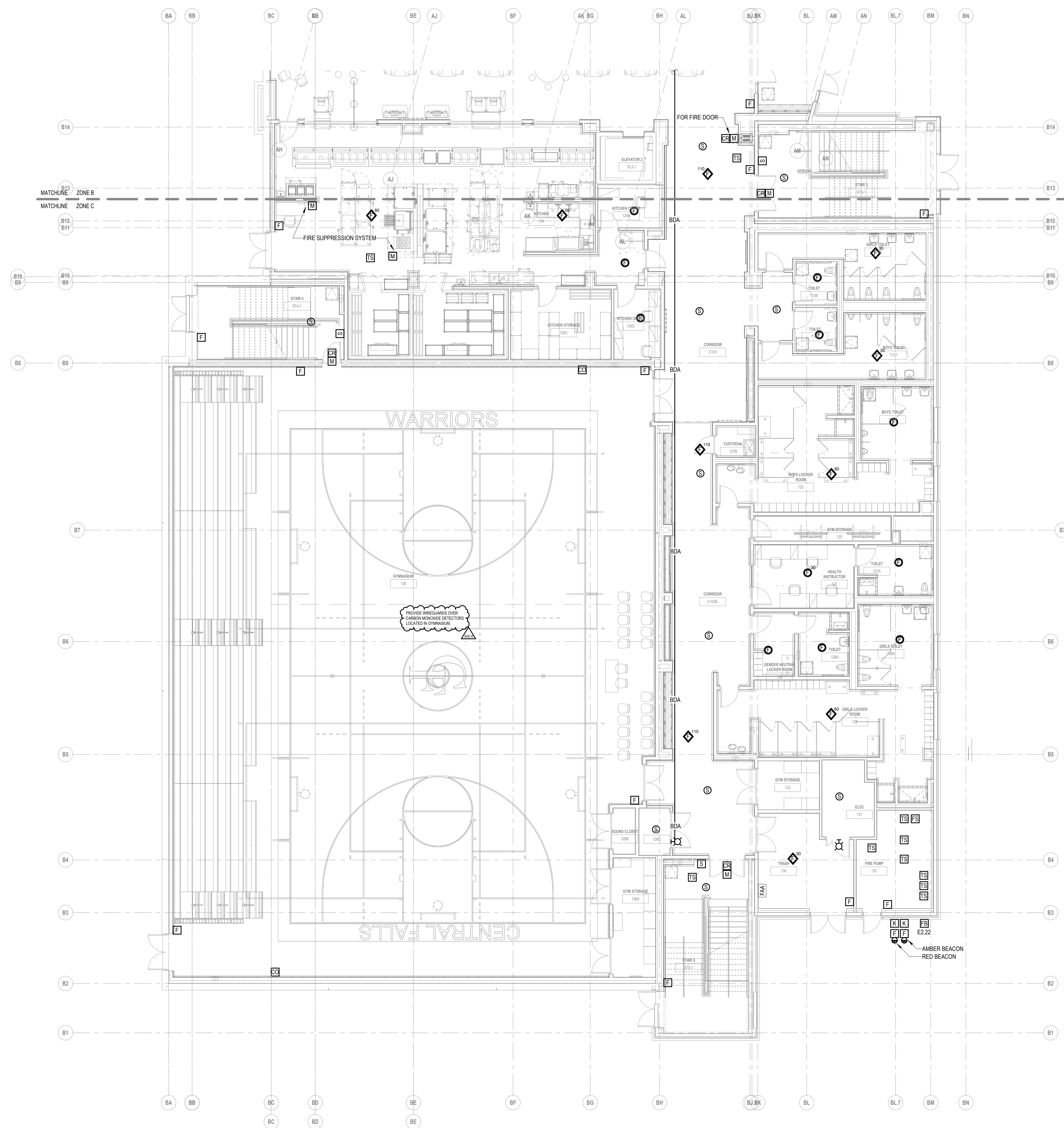
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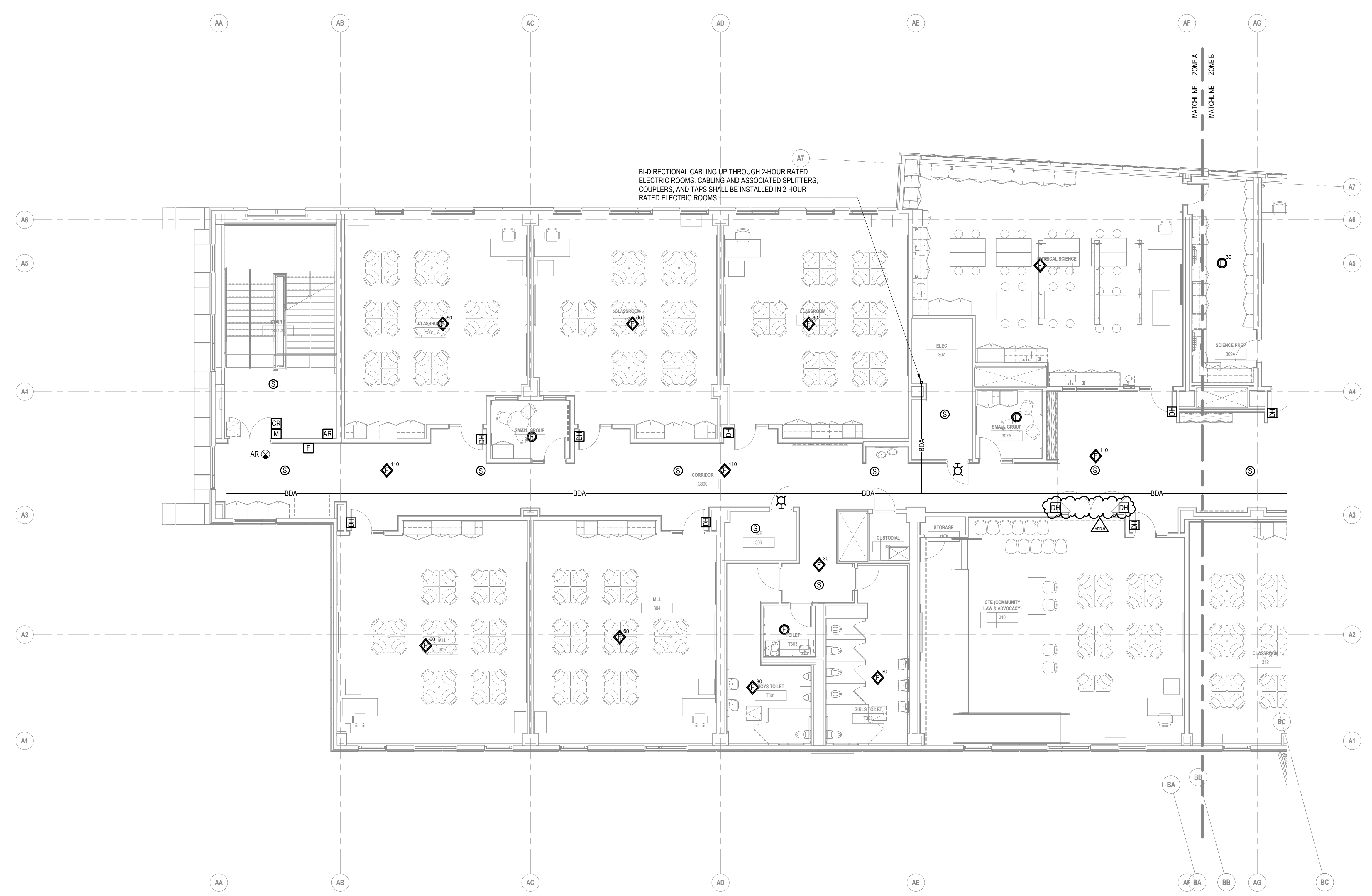
JOB NO.: 2202.02

DATE: OCTOBER 13, 2023

**EF3.11C**



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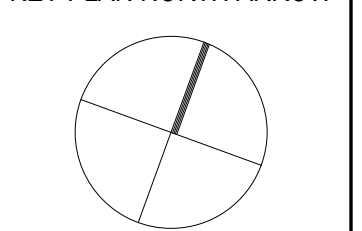


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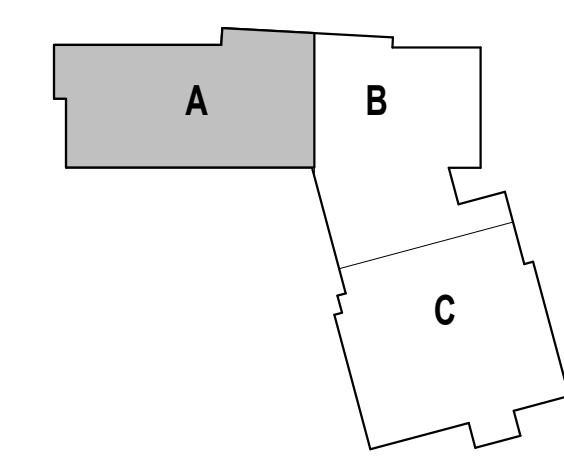
ADD-9 ADDENDUM 9 2/6/2024  
ADD-7 ADDENDUM 7 1/26/2024

**100% CONSTRUCTION DOCUMENTS**

KEY PLAN NORTH ARROW



KEYPLAN



DRAWING NAME:  
**ELECTRICAL  
THIRD FLOOR FIRE  
ALARM PLAN -  
ZONE A**

DRAWN BY: RBC/JAJ

REVIEWED BY: RCB

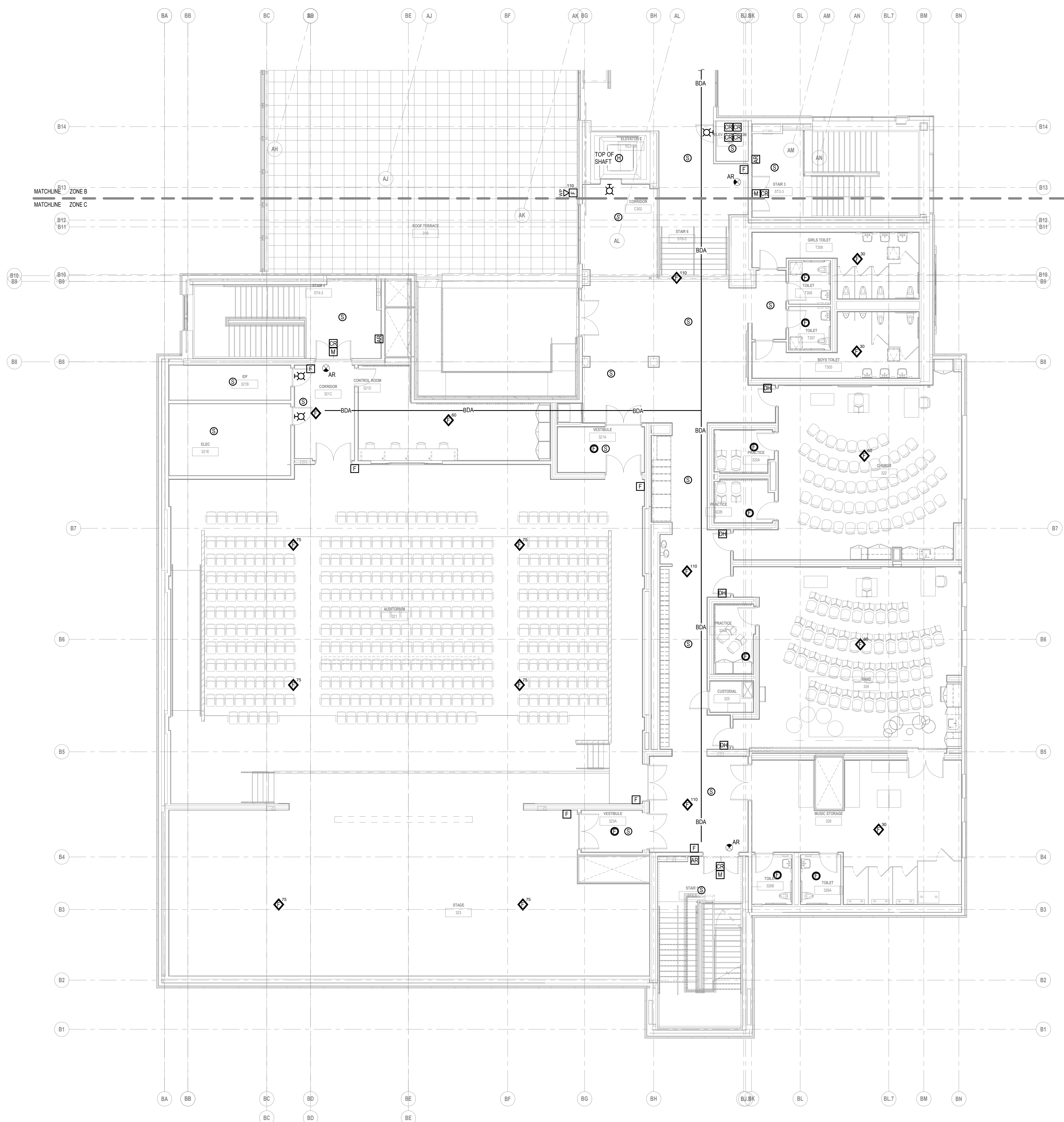
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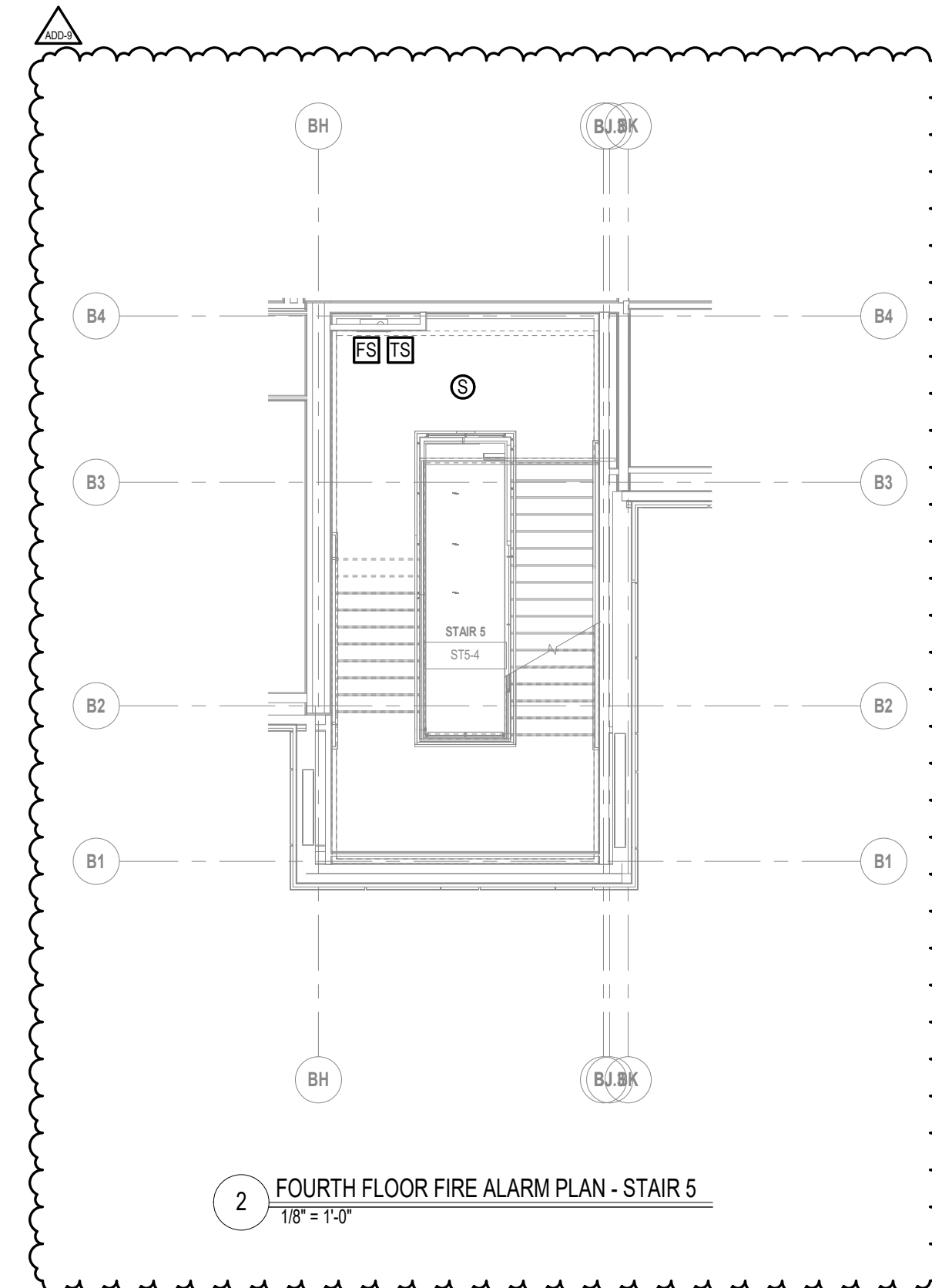
DATE: OCTOBER 13, 2023

**EF3.13A**

1 THIRD FLOOR FIRE ALARM PLAN - ZONE A  
1/8" = 1'-0"

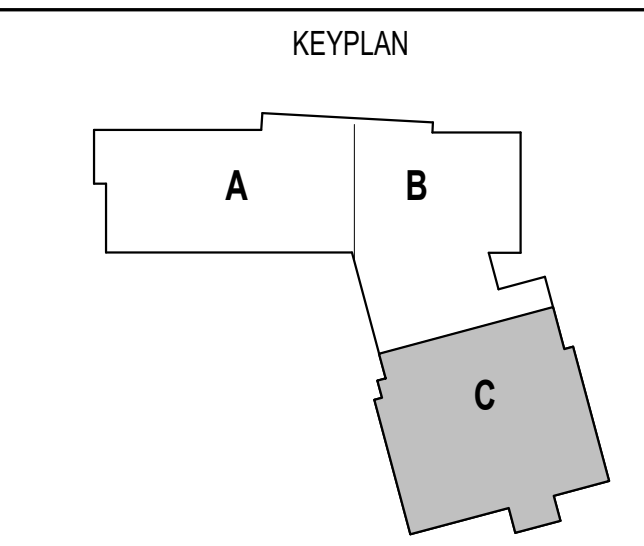


1 THIRD FLOOR FIRE ALARM PLAN - ZONE C  
1/8" = 1'-0"



2 FOURTH FLOOR FIRE ALARM PLAN - STAIR 5  
1/8" = 1'-0"

ADD-9 ADDENDUM 9 2/6/2024  
ADD-7 ADDENDUM 7 1/26/2024  
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KEY PLAN NORTH ARROW



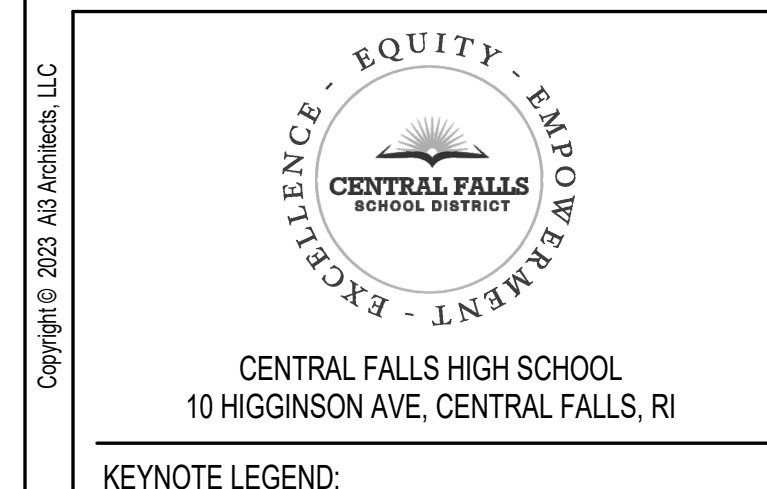
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THIRD FLOOR FIRE  
ALARM PLAN -  
ZONE C**

DRAWN BY: RBC/JAJ  
REVIEWED BY: RCB  
SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **EF3.13C**

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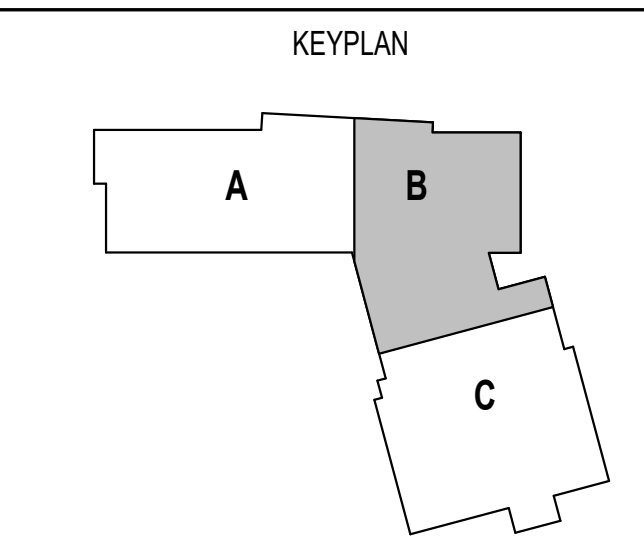
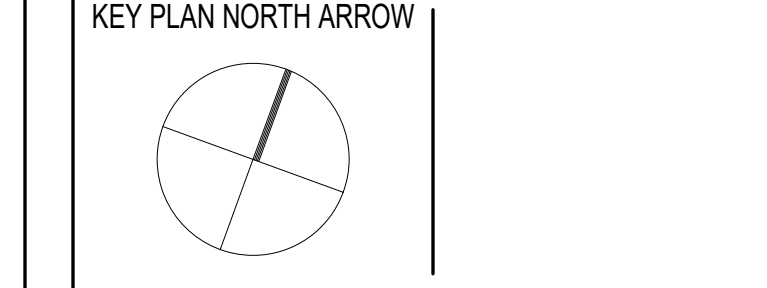
1 FOURTH FLOOR FIRE ALARM PLAN - ZONE B  
1/8" = 1'-0"



KEYNOTE LEGEND:

ADD-9	ADDENDUM 9	2/6/2024
ADD-8	ADDENDUM 8	1/30/2024
ADD-7	ADDENDUM 7	1/26/2024

**100% CONSTRUCTION DOCUMENTS**

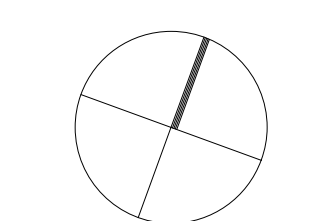


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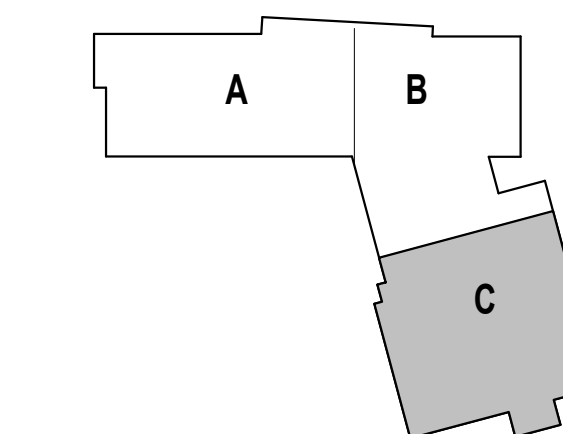
**ELECTRICAL  
FOURTH FLOOR  
FIRE ALARM PLAN  
- ZONE B**

DRAWN BY:	RBC/JAJ
REVIEWED BY:	RCB
SCALE:	AS NOTED   DRAWING NUMBER:
JOB NO.:	2202.02
DATE:	OCTOBER 13, 2023

**EF3.14B**



KEYPLAN



DRAWING NAME:

**ELECTRICAL  
ROOF FIRE ALARM  
PLAN - ZONE C**

DRAWN BY: RBC/JAJ

REVIEWED BY: RCB

SCALE: AS NOTED | DRAWING NUMBER:  
JOB NO.: 2202.02  
DATE: OCTOBER 13, 2023 **EF3.15C**

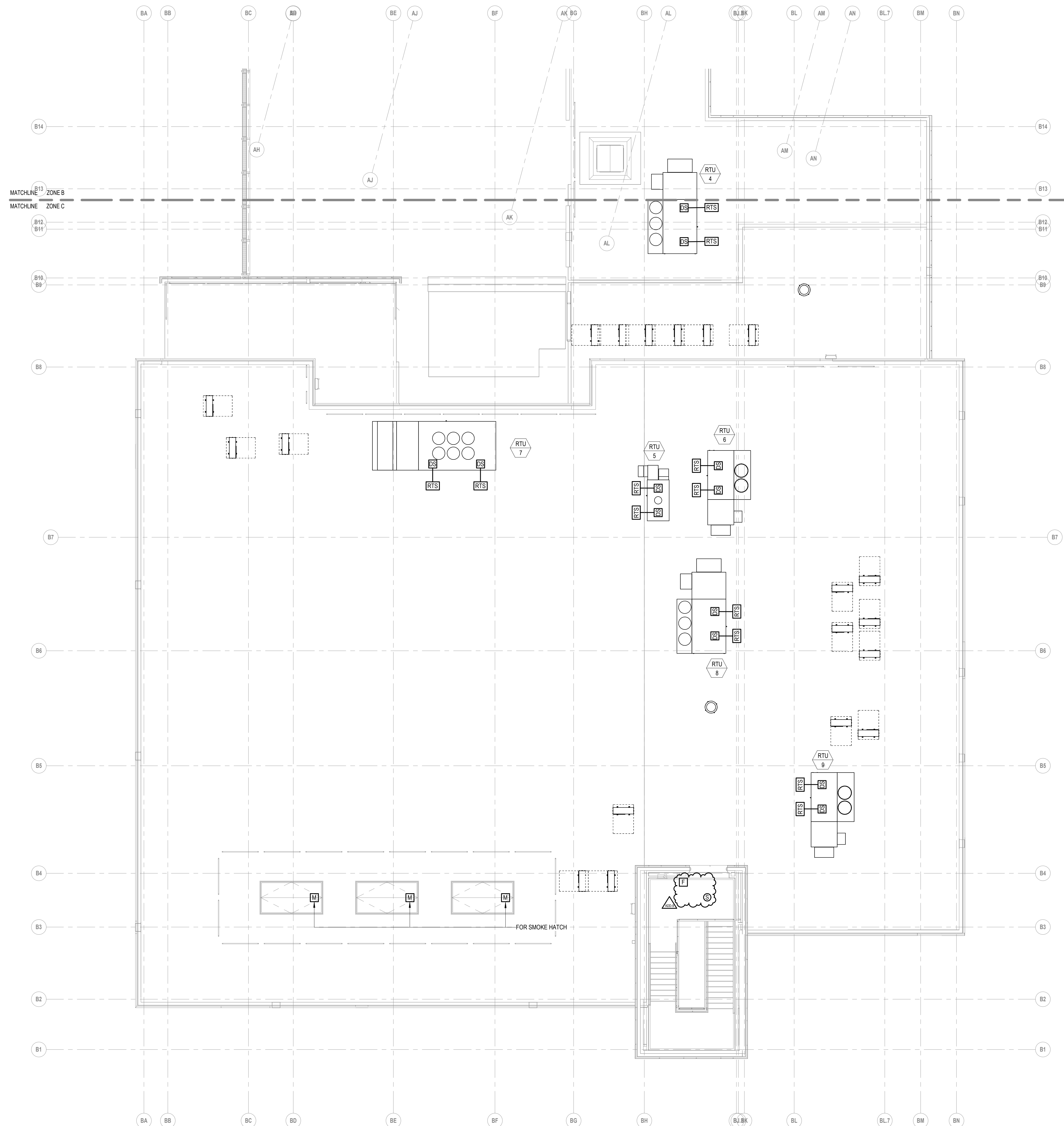


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**DIVISION 33 — UTILITIES**

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**APPENDICES**

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**VOLUME 3 (APPENDIX F)**

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## Section 08 43 15

## BULLET RESISTANT ALUMINUM STOREFRONT FRAMING SYSTEM

**PART 1 - GENERAL**

## 1.1 SUMMARY

- A. The work of this Section consists of bullet-resistant aluminum framed glazing system, where shown on the Drawings, as specified herein, and required for a complete and proper installation.
- B. Furnish and install the following:
- ~~1.~~ **1.** Factory finished bullet-resistant aluminum framed glazing **system**, of the types specified herein, all required integral reinforcing, bracing members and related accessories for the framing systems, and all angles, clips, and other items required to anchor the systems to the building structure. **Work[ADD #9]**
  - ~~4.2.~~ **4.2.** **Factory finished bullet-resistant aluminum entry doors. [ADD #9]**
  - ~~2.3.~~ **2.3.** Prefinished exterior aluminum formed brake-metal work, mullion covers, closures, flashings, and similar components, in conjunction with storefront system.
  - ~~3.4.~~ **3.4.** Metal to metal sealing of exterior aluminum assemblies.
  - ~~4.5.~~ **4.5.** All **Bullet-Resistant** glass, including insulated panels, and glazing materials for the **bullet-resistant** storefront system. **[ADD #9]**
  - ~~5.6.~~ **5.6.** Bullet resistant two way communication speaker/microphone.
  - ~~6.7.~~ **6.7.** Shimming and fasteners required for installation.
  - ~~7.8.~~ **7.8.** Sealant and compressible back-up beads for exterior perimeter joints between framing members furnished hereunder and surrounding dissimilar materials.
- C. Build-into place as work progresses, the following products and materials furnished under the indicated Sections:
1. Door Hardware furnished under Section 08 71 00 – DOOR HARDWARE.
  2. Stainless steel sunshade support brackets furnished under Section 05 50 00 – METAL FABRICATIONS.
  3. Exterior sun control devices furnished under Section 10 71 13 – EXTERIOR SUN CONTROL DEVICES.
- D. The work of this Section is performance based, and shall be developed, tested and warranted by the Glazing Subcontractor to comply with design intent indicated on the Project Drawings, specified performance criteria and requirements, and relevant statutory and project requirements. In case of any conflict between Drawings and Specifications, including referenced standards and codes, the more stringent or onerous requirement shall apply. Where multiple standards or requirements apply, the more stringent or onerous shall apply. This specification describes the work in accordance with the current stage of design and does not contain all information required to produce a full working installation. Further design development will be required by the Glazing Subcontractor..
- E. Delegated-Design Services:
1. The products and systems addressed by this specification shall be delegated design.

2. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Glazing Subcontractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.3.If criteria indicated are insufficient to perform services required, submit a written request for additional information to Architect.

F. System Requirements:

1. Vertical mullions shall be structurally reinforced with steel inserts, as required.
2. Movement that will occur in the primary building structure shall not be imposed on the glass, glazing, glazing components and gaskets. The primary building movement shall not impose unintended stresses in the glass.
3. The system shall incorporate two lines of seals (continuous primary air and water seal, secondary water seal), closure, and flashing to perimeter substrates and assemblies. Aluminum framing shall be provided with weeps to collect and drain bulk rainwater and condensation to the exterior.
4. Glazing systems shall be designed, fabricated and installed with the necessary provisions (e.g. continuous built-in gutter system) required to drain accumulated rainwater or condensation inside the system to the building exterior. Provide accessories required to complete the concealed gutter system including but not limited to seals, dams, tubes, sealants and diverters. Provide baffles as required to prevent the ingress of wind driven water as well as insects.
5. Finish of all exposed interior and exterior visible portions of extruded aluminum glazing frame members shall be custom color 3-coat PVDF coating system per AAMA 2605 to match Architect's sample.
  - a. Basis of Design: PPG Duranar XL.
6. Finish of all formed exterior aluminum sheet metals shall be custom color 3-coat PVDF coating system per AAMA 2605 to match Architect's sample.
  - a.Basis of Design: PPG Duranar XL.
7. Glass lites to be heat treated as required by load, code and or thermal effects.
8. All safety glass lites to be fully tempered (Type FT) or heat strengthened (Type HS) laminated. All fully tempered glass to be heat soak tested.
9. Integration with doors and associated hardware, including requirements for concealed door operators, hinges, and similar and necessary coordination of same with concealed flashing/waterproofing below at door thresholds. Provide all door hardware and associated devices for entrances and terrace doors.
10. Interface, movement joint, and flashing condition between the glazed system and adjacent walls, head of storefront and roof waterproofing.
11. All interface flashing conditions between primary exterior wall materials, components and systems.

G. Elements of the Work:

1. Storefronts and entrances as described above.
2. Operable vents, backpans and other assemblies occurring in the storefront system.
3. All anchors, fixings, miscellaneous steel and attachments to the primary structure and framing reinforcement except those specifically indicated as provided by other trades.

4. Exterior glass and glazing.
5. Thermally broken aluminum glazed entrances including all hardware and accessories required for a complete and operable assembly.
6. All thermal insulation attached to or within the Glazing Assembly inclusive of supports, bracketry, backing and reinforcement.
7. All firesafing insulation and smoke seals attached to the storefront assemblies including supports, backing, and reinforcements and back pans.
8. Mullion wrap fire-rated insulation at all spandrel areas.
9. Sound deadening at all horizontal surfaces.
10. All gaskets, sealants, elastomeric and metal flashing inclusive of sealing at all junctions with ground level waterproofing and building expansion joints and at all interfaces to other new and existing building envelope and waterproofing transitions.
11. End closures at all horizontal and vertical caps and projections and formed metal closures and insulated metal closure panels.
12. Finishes, protective coatings and treatments.
13. Provisions for electrical outlets and cutouts for lighting, conduits, heat tracing cable, and other electrical work.
14. Proposal drawings, data and samples.
15. Design engineering, shop drawings, calculations, engineering data and test reports.
16. Field measurements of adjacent and/or supporting construction and verification of existing conditions where feasible.
17. Scheduling and monitoring of the work.
18. Material samples.
19. On site testing of anchors and field air and water testing.
20. Coordination with the work of other trades.
21. Visual Mock-up as outlined in this section, including prototype drawings, verification of design, components, and total assembly.
22. Storage, handling, protection and cleaning prior to acceptance.
23. Guarantees, warranties and indemnities.
24. All final exterior and interior cleaning of the Glazing System."

## 1.2 RELATED REQUIREMENTS

- A. Section 01 43 39 - MOCKUPS: Requirements for exterior wall mock-up assembly requiring work of this Section.
- B. Section 01 45 29 – TESTING LABORATORY SERVICES: General construction test requirements.
- C. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- D. Section 01 73 00 - EXECUTION: Waste Management and Recycling during Final Cleaning.

- E. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
- F. Section 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS: Procedural and administrative requirements relating to required *Northeast CHPS Verified Program*, (NE-CHPS) Certification.
- G. Section 03 30 00 – CAST-IN-PLACE CONCRETE.
- H. Section 04 20 00 - UNIT MASONRY: Preparation of adjacent masonry work to receive work of this Section.
- I. Section 05 50 00 – METAL FABRICATIONS: Furnishing stainless steel sunshade support brackets for installation under this Section.
- J. Section 06 10 00 - ROUGH CARPENTRY: Wood blockings, nailers.
- K. Section 07 21 00 - THERMAL INSULATION: Perimeter vapor and air seal between storefront frame and adjacent construction.
- L. Section 07 27 13 – SELF-ADHERING SHEET AIR BARRIERS.
- M. Section 07 92 00 - JOINT SEALERS: Requirements for sealant and back-up materials.
- N. Section 08 44 13 – GLAZED ALUMINUM CURTAIN WALLS: Aluminum curtain wall construction.
- O. Section 08 71 00 - DOOR HARDWARE: Furnishing finish hardware for the work of this Section.
- P. Section 08 80 00 - GLAZING: Requirements for glass and specification of glass types used for aluminum storefront systems.
- Q. Section 28 00 00 – ELECTRONIC SAFETY AND SECURITY: Access control and intrusion detection systems to be coordinated with the work of this Section.

### 1.3 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The Work of this section shall comply with the requirements of Rhode Island State Building Code – SBC-1 (2018 International Building Code w/ RI Amendments), all referenced standards, and the following additional reference standards. All standards referenced in this Specification shall be the latest editions, including all amendments current at the date of this Document. Criteria specified herein that exceeds reference standards shall take precedence over such standard.
  - 1. The active standards and publications of the American Institute of Steel Construction (AISC), including but not limited to:
    - a. AISC 360 “Specification for Structural Steel Buildings”
    - b. AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”
  - 2. “Aluminum Design Manual” and “Aluminum Standards and Data” issued by the Aluminum Association (AA).



3. "The Code for Welding in Building Construction" issued by the American Welding Society (AWS), including but not limited to:
  - a. AWS D1.1 Structural Welding Code – Steel.
  - b. AWS D1.2 Structural Welding Code – Aluminum.
  - c. AWS D1.6 Structural Welding Code – Stainless Steel.
4. The specified active standards of the American Society for Testing and Materials (ASTM).
5. The active standards and publications of the American Architectural Manufacturers Association (AAMA), including but not limited to:
  - a. The "Voluntary Guide Specifications for Structural Glazing issued by the American Architectural Manufacturers Association (AAMA).
  - b. AAMA TIR-A9 Metal Curtain Wall Fasteners
  - c. AAMA TIR-A11 Maximum Allowable Deflection of Framing Systems for Building Cladding Components at Design Wind Loads
  - d. AAMA TIR-A1, Sound Control for Fenestration Products
6. The European Committee for Standardization (CEN):
  - a. EN 14179-1:2005 Glass in building - Heat soaked thermally toughened soda lime silicate safety glass - Part 1: Definition and description.
  - b. EN 14179-2:2005 Glass in building - Heat soaked thermally toughened soda lime silicate safety glass - Part 2: Evaluation of conformity/Product standard.
7. French Standard NF P 78-201-1/A1(DTU39) for determination of thermal stress in glass.
8. The active standards and publications of the American National Standards Institute (ANSI), including but not limited to:
  - a. ANSI Z97.1 American National Standard For Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
9. The "Glazing Manual" and the "Laminated Glass Design Guide" as published by the Glass Association of North America Glazing Manual (GANA).
10. The "Sealant, Waterproofing and Restoration Institute: Sealants: The Professional's Guide" issued by the Sealant and Waterproofing Institute (SWRI).
11. The "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use" issued by the Insulating Glass Manufacturer's Alliance (IGMA).
  - a. IGMA TM-3000 North American Glazing Guidelines for Sealed Insulating Glass for Commercial and Residential Use.
12. The "Metal Finishes Manual for Architectural and Metal Products" as published by the National Association of Architectural Metal Manufacturers (NAAMM).
13. The specified documents of the Consumer Products Safety Commission (CPSC).
14. Guidelines of the Glass Architectural Spray Coaters Association (ASCA).
15. The "Architectural Sheet Metal Manual" published by the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).

16. The hardware finish designations of the Building Hardware Manufacturers Association (BHMA).
  17. The specified documents of the National Fenestration Registration Council (NFRC):
    - a. NFRC 100 Procedure for Determining Fenestration Product U-Factors.
    - b. NFRC Simulation Manual.
  18. CPSC 16 CFR, Part 1201-03, Safety Standards for Architectural Glazing.
  19. American Society of Civil Engineers (ASCE).
    - a. ASCE 7: Minimum Design Loads for Buildings and Other Structures
  20. International Code Council (ICC)
    - a. International Building Code (IBC)
- B. Inclusion References The following reference materials are hereby made a part of this Section by reference thereto:
1. UL 752 Specifications and Ammunition, 11th Edition, Standard for Bullet Resisting Equipment published September 9, 2005, revised December 21, 2006, Level 4
- C. Sustainability Requirement Reference: The following sustainability requirements are hereby made a part of this Section by reference thereto:
1. High Performance Schools Exchange, Northeast Energy Efficiency Partnerships NE-CHPS, (referred to herein as "NE-CHPS").

#### 1.4 DRAWINGS AND SPECIFICATIONS

- A. Information on Drawings and in Specifications establishes requirements for system's aesthetic effects as well as its performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance. The drawings are a graphic representation of design intent and do not claim to fully solve movement or structural requirements, pressure equalization, waterproofing, air sealing, thermal requirements, acoustic requirements, glass movement, seismic performance or thermal shock requirements. It is the Glazing Subcontractor's responsibility to provide the final design and meet these requirements.
- B. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit details to Architect for review.
- C. Should the Glazing Subcontractor adopt the details or arrangements indicated on the Design Drawings it shall be deemed that he has checked the materials, their thicknesses, their buildability and performance in terms of this Specification, all relevant Regulations and codes of practice, and manufacturers' recommendations for any products referred to.
- D. Where dimensions are not given, the drawings must not be scaled. The matter is to be referred to the Architect, the General Contractor, the Façade Consultant and the Client's Representative.

## 1.5 PERFORMANCE REQUIREMENTS

- A. General: Provide Storefront Assembly, including anchorage, that will meet or exceed the performance requirements specified herein, capable of withstanding, without failure, the effects of the following:
1. Structural loads.
  2. Thermal movements.
  3. Movements of supporting structure indicated according to the Movement and Tolerance Report by the Structural Engineer of Record including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  4. Storefront assembly shall be weather tight and have weather tight interfaces between other exterior wall system assemblies.
  5. Dimensional tolerances of building frame and other adjacent construction.
  6. Failure includes, but is not limited to the following:
    - a. Material failures.
    - b. Deflection exceeding specified limits.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
- B. Structural Loads:
1. Systems shall be designed to withstand loads indicated according to ASCE 7 and as required by the applicable Building Code, whichever is more stringent.
    - a. Wind Loads for components and cladding: Determined according to the applicable Building Code and ASCE 7-10 per the design data and loads determined by Project's Structural Engineer:
      - 1) Basic Wind Speed ( $V_{ult}$ ): 133 mph (three second gust)
      - 2) Exposure Category: C
      - 3) Occupancy Category: III
      - 4) Importance Factor: 1.00
    - b. Snow Loads: Determined according to ASCE 7 per the design data and loads determined by Project's Structural Engineer:
      - 1) Ground Snow Load ( $P_g$ ) = 30 psf
      - 2) Flat Roof Snow Load ( $P_f$ ) = 30 psf
      - 3) Snow Exposure Factor ( $C_e$ ) = 1.0
      - 4) Thermal Factor ( $C_t$ ) = 1.0
      - 5) Snow Load Importance Factor ( $I$ ) = 1.1
    - c. Seismic loads: Determined according to ASCE 7 per the design data and loads determined by Project's Structural Engineer.
      - 1) Seismic Design Category: C, Per Structural
      - 2) Occupancy Category: III, Per Structural
      - 3) Site Class: E
      - 4) Component Importance Factor:  $I_p$ 
        - a) Glazing at egress stair enclosures: 1.5
        - b) All other Cladding and Component: 1.25

- 5) Component amplification factor,  $a_p$ : 3.0
  - 6) Component response modif. factor,  $R_p$ : 3.0
  - 2. Design Storefront Assembly to transfer wind loads to building structure.
  - 3. Design frames and connections of storefront assemblies to accommodate deflections and other building movements.
  - 4. Dead loads: Self weight of construction.
  - 5. In addition to the minimum design live loads prescribed by the applicable Building Code, glazing systems shall be designed to safely support the following live loads.
    - a. A concentrated loading of 250lbs projected over one square foot on all horizontal surfaces including skylights and framing, and projecting features, sills and canopies extending horizontally more than 8".
      - 1) A concentrated loading of 300 lbs projected over one square foot or 40psf evenly distributed load on all skylights which may be accessed for maintenance.
    - b. A line loading of 50lbs per lineal foot acting either downward or outward on all window sills, including on trim components attached at back of sills.
    - c. At locations where the façade acts as a guard, located at or near the open sides of an elevated walking surface or slab edge, that minimizes the possibility of a fall from the walking surface to a lower level:
      - 1) 50 plf at 42 inch above occupied floor surface.
      - 2) 200 lbf concentrated load applied in the direction and at location of worst effect. When applied to panel surfaces, concentrated load may be distributed over a 4 inch x 4 inch tributary area.
      - 3) These loads need not be superimposed.
    - d. A uniformly distributed load of 20 psf on all canopies.
    - e. A concentrated load of 10 lbs at any point, over a 1 inch x 1 inch tributary area, on snap-engaged components.
    - f. These live loading requirements do not need to be superimposed with each other.
  - 6. Other Loads:
    - a. Self-straining stresses or forces due to thermal gradients, thermal expansion and contraction, or other effects inherent in the design.
    - b. Dynamic loading due to operable components.
    - c. Temporary and construction loads:
      - 1) Design the glazing systems to allow for all handling and installation loads without causing overstress, permanent deflection or warping.
      - 2) No permanent deformation of panels, channel legs and the like during installation to enable panels to fit into place will be allowed on the project.
- C. Structural Performance:
- 1. When tested according to ASTM E 330 at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits
  - 2. When tested at 150 percent of positive and negative wind-load design pressures:

- a. Framing member residual deflection after pressure or load is removed shall not exceed 0.002 times distance between supports or cantilever length.
  - b. Glazing systems, including but not limited to glass, sealants, gaskets, and anchorage, shall not evidence disengagement, material failures, structural distress, or permanent deformation of any component.
- D. Deflection of Framing Members: AAMA TIR-A11
1. Deflection Normal to Wall Plane: Limited to L/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to L/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to the lesser of L/360 of clear span or 1/8", or amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension, or which reduces edge clearance between framing members and glazing or other fixed components to run or contact block, or which reduces the minimum edge clearance required to accommodate movements.
    - a. In-plane deflections of horizontal members supporting operable components shall be limited to less than 1/16 inch (1.5 mm) or L/360 whichever is less.
  3. The anticipated movement of the framing members must not exceed the movement capabilities of adjoining sealants.
  4. The movement of the framing members must not cause disengagement of applied snap covers or trim.
  5. The design of the framing members must accommodate differential movement in adjacent framing members such as might occur at jambs, parapets, unusual geometries and other similar conditions.
  6. The framing members must be able to resist any secondary bending moments resulting from axial loads acting through eccentricities caused by large deflections, such as, P-Delta effects.
  7. In order to prevent disengagement of the infill material, design of systems incorporating large infill panels must also address the center deflection of the infill panels in conjunction with the framing deflection.
- E. Glass Design
1. Comply with **material, fabrication, and quality requirements of Section 088000 "Glazing". [ADD #9]**
  2. System shall be designed for actual glass thickness, rather than nominal thickness, to ensure proper sealing of compression gaskets.
- F. Metal Panel Design (Integral to Glazed Storefront):
1. The deflection of sheet metal backpans shall be limited to 1/4 inch.
    - a. If stiffening members are required on backside of metal panel to limit deflection, stiffening members are to be separated from the storefront framing system to prevent panel curvature (oil canning) by way of thermal expansion. The stiffeners must be free to expand and contract due to changes in temperature.
- G. Resistance to progressive collapse

1. Failure of a single component should not lead to more extensive collapse of a wall or roof. The building envelope should have sufficient redundancy that in the event of failure of a component the remaining components are able to prevent collapse.
  2. The Glazing Subcontractor shall provide a risk assessment and strategy for mitigation of progressive collapse should the bottom panel of a stacked configuration fail.
- H. Falling snow and ice mitigation
1. The Glazing Subcontractor shall provide a risk assessment and strategy for mitigation of falling hazard associated with snow and ice accumulation.
- I. Air Infiltration:
1. Provide fixed glazing systems with permanent resistance to air leakage through system of not more than 0.06 cfm/sq.ft. of fixed wall area when tested according to ASTM E283 at a minimum uniform static air pressure differential of 6.24 lbf/sq.ft.
  2. Provide operable glazing systems with permanent resistance to air leakage through system of not more than 0.3 cfm per square foot of area when tested according to ASTM E283 at a minimum uniform static air pressure differential of 6.24 lbf/sq.ft.
  3. Provide entrance doors with permanent resistance to air leakage through system of not more than the following air leakage rates when tested according to ASTM E283 at a minimum uniform static air pressure differential of 1.57 lbf/sq.ft:
    - a. Double doors: 1.0 cfm per square foot of area
    - b. Single doors: 0.5 cfm per square foot of area
  4. The glazed systems, including all joints between it and other works shall be designed to prevent air flow, from the exterior surface to the interior surface, through the joints of the storefront assembly.
- J. Water Penetration Resistance:
1. Storefront Assembly: Provide fixed window glazing that do not evidence water leakage when tested according to the following:
    - a. ASTM E 331 at differential pressure of 12 lbf/sq.ft.
    - b. AAMA 501.1 under dynamic pressure of 12 lbf/sq.ft.
  2. Definition of Uncontrolled Water Penetration and Test Specimen Failure shall be as published by ASTM with the following additions:
    - a. There shall be no water penetration inboard of the air barrier plane, nor visible from the interior, and the assembly shall provide rapid drainage resulting in no retained water in cavities outboard of the air barrier. There shall be no uncontrolled water infiltrating system or migration of water into the concealed spaces of any exterior wall cavity not intended to function as a "wet zone" in the design of the above-grade building envelope. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials and finishes is not considered water leakage.
  3. Additional Requirements:

- a. The glazed assemblies, any incorporated opening lites, including all joints between it and other works shall be designed to prevent leakage of water onto the internal face of the Façade.
  - b. The glazed assemblies, any incorporated opening lites, including all joints between it and other works, shall be designed to prevent water entry into those parts of the external cladding that would be adversely affected by the presence of water.
  - c. The glazed assemblies, including any incorporated opening lites components and interfaces, shall be designed to be drained and ventilated or pressure equalized, such that any water which enters the framing system shall be drained to the exterior via an appropriately designed water management system. No traces of water are permitted at any time beyond the air seal line. The discharge of all such water shall avoid producing unsightly staining or deposits. The ventilation and drainage provision shall take into account the sloping nature of the facades without retaining water or compromising the weather performance in any way. Face sealed, barrier systems with only one line of defense against water penetration will not be acceptable.
  - d. Expansion / Movement joints must be installed to be fully engaged at all times, and is to be permanently watertight and airtight under all conditions and to operate without binding or causing noise or vibration
4. Rainwater disposal:
- a. Where necessary, the Glazing Subcontractor will be responsible for verifying the size of the drainage channels and rainwater outlets in accordance with the MEP engineer drawings and specification. The Glazing Subcontractor shall provide calculations to demonstrate that the proposed profiles and outlets can accommodate the anticipated levels of rainfall and that there are sufficient numbers of rainwater outlets for each roof area.
  - b. The Glazing Subcontractor shall submit his rainwater gutter and outlet design calculations to the Architect for review.
- K. Thermal Movements:
1. Provide glazing systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
    - a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
  2. Provide for all thermal movement to take place freely in the plane of the exterior wall system without causing harmful buckling, stress on glass, stone, metal, or joint seals, undue stress on structural elements or glass, excess loads on fasteners, reduction of performance or other detrimental effects.
  3. Full movement allowances including assembly and installation tolerances shall be incorporated into all junction/components at each expansion joint or assembly.
  4. Where necessary carry out checks in respect of the influence of thermal movement on air permeability and water penetration performances of the installation.

5. The dimensions shown on the drawings are to be based on a design temperature of 72°F. Fabrication, assembly and erection shall therefore take into account the possible thermal movements due to the ambient temperature during fabrication, assembly and installation.
  6. Shadow boxes shall be designed for an exposed surface metal temperature (including paint coating system) range of -20 deg. F to +235 deg. F. Design glass seals, gaskets, sealant, etc. to perform under these high temperatures. Seal entire shadow box back pan perimeter. Shadow box should be designed to control condensation that may form in the interstitial space and vent to the exterior. The metal back panel shall exhibit no distress (buckling or distortion) nor shall fastener failure occur as a result of temperature exposure.
- L. Energy Performance:
1. Storefront Assembly shall meet or exceed the requirements of the applicable Energy Conservation Code.
  2. Provide Storefront Assembly with performance properties specified based on test data or computer simulation and engineering with performance values in accordance with the Project Energy Model, or listed herein, whichever is more stringent.
    - a. Maximum assembly thermal transmittance [BD1] including framing (U-Value):
      - 1) Storefront Fixed Glazed Assemblies: 0.35 Btu/hr.ft<sup>2</sup>.°F in winter.
      - 2) Storefront Operable Window Assemblies: 0.36 Btu/hr.ft<sup>2</sup>.°F in winter
      - 3) Storefront Opaque Assemblies: 0.11 Btu/hr.ft<sup>2</sup>.°F in winter
      - 4) Storefront Glazed Entrance Door Assemblies: 0.60 Btu/hr.ft<sup>2</sup>.°F in winter
    - b. Solar Heat Gain Coefficient: Glazing shall have a solar heat gain coefficient no greater than the basis of design values specified in spec section 088000.
  3. Thermal conductance shall be verified by AAMA 1503-09 or NFRC 100 laboratory test or by computer simulation where achievable in accordance with NFRC guidelines. The model shall include glass panels, areas with and without insulated back-pans, typical and atypical mullion and gasket arrangements, thermal bridges, and interface conditions. Where computer simulations are used analysis shall include two dimensional analyses or where appropriate and assemblies have conditions where three-dimensional heat flow exists then three dimensional analyses shall also be performed.
- M. Condensation Resistance:
1. Condensation is defined as water, frost, or ice forming on any interior surface of any one component or water that is not collected and positively drained to the exterior through the condensation drainage gutter.
  2. The Glazing Subcontractor shall submit a Condensation Resistance Test report according to the AAMA 1503 test method for each Storefront Assembly. Or computer simulation where achievable in accordance with NFRC guidelines. The modelling shall include glass panels, areas with and without insulated back-pans and typical mullion and gasket arrangements, thermal bridges, interface conditions, and atypical details and adjacent constructions. Where required two dimensional or three dimensional heat transfer analysis shall be used.



3. The Glazing Subcontractor shall request confirmation of the boundary conditions below in writing, including but not limited to wind velocity, and exterior and interior temperature and relative humidity from the MEP Engineer.
    - a. Exterior Temp: 5°F (winter)  
89°F (summer)  
Mean wind speed: 12.3 mph
    - b. Interior Temp and Humidity: 72°F, 30% RH (winter)  
75°F, 55% RH (summer)
  4. The submitted condensation report shall be assessed by the Architect on a case by case basis. Assessment will be based but not limited to best practice principles of moisture management, location of condensation, incidence, and occurrence, and surface area of condensation.
    - a. Condensation shall be assessed case by case as specified herein. No condensation on exposed interior surfaces is allowed.
  5. Condensation Resistance within glass spandrel cavities and within insulated cavities.
    - a. The venting design of spandrel cavities shall ensure that no condensation occurs within the system cavities throughout yearly climatic conditions.
    - b. The venting design shall be proposed by Glazing Subcontractor based on the Glazing Subcontractor's proposed system and the specified requirements.
- N. Story Drift: Provide EGA systems that accommodate design displacement of adjacent stories according to the Structural Drawings by The Structural Engineer of Record.
1. Serviceability: When tested in accordance with AAMA 501.4-18 at 1.0x design wind drift, or 1.0x design elastic seismic displacement, whichever is greater:
    - a. No visible damage to framing or trim components or assemblies is allowed.
    - b. No glass breakage or glass fallout is allowed.
    - c. Full disengagement of gaskets or weatherseals is not allowed at any location.
    - d. Air infiltration and water penetration resistance shall remain within specified allowable limits without adjustment or repair.
    - e. No wall components may fall off.
  2. Ultimate: When tested in accordance with AAMA 501.4-18 at 1.5x design wind drift, or 1.0x design inelastic seismic displacement, whichever is greater:
    - a. Glass shall be retained completely in the glazed opening with no glass fallout.
    - b. No wall components may fall off.
  3. Comply with ASCE 7, Section 13.5.9 "Glass in Glazed Curtain Walls, Glazed Storefronts, and Glazed Partitions."

- O. Outdoor-Indoor Transmission Class: Provide the following minimum OITC for glazed system assemblies (frame and glass) when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332:
1. OITC 27
- P. Acoustical Performance: Storefront Assembly system shall meet and / or exceed requirements of project acoustic report, or code required minimums, whichever is more stringent. Glazing Subcontractor shall provide calculations and glass supplier testing data to verify that acoustic performance targets will be achieved. IN the absence of supplier data, the Glazing Subcontractor shall perform necessary acoustic testing to verify performance targets will be achieved.
- Q. Self Generated Noise:
1. Design and install glazing systems and all component parts to provide for noiseless movement caused by thermal expansion, and when subject to dynamic load caused by external wind pressure and in the operation of operable components. The system shall not generate noise due to creaking, drumming, or rattle.
  2. Metal to metal contact between inter-locking members is not permitted unless specifically indicated on the structural drawings.
- R. Fire Performance:
1. General:
    - a. Where required by code, exterior wall systems shall be tested in accordance with, and comply with, the acceptance criteria of NFPA285. Such testing shall be performed on the total wall systems.
  2. Surface Burning Characteristics
    - a. The Storefront Assembly shall not be composed of any materials which readily support combustion, add significantly to the fire load, and/or give off toxic fumes. Foamed core insulation and metal composite material panels are not permitted.
    - b. All materials used internally and externally shall have a Class 1 surface burning to ASTM E 84 classification. Façade/Cladding/Roof Glazing system shall have a flame spread index of not more than 25 and a smoke developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723.
  3. Fire-Resistance Ratings: Where required comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency
  4. Fire Stopping between Floors and along Mullions
    - a. The junction of the floor and the exterior façade or roofing shall preserve the integrity and insulation of compartmentation, to prevent fire spread from floor to floor.
    - b. Where required by the Design Drawings, the junction of the mullion and the partition wall shall preserve the integrity and insulation of compartmentation, to prevent fire spread between rooms or zones.

- c. Spandrel panels must be designed and anchored in a manner that keeps them in place and prevents passage of smoke, flame and hot gasses when exposed to the ASTM E 119 time-temperature curve.
- d. Materials used to complete the junctions shall accommodate movement between slab edge and cladding, and their fire resisting performance shall not be affected by water from sprinkler discharge.
- e. The Glazing Subcontractor is responsible for the provision of all horizontal cavity barriers in the facade system and for fire stopping, as specified, at the junction of the external wall with all other fire-resisting elements of the structure. Continuous smoke seal (sealant) over fire stopping is required.
- f. All fire and smoke stops shall be positively fixed in position in such a manner that they shall not become dislodged in the event of a fire. The fixing shall secure the stop in position for a period at least equal to that required for the compartment wall or floor against which the works abut.
- g. Any insulation in the external wall construction that is exposed in a ventilated cavity shall be of limited combustibility.
- h. Cavity barriers shall be incorporated into the envelope construction so as to prevent the transmission of fire or smoke through voids in the envelope assembly from bypassing any of the fire stops.

## 1.6 STRUCTURAL REQUIREMENTS

### A. General:

- 1. Except for anchors embedded in concrete and glass design, allowable stress design (ASD) and load and resistance factor design (LRFD) are acceptable.
  - a. LRFD shall be used for anchors embedded in concrete.
  - b. ASD shall be used for glass design.
- 2. Loads shall be considered in accordance with the load combinations specified by the applicable Building Code.

### B. Building Movements:

- 1. Provide moveable joints to accommodate the full range of movement requirements including manufacturing tolerances, construction tolerances, thermal movement, lateral movement, floor sag, beam sag, live load deflection, and column settlement.
- 2. Allowance for movement shall be in addition to allowance for building construction tolerances.
- 3. Joints shall accommodate the worst possible combination of erection tolerances and anticipated movements to prevent loads of any kind being transferred from the building into the glazing systems, excessive movements of any joints or failure of weather seals.
- 4. Design movement joint and select sealant products to accommodate all required expansion and contraction within joint tolerances indicated on the approved shop drawings and within the sealant movement limits recommended by the sealant manufacturer under loaded and unloaded conditions.
- 5. All movement allowances shall be consistent and applied across all junctions and/or components for each expansion joint system or assembly.

6. Basic preliminary criteria for movements including criteria for envelope of vertical deflections of building structure and span ratios for typical deflections of concrete:
- a. Floor slab deflection along perimeter:
    - 1) Due to Construction Stage:  $??[BD2]$ " maximum\*
    - 2) Due to Dead Load: 0.8" maximum\*
    - 3) Due to Service Live Load: 0.6" maximum\*

\*Special condition at long span roof and floor girders at exterior adjacent to B8 – 2.75" maximum total deflection.
  - b. Maximum horizontal inter-story differential movement (lateral drift):
    - 1) Due to 50-year wind event: H/500
      - a) Academic Level 2: 3/16"
      - b) Academic Level 3: 3/16"
      - c) Academic Level 4: 3/16"
      - d) Academic Roof: 3/16"
      - e) Performing Arts Level 2: 1/8"
      - f) Performing Arts Level 3: 1/8"
      - g) Performing Arts Roof: 1/4"
    - 2) Due to seismic event (service elastic):
      - a) Academic Level 2: 1/2"
      - b) Academic Level 3: 1/2"
      - c) Academic Level 4: 1/2"
      - d) Academic Roof: 1/2"
      - e) Performing Arts Level 2: 3/16"
      - f) Performing Arts Level 3: 3/16"
      - g) Performing Arts Roof: 1/2"
  - c. Glazing Subcontractor to confirm that creep assumptions are consistent with the construction schedule.
  - d. Displacements indicated above are preliminary and provided for reference only. Glazing Subcontractor is responsible for requesting design displacements and tolerances for each slab, and at all necessary locations along each slab edge, from the structural engineer of record (EOR), and ensuring the façade system can accommodate them.
7. Joint widths shall accommodate structural movements and tolerances, in addition to compressibility of joint filler.
8. The use of shoring, pre-loading, or other methods to limit or control building movements during installation is the responsibility of the Glazing Subcontractor. See section 1.9 Action Submittals for requirements for submittal of erection procedure and supporting calculation by Glazing Subcontractor.

C. Long Term Building Movements:

1. Design the glazing system to accommodate the absolute relative vertical deflections and horizontal movements that may occur due to panel rotations due to the following displacements occurring between successive floors:
  - a. Column and core shortening.
  - b. Beam or slab edge displacement.
  - c. Axial Shortening of edge beams.

- d. Floor to floor drift of the building due to wind and/or earthquake loads.
- D. Primary Structure Tolerance:
1. Minimum +/- 1.5 inch in all directions.
  2. Steel: AISC tolerances.
  3. Concrete: ACI tolerances.
- 1.7 ACTION SUBMITTALS
- A. General Submittals
1. Comply with Conditions of the Construction Contract and Division 1 Specification Sections.
  2. Submissions shall be complete and comprehensive and include all shop drawings, samples, material data submissions, and engineering calculations for each system specified herein, and shall include fully coordinated interface details between each system and the adjacent construction such that air/moisture barrier continuity between the materials, components and systems that comprise the above-grade building envelope can be reasonably evaluated by the Architect-of-Record against the design intent of the contract documents. All work shall be coordinated by the General Contractor prior to submission. Incomplete, non-conforming, or uncoordinated submissions shall be subject to rejection or return without action by the Architect.
  3. Analysis: All requirements specified herein shall be analytically and mathematically proven, except for those requirements called for to be proven exclusively by physical testing methods. Calculations and related data and their application in engineering, fabrication, assembly and installation shall be the responsibility of the Glazing Subcontractor's registered Professional Engineer.
- B. Shop Drawings: Shall clearly indicate but not be limited to: Show fabrication and installation of glazed aluminum, steel, and glass exterior wall systems including plans, elevations, sections, details of components, and attachments to other units of Work.
1. Shop Drawings shall clearly illustrate all aspects of the exterior wall system including the relationship of the Work to the structure, waterproofing, roofing, paving, and other adjacent construction and interface conditions; the arrangement of components; and the sequence and details of fabrication, assembly and erection.
  2. Shop drawings shall clearly identify locations of steel reinforcing within the storefront framing on building elevations.
  3. Shop drawings shall include details of all connections to contiguous work as approved by the Glazing Subcontractor for the work adjacent and as coordinated by the General Contractor.
  4. Details drawings in the shop drawings shall be full size and not scaled.
  5. Coordinate installation of anchors for glazing members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry or attached to wood.
  6. Submit full analysis and complete details of proposed cladding design movement allowances based on the base structure information contained in

the Contract Documents. Indicate all cladding design movements and required clearances to adjacent construction on shop drawings.

7. Brackets, anchors, and related components shall be scheduled and described in detail on shop drawings. Show details, including computations, of all related components and connections to areas by others.
8. Submit a schedule of fabrication tolerances for all major glazing system components. Indicate extremes of allowable base-structure tolerances on shop drawings.
9. Exposed fasteners, where approved, shall be indicated on the shop drawings.
10. Clearly indicate all revisions to shop drawings on re-submissions.
11. Shop Drawings shall clearly show internal and concealed sealant joinery. Isometrics to be provided at design team's request.
12. Signed and Sealed Engineering calculations shall be submitted concurrently with the corresponding shop drawings. Shop Drawings will not be reviewed unless this requirement has been met.
13. All shop drawing sheets shall be of one size and shall bear the seal of a Professional Engineer currently licensed in the licensing jurisdiction of the project.

C. Structural Design Calculations:

1. All structural calculation submissions shall bear the seal of a Professional Engineer currently licensed in the licensing jurisdiction of the project.
2. Submit for review by the A/E structural design calculations for all components of the glazing assemblies, including, but not limited to panels, framing, and connections. Indicate direction, location, and magnitude of all connected loads to the building structure coordinated to the building structure as shown in the Contract Documents.
3. Submittal of loads imposed on primary structure shall include location, magnitude and direction of imposed loads, graphically represented in their appropriate locations on a copy of the Contract Document structural framing plans or elevations as appropriate. Detail references indicating the connections applicable at each location shall be noted on the submittal drawings.
  - a. Where Glazing Subcontractor loads imposed exceed and/or connection conditions differ from what is shown in the structural drawings, submit for approval to Structural Engineer of Record loads imposed on the primary structural frame due to the dead, live, and wind/seismic loads indicated on the Contract Documents.
4. Calculations shall demonstrate compliance with applicable sections of the applicable Building Code and the appropriate material reference specification for each component considered.
5. Structural Sealant:
  - a. Submit certification from the sealant manufacturer that they have reviewed all sealant details and that when exposed to the specified loads the stress in the silicone sealant of dimensions shown does not exceed manufacturer's recommendations.
  - b. Engineer structural silicone glazing systems specifically for this Project. Stock or standard engineering information is not acceptable.

- D. Thermal Performance and Condensation Calculations:
1. Submit calculations and/or test data demonstrating condensation resistance of glazing assemblies.
  2. Submit calculations and/or test data demonstrating solar shading and thermal transfer values across exterior wall system assemblies.
- E. Engineering Judgement for Perimeter Fire Containment Systems:
1. Submit project-specific engineering judgement prepared by a professional engineer licensed in the Rhode Island that demonstrates the storefront assembly satisfies the specified fire resistance requirements and will be capable of providing an ASTM E 2307 compliant perimeter fire containment system.
- F. Product Data: Submit manufacturer's product data for each product included in the work, including test data, manufacturer's quality assurance documentation, and preparation and installation recommendations. Also include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
1. Include product data for:
    - a. Glass and glazing accessories.
    - b. Sealants, setting blocks, gaskets and glazing accessories, membranes, vapor barriers, including all compatibility test reports.
    - c. All proprietary accessory hardware and fasteners.
    - d. Metals and metal alloys, including welding materials.
    - e. Applied finishes, including preparation and pre-treatment, application, curing, and maintenance procedures.
    - f. Thermal and Firesafing insulation.
      - 1) For non-UL assemblies used as fire separation between floors, provide engineering judgement from manufacturer.
    - g. Smoke seals.
    - h. Grades of all bolts, nuts, washers, screws, pins, and rivets.
    - i. Submit safety glazing letter from manufacturer. Permanent etched safety label on glass shall not be permitted unless required by code. Removable sticker safety label is permitted.
    - j. Complete information, as applicable, concerning materials, dimensions, coatings, manufacturing process, and installation procedures.
    - k. The method of packaging and identifying the Glazing components shall be indicated by manufacturer. Identification shall include the evaluation report number and notice of any product installation limitations.
    - l. Any products included in the work, but not listed above.
- G. Samples: Submit samples for verification of each type of exposed finish required in manufacturer's standard U.S. sizes. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
1. Samples of production materials shall be of the following sizes:
    - a. Color samples: 12 inches x 12 inches, each color.
    - b. Finished extrusions: 12 inches in length.
    - c. Glass: comply with Section 088000 "Glazing".

- d. Finished sheet metal (aluminum): 12 inches x 12 inches, each type.
- e. Finish hardware: each type.
- f. Fastening devices, each type.
- g. Flashing (coated aluminum, stainless steel and non-metallic membranes): 12 inches x 12 inches, each type.
- h. Gaskets and joint fillers: 12 inches long, each type, 12 inches x 12 inches, each corner.
- i. Sealants: Cured sample-12 inches long, each type, with approved backer rod or similar joint back-up.
- j. Range samples shall be provided to define any visual acceptance criteria, including colors, gloss, flatness, presence of die lines, etc. All finishes of extrusions to be from hardened dies. Min 12 inches long.
  - 1) All Aluminum Painted Finishes.

## 1.8 INFORMATIONAL SUBMITTALS

### A. Certificates:

- 1. Submit product and installer certificates signed by the respective manufacturers certifying that all materials of the glazing systems comply with fabrication, erection, approved shop drawings, structural computations and specified requirements.
- 2. Submit all shop drawings to the following manufacturers for their review and provide written confirmation from them that the manufacturer's products are appropriate for the proposed use and are being used in accordance with the manufacturer's recommendations.
  - a. Glass
  - b. Sealants
- 3. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.
- 4. Submit written certification that welded anchors have been designed and tested and will comply with specified performance requirements.
- 5. Submit welder certificates indicating that welders have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.
- 6. Submit installer certificates signed by manufacturer certifying that installers comply with requirements in "Quality Assurance" Article.

### B. Product Test Reports:

- 1. For each glazing system, submit test reports from the approved independent testing laboratory showing compliance of the individual components and parts of each glazing system with the performance requirements indicated. Test reports to be within 10 years and without changes to the system specified.
- 2. Test reports shall be submitted in a timely manner and well before execution of any related component of the storefront system.
- 3. Test Reports shall include:



- a. Glazing.
  - b. Fasteners, bolts (each size, length, and type), nuts, washers, and hardware, including manufacturer's certification of conformance for each and every lot. When requested by Engineer, submit samples to Testing Agency for testing prior to start of any work or delivery of materials to job site or stockyards.
  - c. Expansion anchors.
  - d. Mechanical fasteners.
  - e. Miscellaneous structural clips and accessories.
4. Materials Testing Reports:
- a. Sealants: Comply with Section 079200 "Joint Sealants".
  - b. Staining: Include ASTM C1248 stain response testing for sealant and primers in direct contact with natural stone, concrete, or wood.
  - c. Structural silicone: Provide Project specific adhesion testing. Stock or standard testing is not acceptable. Test each material to which structural silicone is adhered.
- C. Submit Manufacturers' Quality Assurance Inspection and Production Testing Programs.
1. Inspection and production testing programs are subject to the Owner's Representative's approval.
  2. Submit detailed description of inspection and production testing programs and inspection reports for:
    - a. Shop fabricated glazed steel and aluminum exterior wall and assemblies.
    - b. Insulating glass units fabrication.
    - c. Structural silicone glazing.
    - d. Organic coatings.
    - e. Mill reports for structural steel.
- D. Installation Procedures Manual:
1. Submit a comprehensive manual containing all installation procedures, equipment and personnel required for acceptance prior to the commencement of installation works. Comply with requirements in "Quality Assurance" Article.
  2. The Glazing Subcontractor shall submit an erection procedure, prepared under the supervision of the Glazing Subcontractor's Engineer for review. This procedure should consider any shoring, pre-loading, or other temporary means necessary for the sequence of installation of the Storefront Assemblies and related scope of work including compatibility of any loads applied to the primary structure because of these temporary means. The erection procedure and supporting calculations shall be submitted for review and shall bear the seal of a Professional Engineer currently licensed in the licensing jurisdiction of the project.
- E. As-Built Record Shop Drawings and Documents:
1. Submit final approved shop drawings and BIM models in electronic format.
  2. Prepare as-built drawings, photographs and other records progressively as the work proceeds.

3. Record Shop Drawings: At the completion of the project, submit electronic copies of all final approved shop drawings prepared under the supervision of and signed and sealed by the Professional Engineer currently licensed in the licensing jurisdiction of the project.
- F. Operation and Maintenance Manual: At the completion of the project, submit electronic copy of a maintenance manual describing the various materials, equipment and procedures for cleaning and maintaining the work of this Section. Include the manufacturer's data for all components of each glazing system and type, with supplier/source and contact information included for future reference. Clearly provide replacement procedures, replacement components and methods of replacement of damaged components of glazed steel and aluminum exterior wall systems to ensure full service capability of the work. Include copies of glazing systems guarantees and warranties.
- G. Sustainable Design Submittals: As required by NE CHPS.

#### 1.9 QUALITY ASSURANCE

- A. The work of this section shall be performed by a company which specializes in the type of Storefront work and Design Assist process required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.
  1. Work shall be performed in compliance with Owner's insurance underwriters' requirements and UL approvals and testing for materials, assemblies, and procedures.
- B. Manufacturer shall specialize in manufacturing the type of glazed systems specified in this section, with a minimum of 10 years of documented successful experience, and have the facilities capable of meeting all requirements of Contract Documents as a single-source responsibility and warranty.
- C. The Work of this Section shall be the responsibility of one Subcontractor.
- D. The Glazing Subcontractor for the Work of this Section shall have proven achievement and experience in similar work and is subject to approval by the Architect.
- E. Manufacturers and suppliers of all materials and components of the Work of this Section are subject to approval by the Architect.
- F. All products and individual or aggregate components of the Storefront Assembly for which acceptable engineering or test data are not available shall be physically tested.
- G. Engineering services are defined as those performed for the design and installation of all exterior glazing systems and types specified herein or otherwise included in the contract documents for this project.
  1. Engineering Responsibility: Engage a qualified Professional Engineer currently licensed in the licensing jurisdiction of the project to prepare, or supervise the preparation of, drawings, calculations, and data for the Work of this Section to include a comprehensive engineering analysis that demonstrates full compliance requirements of the contract documents.
  2. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

- H. Source Limitations: Obtain each type of exterior glazing system from one source, and by a single manufacturer.
- I. Source Limitations for Glass: Obtain glass from single source from single manufacturer and single plant for each glass type.
- J. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- K. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings". Meeting shall include General Contractor, Owner, Architect, Glazing Subcontractor, Sealant Subcontractor, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the storefront work. Review methods and procedures related to glazed aluminum exterior wall system including, but not limited to, the following:
  - 1. Review and discuss condition of substrate and other preparatory work performed by other trades.
  - 2. Review erection procedure prepared by Glazing Subcontractor and discuss coordination of procedure with previously installed scope of work.
  - 3. Review structural loading limitations.
  - 4. Review and discuss the sequence of work required to construct a watertight and weather tight exterior building envelope.
  - 5. Review and finalize construction schedule and verify availability of materials, Glazing Subcontractor's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 6. Review required inspecting, testing, and certifying procedures and coordinate with installation schedule and work of individual trades to avoid delays in the Work.
  - 7. Review weather and forecasted weather conditions, and procedures established to mitigate the impact of unfavorable weather conditions on the quality and progress of the Work.
- L. Prior to the start of fabrication, the Glazing Subcontractor shall submit a comprehensive Quality Control Program covering all phases of the exterior wall system including, but not necessarily limited to, the following:
  - 1. Procurement of materials including quality control programs of major suppliers.
  - 2. Verification of compliance with International Standards Organization (ISO) or similar agency authorized or otherwise qualified and accredited to provide periodic, independent review and certification of each supplier/manufacturer's Quality Assurance program.
  - 3. Fabrication of components, to include milestone inspections and written certification that components and finishes meet or exceed the requirements of the contract documents and recognized industry standards specified herein, and that pre-finished components and parts are free of any visible scratches, gouges, dents, blemishes and similar damage considered by the Architect to be unacceptable for the project.
  - 4. Final assembly of components, to include milestone inspections and written certification that internal end-dams, zone-dams, and critical seals have been

- installed in accordance with the contract documents and recognized industry standards specified herein.
5. Installation and site quality control, to include a sample of the intended Field Report format and intended method to track or otherwise monitor and correct all non-conforming work in a manner that is consistent with the requirements of the contract documents, and available on site for review and independent verification by the Architect and Owner.
  6. Periodic, in-house evaluation and performance testing of completed systems and assemblies to verify compliance of glazing systems and assemblies during production, prior to shipment to project site.
  7. The QC Programs submitted by each of the Glazing Subcontractors, suppliers, manufacturers shall be included by the GC/CM into a comprehensive and fully integrated, project-specific Building Envelope Quality Assurance Program.
  8. The submittal shall include the identification of a single, qualified Quality Assurance Manager representing the GC/CM who will be in responsible charge of developing and administering the Building Envelope Quality Assurance Program (BEQAP) throughout the duration of the project.
  9. The BEQAP shall be subject to review and approval by the Architect, Owner, and Owner's building envelope technical representative.
  10. The Architect and Owner shall be allowed access to the Glazing Subcontractor's facilities and those of the major suppliers and subcontractors to monitor QC procedures. The Glazing Subcontractor shall make available to the Owner and the Architect all QC Program records upon request.
- M. The Certification Entities shall be accredited as operating in compliance with International Standards Organization (ISO) or similar agency authorized or otherwise qualified and accredited to provide periodic, independent review and certification of each Certification Agency's Quality Assurance program.
- N. Production testing programs for coatings and finishes:
1. AAMA 2605 for Coatings.
- O. NAAMM /NOMMA 500-06, Metal Finishes Manual for Architectural and Metal Products for fabrication and finishing of stainless steel. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- P. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- Q. AAMA QAG 1 Quality Assurance Processing Guide or equal for poured, de-bridged, and crimped thermal breaks.
- R. Manufacturer Qualifications: A manufacturer capable of fabricating glazed steel and aluminum exterior walls that meet or exceed performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.
- S. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

- T. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project and certified under the National Glass Association's Certified Glass Installer Program.
  - U. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
  - V. AISC "Code of Standard Practice," latest edition, Section 10 as amended herein.
  - W. Welding Qualifications: Qualify procedures and personnel according to the following:
    - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel".
    - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum".
    - 3. AWS D1.6/D1.6M, "Structural Welding Code – Stainless Steel".
  - X. Independent Inspections: General Contractor shall employ Independent Agent to perform Independent Inspections for, including but not limited to, field welds, shop welds, bolts, and anchors as specified in General Conditions Division 01.
  - Y. Manufacturer's identification tags or marks are not acceptable on surfaces which will remain exposed to view after installation.
    - 1. Evidence of "patching" after removal of tags or marks is not acceptable.
- 1.10 MOCK-UP
- A. Provide mock-up elements for field panel in accordance with Section 01 43 39 – MOCKUPS at exterior location where directed by Architect. Mock-up will demonstrate quality of work, construction methods, relationship to other work.
- 1.11 PRE-INSTALLATION CONFERENCE
- A. Installer of the Work of this Section is required to attend pre-installation conference specified under Section 04 20 00 - UNIT MASONRY.
- 1.12 DELIVERY, STORAGE AND HANDLING
- A. Comply with General Conditions and Division 1 Section "Product Requirements".
  - B. Deliver glazing systems and components complete with factory applied protections, removable labeling, and packaging to comply with manufacturer/fabricator's requirements and adequately protected from damage during shipment.
  - C. Protect glazing systems and components from adverse job conditions before, during, and after installation, including but not limited to:
    - 1. Condensation, temperature changes, direct exposure to sun, or other causes that could otherwise damage the assemblies.
    - 2. The work of other trades before, during, and after installation (e.g. weld slag, concrete spray, run-down staining/etching of aluminum and glass surfaces and similar).
    - 3. Adhere to insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.
  - D. Storage:

1. Coordinate storage requirements and logistics with the General Contractor before shipping materials.
  2. Components shall be stored on elevated platforms, skids, or pallets; covered with tarpaulins or other suitable weather-tight covering. Covering material shall allow for air circulation about the components. Store panel components so that water accumulation drains freely.
  3. Neatly stack (in a manner that will not affect the components) system assemblies in locations designated by the General Contractor. Isolate panel assemblies at all contact points; store assemblies to prevent permanent damage, deformation, and similar distress.
  4. Do not store system materials in contact with other materials that might cause scratching, gouging, staining, and etching of aluminum and glass surfaces, denting, surface damage, or other deleterious effect.
- E. Handling:
1. Take into account the restrictions imposed on the delivery of pre-fabricated elements by the existing building's dimensions and site access.
  2. Care shall be exercised to properly brace and reinforce prefabricated assemblies against racking during hoisting and installation.
- F. Field Measurements: Verify actual locations of structural supports for glazed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum storefront systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.
- G. Sequencing: Coordinate the storefront fabrication and installation with the General Contractor / Construction Manager and the Air Barrier Subcontractor sequence to ensure that the air barrier tie-in shown on the drawings is achieved. Work with the General Contractor to represent proper sequencing on Construction Schedule.
1. Do not order or deliver any materials until all submittals, required hereunder, have been received and approved by the Architect.
  2. Arrange keying, and schedule delivery of keys, with Owner.

### 1.13 WARRANTY

- A. Comply with Section 01 78 00 - CLOSEOUT SUBMITTALS, and in compliance with Section 01 78 36 – WARRANTIES. The more stringent requirements of the contract documents shall apply.
- B. Installer's Warranty:
1. Provide a warranty for materials and workmanship of the Exterior Glazed Assemblies Contract from Date of Completion for a period of ten (10) years (the "warranty period"). Provide all manufacturer's pass through warranties. Also provide a warranty to cover all the costs of materials, labor, and equipment to remove any defective components of the glazing systems and replace them.

2. This warranty shall also cover the costs associated with removing and replacing internal finishes trims and services so that remedial works can be carried out. The content of each warranty is to be approved by the Architect.
- C. Manufacturer's Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of a glazed exterior envelope system that fail in materials or workmanship within the specified warranty period, at no cost to the Owner.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration caused by design loads, thermal or other movements.
    - c. Thermal stresses transferring to building structure.
    - d. Failure of system to meet performance requirements.
    - e. Failure of operating components to function normally.
    - f. Loosening or weakening of fasteners, attachments, hardware, and other components.
    - g. Water leakage.
    - h. Failure of glazing due to non-impact breakage including breakage due to Nickel Sulfide, thermal stress, or any other non-impact breakage.
    - i. Failure of insulating glass edge seal as evidenced by frost, condensation, water, dust, corrosion, haloing or low-e coating damage within sealed air space.
    - j. Insulating glass spacer migration.
    - k. De-lamination or discoloration of laminated glass or panels.
    - l. Cracking, pitting, or discoloration of glass decorative and low-e coatings.
    - m. Deterioration, fading, excessive non-uniformity, pitting, cracking, peeling, crazing or discoloration of finishes and other materials beyond normal weathering.
    - n. Loss of effective glass bite due to shifting of glass or loss of effective glass bearing of setting blocks due to shifting of glass and/or blocks.
    - o. Adhesive or cohesive sealant failures or crazing/ bulging on surface of sealant.
    - p. Gaskets or weather strips hardening, discoloration, or disengagement.
    - q. Collapse, slumping or loosening of support of thermal insulation or fire safing insulation.
  2. Warranty Period: Ten (10) years from date of Substantial Completion.
- D. High Performance Organic Coatings: Submit a warranty for a period as listed below, warranting the integrity of film and permanence of color of the high performance organic coatings for the following:
1. Color fade not to exceed 5 delta E units (Hunter) as calculated in accordance with ASTM D 2244 on exposed surfaces cleaned with clean water and a soft cloth.
  2. Degree of chalking not to exceed rating No. 8 when measured in accordance with ASTM D 4214 on exposed unwashed surfaces.
  3. Will not crack, check, or peel.
  4. Warranty Period for Exterior Coatings systems for Metal: 20 years

5. Warranty Period for Interior Coatings systems for Metal: 5 years

E. Material Manufacturer’s Guarantee:

1. Submit written guarantee signed by the respective manufacturer agreeing to furnish replacements for those glass units, finishes, or components that deteriorate from the point of manufacture, during shipping, during storage on site and in the installed condition, within specified period indicated below. Guarantee covers only deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to glass manufacturer’s published instructions. Guarantee for Structural Silicone and Weather-Sealant shall include full material costs for failure incurred.
  - a. Glass: Comply with 088000 “Glazing”
  - b. Weather-Sealant: 20 years
  - c. Aluminum Panels: 10 years
2. Warranty does not include damage caused by vandalism, or natural conditions exceeding the performance requirements.

F. Owner’s Rights:

1. The Guarantees submitted under this section shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other guarantees made by the Glazing Subcontractor under requirements of the Contract Documents.
2. Inspections Upon and After Substantial Completion: Owner’s Inspecting Agent (Agent) shall inspect entire system at six months and twelve months after the date of Substantial Completion and provide a written report to the Contractor and Architect. Systems will be evaluated during actual wind-driven rain events at the discretion of the Agent. Glazing Subcontractor shall promptly replace defective work.

1.14 ATTIC STOCK

- A. At the completion of the project, provide the following attic stock:
  1. A minimum of one percent, but not less than two lites, of each typical size for each glass type. Total amount of required attic stock to be determined by Owner.
  2. Attic stock is intended for use in the event of damage after completion of the project and shall not be used to replace materials damaged during construction.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Basis of Design: To establish a standard of quality, design and function desired, Drawings and specifications have been based on the following products by **the following: Armortex, Inc., Schertz, TX: Insulgard Security Products, Brighton, MI. [ADD #9]**
  1. **Framing System: Insulgard, product "HP600."**
  2. **Door System: Insulgard, product "HP500."**
  3. **Glass type F : Insulgard, product "Armor-Gard BALULN32IG."**



**4. Glass type 7 : Insulgard, product "Armor-Gard BALULN32."**

- ~~1. Framing System: Armortex, product "TH600."~~
- ~~2. Door System: Armortex, product "HP500."~~
- ~~3. Passive voice device: Armortex, product "SP-CS-NV-06."~~

B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:

1. Armortex, Inc., Schertz, TX.
- 2. Insulgard Security Products, Brighton, MI.**
- 3. Total Security Systems (TSS), Fowlerville, MI.**

## 2.2 DESCRIPTION

- A. The Glazing Subcontractor shall engineer, test, fabricate, deliver, install, and warranty all construction necessary to provide all Storefront Assembly systems including all measures that may be required to that end, notwithstanding any omissions or inadequacies of the Contract Documents. The work of this Section shall include all materials, components and systems necessary and incidental to the weather-tight installation.
- B. General Description: Bullet Resistant Aluminum Curtainwall Framing System: flush-glazed, outside glazed, stick fabricated system. Vertical and horizontal framing members shall be of shear block construction.
- C. Ballistic Protection Requirements Performance Criteria:
1. Frame: Ballistic Level 5, tested to UL 752.
  2. Doors: Ballistic Level 5, tested to UL 752.
  3. Glazing: Ballistic Level 5, tested to UL 752.
  4. GSA P-100, Classifications C Blast Resistant.
  5. FEMA 361 – Safe Rooms for Tornadoes and Hurricanes.
- D. Door Hardware: **[ADD #9]**
- ~~1. SL 11 HD continuous hinge.~~
  - ~~2. Adams Rite MS1850, Lock.~~
  - ~~3.1. Manufacturer's standard 9 inch pull handle and push bar.~~
  - ~~2. LCN 4000 series closer.~~
  - 3. Hinges: Select SL-11HD continuous aluminum gear hinge.**
  - 4. Deadlock: Adams Rite MS1850 deadlock.**
  - 5. Thumb Turn: Adams Rite 4510 Series mortise thumb turn.**
  - 6. Keyed Mortise Cylinder: Adams Rite 4510 Series.**
  - 7. Door Pull and Push Bar: Manufacturer's standard 9" aluminum pull handle and door width push bar as selected by Architect from manufacturer's standard options.**
  - 8. Door Closer: LCN 400 series Heavy Duty.**
  - 9. Additional Door Hardware including exit devices, electric strike plate, and custom security hardware, as selected by Architect from manufacturer's standard options.**

- E. Bullet resistant two way communication speaker/microphone: Natural voice speak Thru provide voice transmission along with security for 4 inch to 6 inch diameter hole with 7 inch stainless steel face plates secured from the safe side to avoid tampering from exterior. Provide painted ballistic steel to provided protection level required to match storefront system.

## 2.3 GLASS AND GLAZING

- A. Glass and Glazing: Comply with **glass and glazing material and performance requirements of Section 088000 "Glazing", in addition to glass criteria specified herein- [ADD #9].**
- B. **Bullet Resistant glass types provided under this Section 08 43 15. [ADD \$9]**
1. **General:**
    - a. **Specified bullet resistant glass types are proprietary based on performance requirements of project, and compatibility with other glass types. The specified products establish standards of quality, design and function desired,**
    - b. **Other manufacturers will be considered for acceptance per the following:**
      - 1) **Contractor must provide appropriate product data with bid for the Architect to consider the substitutions as "equal" to the manufacturer and product specified. Submit supporting technical literature, samples, drawings and performance data in order for Architect/Engineer to make a valid comparison of the products involved. Test reports certified by an independent test laboratory must be included.**
      - 2) **Contractor must include unit prices showing deduct costs for recommended substitutions which are a lesser cost than furnishing and installing the specified manufacturer and product.**
      - 3) **Requesting substitutions for the products specified herein is at the Contractor's own risk, with regard to uncompensated delays of the Project. Time is required for sufficient review and additional requests for information. Delays of work which result from substitution reviews and resubmissions are not grounds for additional time or cost change orders, and will not be considered by the Awarding Authority.**
  2. **Glass Type F:- Bullet Resistant Insulating Glazing Glazing shall be UL Listed Level 5 per UL 752, at exterior exposure locations. [ADD \$9]**
  - ~~A-3. Glass Type 7:- **Bullet Resistant Glazing** Glazing shall be UL Listed Level 5 per UL 752, Laminated glass with PVB interlayers, at interior locations. [ADD \$9]~~
  - ~~4. **Clear Laminated Glass:- Consisting of multiple plies of glass and PVB interlayers. [ADD \$9]**~~

## 2.4 ALUMINUM

- A. Aluminum Extrusions: ASTM B221, Provide extrusions of the alloy, temper, and thickness recommended by the manufacturer to comply with the following:
1. Alloy 6063-T6, 6063-T5, or 6061-T6, tempered as required by calculations.
    - a. Extrusions (anodic finish): 6063 T5 or T6, ASTM B221.

- b. Extrusions (painted or conversion coat finish): 6063-T5 or T6, 6061-T6, ASTM B221.
  2. Dimensional tolerances for all aluminum extrusions regarding thickness, straightness, twisting and flatness shall be held to better than one-half of those published under Sections 11 and 12 of the Aluminum Association's Publication No. 1 "Aluminum Standards and Data" wherever possible.
  3. Minimum Wall Thickness for Primary (Structural) Extrusions: As required to satisfy the performance requirements inclusive of deflections and stress but not less than 0.09 inch.
  4. Minimum Wall Thickness for Trim (Non-Structural) Extrusions: As determined relative to die size:
    - a. For dies less than 4 inches in diameter; 0.062 inches.
    - b. For dies 4 inches to 6 inches in diameter; 0.080 inches.
    - c. For dies greater than 6 inches in diameter; 0.093 inches.
  5. Extrusion tempers shall be as recommended by the producer and fabricator based on the end-use and requirements for the component part.
  6. Welding of aluminum alloys shall be in accordance with the Aluminum Design Manual and AWS D1.2 Structural Welding Code - Aluminum.
- B. Aluminum Sheets and Plates: ASTM B209, Alloy 3003-H14 for paint finish, and AA5005-H34 for anodized finish. Sizes and minimum gauges as shown or specified, or as required to provide adequate structural characteristics and suitable for forming and finishing as specified. Dimensional tolerances for aluminum sheet shall be held to better than those published under applicable AA Standards and Data.
1. Minimum Gauges for Sheet Fabrication of Components:
    - a. Exposed Panels, Typical: 0.125" (3mm).
  2. All sheet for exposed or semi-exposed applications is to be provided annealed to relieve work hardening stress prior to fabrication.
  3. Metal panels shall follow the profiles indicated on the Contract Documents.
  4. Panels shall be fabricated to ensure that the grain of all contiguous panels is oriented in the same direction upon installation.
  5. Prior to installation the finished panels shall be laid out and viewed under a uniform daylight source and reviewed for uniformity in color and tonality.
  6. Panel support construction shall result in a panel visual flatness acceptable to the Architect.
  7. Extruded aluminum stiffeners or any alternate panel stiffening devices shall be designed to prevent 'telegraphing' of the stiffening device on the exposed face of the panel.
- C. Fasteners: As required by design and calculations with specific torque values identified in the shop drawings where required.
- D. Non-conductive spacers: (except at bolted slip-joints): Non-corrosive gaskets shall provide a barrier to prevent galvanic corrosion between dissimilar metals. Gaskets shall contain temperature and moisture properties as required to suit specified performance criteria.

- E. Slide Bearings (At slip-joints in exterior wall): Wherever materials are subject by engineering design to movement, provide suitable low friction material(s) such as:
1. Polytetrafluoroethylene fluoropolymer: ASTM D4894, Teflon as manufactured by Dupont or equal.
  2. Acetal homopolymer: ASTM D6100, Delrin as manufactured by Dupont or equal.
  3. Nylon: ASTM D4066.
  4. Low-friction materials shall be dimensionally-stable, impact-resistant and impervious to moisture.
  5. Mating surfaces: PTFE/AHP and PTFE/AHP or PTFE/AHP and mirror finish stainless steel.

## 2.5 MILD (FERROUS) STEEL

### A. General:

1. The Work of this Section shall include the design, supply, fabrication, surface treatment, storage, delivery, and erection of all the exterior wall support steelwork (typically not shown or shown for reference only on the Contract Documents). This also includes the supply and installation of all anchors used to support the steelwork, the grouting of base plates, the provision of cleats and drilling of holes for the attachment of the glazing system, and repairs to damaged surfaces during construction.
2. All visible steel components including but not limited to mullions, anchors, plates, bars, and shapes shall be installed and fabricated to AESS requirements prescribed herein.
  - a. Steel framing shall be straight and true with allowable dimensional tolerances one half of those permitted under ASTM A6 for shapes and bars.
  - b. Steel framing shall be straight and true with allowable dimensional tolerances one quarter of those permitted under ASTM A6 for plates.
3. Steel Plates, Shapes, and Bars: ASTM A36 or ASTM A992.
4. Cold Formed Hollow Structural Sections: ASTM A500.
5. Steel Pipe: ASTM A53.
6. Hot and cold rolled finished bars: ASTM A108.
7. Steel Sheet, Cold Rolled: ASTM A1008.
8. Steel castings: ASTM A27 or ASTM A148.
9. Coordinate and provide holes in members as required by the Work of other trades or contracts. All holes shall be accurately drilled or punched in the factory. Holes that must be enlarged shall be reamed. Holes for the attachment of work by others shall be coordinated for factory preparation. Holes shall be drilled or punched at right angles to the surface of the metal, in accordance with AISC Specification. Holes shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges. Outside burrs resulting from drilling operations shall be removed with a suitable tool. The use of manual gas-cutting in the shop may be used only if automatic or semi-automatic methods are not possible. The use of manual gas cutting torch in the field will not be permitted without the specific approval of the Engineer.

10. Members shall be supplied in a single stock length. Splicing of members is not permitted unless it is shown on the Contract Drawings, or it has been approved in writing from the Architect.

B. Structural Steel Hardware and Fittings:

1. Connectors:
  - a. Nuts and Bolts: ASTM A307 Grade A, A325 Type 1, and shall be the regular hexagon-bolt type. Hex head nuts, ASTM A 563. Round washers shall conform to ASTM F436. Washers in contact with high-strength bolt heads and nuts shall be hardened in accordance with ASTM Standard A325 and AISC requirements. Beveled washers shall be square, smooth and sloped so that contact surfaces with the bolt head and nut are parallel.
  - b. Carbon steel connectors shall be permitted for use at the interior side of the air seal only and must be plated, hot dip or mechanically galvanized, or polymer coated to provide protection against corrosion.
2. Metal Fittings: ASTM A36, Fabricated of machined and welded materials ground smooth and finished to visual uniformity. Finish as noted on the contract documents.
3. Stainless Steel Fasteners, Bolts, Nuts, and Washers:
  - a. Stainless steel bolts and nuts shall comply with ASTM F593 and F594, series 300, non-magnetic.
  - b. Stainless steel washers shall comply with ASTM A276, Grade 316.
  - c. All fasteners located to the exterior side of the air seal shall be stainless steel, series 300 non-magnetic.
4. Studs: Shear studs shall be Nelson Studs or approved equivalent welded to the structural steel in accordance with manufacturer requirements.
5. Concrete Anchors:
  - a. Mechanical masonry anchors are to be Hilti HSL or Ramset Trubolts, or Power Wedge Bolts. Chemical anchors are to be Hilti HVA or Ramset Chemset Injection anchors. All anchors are to be installed in accordance with the manufacturer's requirements. The Glazing Subcontractor is responsible for confirming that all edge distance, spacing, and embedment requirements are satisfied.
  - b. The Glazing Subcontractor shall be responsible for ensuring that where concrete anchors clash with reinforcement, there is an alternative anchor set out that satisfies the design requirements. Slotting of holes and flame cutting are not permitted. Holes in the concrete are to be repaired by dry packing with a 6000psi cementitious non-shrink grout.
6. Connectors, bolts, and fasteners shall be tested in accordance with ASTM F606.
7. Fasteners subject to vibration, primarily wind induced, can loosen over time. Prevention of loosening shall be achieved through use of lock washers or other locking anchor systems that shall prevent loosening of fasteners.
8. Epoxy or resin bonded anchors: not permitted for use in permanent tension without approval by the Architect. General Contractor shall employ Independent Agent to perform Independent Inspections and tests for all such anchors specified in General Conditions Division 01.

- C. Welding:
1. Welding of carbon steel shall be in accordance with AWS D1.1 Structural Welding Code - Steel.
  2. Method and Type of welding indicated on the Contract Drawings or the approved shop drawings shall be electric arc welding and shall comply in all respects with the codes and Specifications herein noted covering the Specifications for design, fabrication, and inspection of welded structures and the qualifications of welders and supervisors.
  3. The head, input, length of weld, and sequence of weld and cooling process shall be controlled to prevent distortions. For welds comprised of plates in more than one plane, and of configuration that could cause restraint to uniform cooling of the weld, take precautions. Use stress relieving techniques where necessary. Each welder shall mark his identification symbol on his work. Welds found deficient in dimensions but not in quality may be enlarged by additional welding, or removed by chipping or melting and remade if deficient.
  4. Tack welds: May only be used with express approval. Tack welds to be minimum 2" long.
  5. Butt welds: Shall be full penetration welds between prepared fusion faces, unless otherwise specified. Carry out back chipping, grinding or gouging of the deposited weld as required to obviate imperfections in the root run. Grind butt welds flush without loss of parent metal.
  6. Fillet welds: Deposit fillet welds to the required length, throat thickness and with partial or full penetration as specified.
  7. Temporary attachment: Do not weld temporary attachments to principle joints. Obtain approval of the position of welds for temporary attachments.
- D. Grout for Base Plates: Grout for member base plates shall be proprietary type cementitious non-shrink grout with a minimum compressive strength of 6000 psi. Data sheets, installation procedures and other supporting information for flowing and dry pack grout are to be submitted to the Architect for written acceptance before use.

## 2.6 BRACKETS AND ANCHORS

- A. General:
1. Anchors and connections that are engineered for movement shall include suitable low friction materials specified in this section, as or recommend by the manufacturer.
  2. All components are to be designed for the maximum tolerance of the system relative to the base structure, including but not limited to those referenced in Section "Building Movements", and due consideration shall be given to additional forces from prying action and bolt group effects.
  3. Connections between different materials, or different alloys of the same metal, shall be engineered to accommodate the differential thermal movement of the materials to be connected.
  4. Design fixing brackets for the worst possible panel eccentricity, packing location, and uneven load sharing. Include prying effects on bolt groups.
  5. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

6. Do not use explosive shot fired devices unless approved in writing before commencing installation.

B. Brackets:

1. There shall be no direct fastening or close contact between any part of the glazing systems and the base structure or interior construction, except through approved bracket connections.
2. Design and install brackets so that all glazing system loads are transmitted through brackets to the base building structure, and prevent transfer of loads to adjacent panels unless specifically designed to do so.
3. Brackets shall be designed to provide three-dimensional adjustment and accurate location of the work, and be rigidly fastened after the work is finally positioned within the specified erection tolerances.

C. Anchors:

1. Provide all required anchors to attach glazing systems to the base structure which:
  - a. Are compatible with the bracket assembly and together provide three-way adjustment to accommodate fabrication and construction tolerances.
  - b. Secure the glass wall system in its correct position providing for building and glazing system movements.
  - c. Are structurally adequate to carry the design loads for the worst possible bracket positioning.
  - d. Provide anchor adjustment capability for full range of specified tolerances for building structure, but not less than one inch in all directions.
2. Base Building Substrates: Provide contingency design and installation procedures for all typical substrate conditions and deficiencies including:
  - a. Reinforcement clash.
  - b. Excessive out-of-tolerance concrete and stone.
  - c. Clash with other structural details.
  - d. Mislocated, missed and incorrect embeds and epoxy anchors.

## 2.7 GASKETS/WEATHERSTRIPPING

- A. Where gaskets combine to form a continuous seal around all four edges of the lite or panel, all corners and abutted ends of weather stripping gaskets shall be vulcanized, heat-welded, or injection molded to form a positive seal.
- B. All material shall be non-staining, UV stabilized and ozone-resistant.
- C. All gaskets other than in glazing are to be silicone or silicone compatible EPDM. All gaskets shall have continuous mechanical engagement to framing members; adhesive attachment is not acceptable. All gaskets shall be continuous and contiguous.
  1. Silicone or silicone compatible EPDM gaskets shall meet ASTM C509, Option 2, Type 2 for soft gaskets, and ASTM C864 for dense gaskets.
  2. Silicone compatible EPDM gaskets shall meet ASTM C864 for dense gaskets.
  3. Silicone gaskets shall be profiled to form a positive seal, ASTM C 1115.

4. Silicone Glazing Spacers shall be custom profiled, gray silicone to form a positive seal, ASTM C 1115, Type C (70 ±5 Shore A Durometer). Color to match IGU seals.

## 2.8 SEALANTS (WEATHERSEAL)

- A. Comply with Section 079200 "Joint Sealants".
- B. All joints, which are sealed with sealant as part of the fabrication or erection procedure, shall be sealed with silicone (exposed or concealed) sealant in color to match the adjoining surfaces or as required by the Architect. All perimeter sealant (metal to adjacent construction) shall be low or medium modulus silicone sealant.
- C. Seals to air barrier and membrane wall materials medium modulus silicone complying with ASTM C920 as recommended by the sealant and air barrier manufacturer. The sealant shall be designed for adhering to low energy surfaces common in sheet or peel and stick weather resistant barriers. Compatibility and adhesion of sealants with air barrier materials shall be demonstrated by the sealant and membrane manufacturers, based on testing and shall be submitted in writing. Test procedure shall be as indicated below and as specified herein.
  1. Adhesion: ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
  2. Compatibility: ASTM C1087 Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- D. Sealants shall have a VOC content of 250 g/L or less.
- E. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers".
- F. Care shall be exercised to insure against "Three Surface Adhesion". Bond breakers shall be provided.
  1. Comply with ASTM C 1193 Standard Guide for Use of Joint Sealants.
- G. Provide two lines of weather seal:
  1. Primary seal shall be both an air and water seal.
  2. Secondary seal shall be water seal.
- H. Provide non-staining sealant when sealing to porous substrates such as natural stone, wood, or concrete.
- I. Provide sealants from one of the following acceptable sealant manufacturers or equal:
  1. Dow Corning Corporation.
  2. GE / Momentive.
  3. Sika.



## 2.9 ELASTOMERIC SHEET MATERIAL

- A. Elastomeric sheet shall be a complete engineered membrane system, consisting primarily of:
1. Low-modulus pre-cured silicone extrusion and sealant for bonding extrusions to substrates:
    - a. Hardness: 30 to 70 durometer hardness, Shore A, tested in accordance with ASTM D2240.
    - b. Tensile strength: 800 to 1,400 psi, tested in accordance with ASTM D412.
    - c. Elongation: Not less than 500 percent, tested in accordance with ASTM D412.
    - d. Tear strength, die B: 75 to 130 pli, tested in accordance with ASTM D624.
    - e. Adhesive: Compatible approved silicone recommended by manufacturer.
    - f. Thickness: Not less than 65 mils.
    - g. Color: Translucent.
    - h. Provide elastomeric sheet metal from one of the following manufacturers or equal:
      - 1) General Electric Silicones.
      - 2) Dowsil.
  2. Non-corrosive termination bars and fasteners.
- B. Bonding, splicing adhesives, and Sealants: Comply with Section 079200 "Joint Sealants" and ASTM C920.
1. Primers, setting cement, putty, sealants, and all other materials as recommended by the manufacturer of the membrane system.

~~2.10 — INTERIOR ENTRANCE DOORS [ADD #9]~~

- ~~A. — Aluminum doors shall be extruded aluminum, pre-glazed, single acting, hinged doors, narrow stile and rail type. Subject to compliance with the requirements specified herein, products which may be incorporated in the work include, the following:~~
- ~~1. — EFCO model: "D200 Narrow Stile Door.~~
  - ~~2. — Kawneer model: "190".~~
  - ~~3. — Vistawall model: "NS-212".~~
  - ~~4. — YKK AP America: "20D" system.~~
- ~~B. — Entrance doors:~~
- ~~1. — Wall thickness of stile and rail extrusions: not less than 0.125 inch.~~
  - ~~2. — Wall thickness of glazing stops: not less than 0.050 inch.~~
  - ~~3. — Thickness of door: 1 3/4 inches.~~
  - ~~4. — Width of door stiles: 2 1/8 inches minimum.~~
  - ~~5. — Width of top rail: 2 1/4 inches minimum.~~
  - ~~6. — Width of bottom rail: 10 inches minimum (in conformance with 2012 ADA).~~

~~7. Fabricate doors with hairline joints at corners of stiles and rails; provide heavy concealed reinforcement brackets secured with screws and welded.~~

~~8. Weatherstripping: Wool pile type.~~

~~C. Door frame: Nominal 2 inch width by 4 1/2 inches deep.~~

~~1. Wall thickness of frame extrusions: not less than 0.125 inch.~~

~~2. Utilize shear block type construction throughout. No visible raw edges are permitted at joints.~~

~~3. Weatherstripping: Wool pile type.~~

## ~~2.11 EXTERIOR ENTRANCE DOORS [ADD #9]~~

~~A. General: Supply and install aluminum framed glass doors as required for the Storefront System as specified hereinafter or as indicated on the Drawings and all other finish hardware that will be required to make the Storefront System complete."~~

~~B. Entrance doors shall be extruded aluminum, pre-glazed, single acting, hinged doors, heavy duty, wide stile and rail type; acceptable products are:~~

~~1. EFCO model "D318 DuraStile".~~

~~2. Kawneer model: "Tuffline 350 Series".~~

~~3. Oldcastle: "Rugged MS 375".~~

~~4. Wausau "Monumental, Medium Stile," door."~~

~~5. YKK: "40M Monumental Door".~~

~~C. Entrance doors:~~

~~1. Wall thickness of stile and rail extrusions: not less than 0.1875 inch.~~

~~2. Wall thickness of glazing stops: not less than 0.050 inch.~~

~~3. Thickness of door: Nominal 2 inches.~~

~~4. Width of door stiles: Nominal 3 3/4 inches, 4 1/16 inches maximum.~~

~~5. Width of top rail: Nominal 3 3/4 inches, 4 1/16 inches maximum.~~

~~6. Width of bottom rail: 10 inches minimum (in conformance with 2012 ADA).~~

~~7. Fabricate doors with hairline joints at corners of stiles and rails; provide heavy concealed reinforcement brackets secured with screws and welded.~~

~~8. Weatherstripping: Wool pile type.~~

~~D. Door frame: Nominal 2 inch width by 4 1/2 inches deep, or 6 1/2 inches deep for compatibility with adjacent storefront, refer to Drwing.~~

~~1. Wall thickness of frame extrusions: not less than 0.1875 inch.~~

~~2. Utilize shear block type construction throughout. No visible raw edges are permitted at joints.~~

~~3. Weatherstripping: Bulb polymeric type.~~

~~E. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440~~

~~1. Thermally Broken Construction: Fabricate frames and door panels with an integral, concealed, low conductance thermal barrier located between exterior and interior surfaces in a manner that eliminates direct metal to metal contact.~~

- ~~F. Threshold: Provide extruded aluminum threshold of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior; with manufacturer's standard finish.~~
- ~~1. Low Profile Threshold: ADA-ABA compliant.~~
- ~~G. Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and with Section "Aluminum Finishes". Custom metallic color as selected by Architect~~
- ~~H. Glass and Glazing Materials: Comply with Section 088000 "Glazing".~~
- ~~I. Hardware: Comply with Section 087100 "Door Hardware".~~
- ~~J. Fabrication:~~
- ~~1. Fabricate doors in sizes indicated. Include a complete system for assembling components and anchoring doors.~~
- ~~2. Fabricate doors that are reglazable without dismantling panel framing.~~
- ~~3. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to exterior.~~
- ~~4. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.~~
- ~~5. Factory Glazed Fabrication: Glaze architectural doors in the factory where practical and possible for applications indicated. Comply with requirements within this specification and with AAMA/WDMA/CSA 101/I.S.2/A440."~~

**2.122.10 HARDWARE**

- A. Hardware shall be furnished under Section 08 71 00 - DOOR HARDWARE, and installed by aluminum entrance and storefront framing system manufacturer unless otherwise indicated herein, conforming to governing laws and building codes.
1. Provide aluminum storefront manufacturer's recommended door bottoms at all exterior doors as part of the work of this Section.
  2. Install all reinforcing required and prepare doors for finished hardware specified herein below.

**2.132.11 OPERABLE WINDOWS (VENTS) [ADD #9]**

- ~~A. Outswing Casement windows (vents) in storefront system.~~
- ~~1. Specified Manufacturer/model: EFCO Series "WV 430", Thermally broken, Outswing casement window.~~
- ~~2. Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).~~
- ~~a. Performance Class and Grade: AW-PG65-H~~
- ~~3. Materials~~
- ~~a. Extruded aluminum profiles shall be 6063-T5 alloy and temper (ASTM B221 G.S. 10A-T5).~~
- ~~b. The frame adaptor depth shall be not less than 2 1/4 inches. The ventilator depth shall not be less than 2 inches.~~

- c. ~~All framing members shall have minimum wall thickness of 0.125 inch and shall provide the structural strength sufficient to meet the specified performance requirements.~~
- d. ~~All references to dimensions for wall thicknesses and other cross-sectional dimensions of window members are nominal and in compliance with ANSI H35.2-1990.~~
- 4. ~~Accessories~~
  - a. ~~Fasteners: Where exposed, shall be 300 Series, Stainless Steel.~~
  - b. ~~Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.~~
- 5. ~~Hardware:~~
  - a. ~~Stainless Steel 4-Bar Hinges.~~
  - b. ~~Cast White Bronze Air Conditioning (Custodial) Locks with Removable Handle.~~
- 6. ~~Finish: High Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions~~
- 7. ~~Glass and Glazing Materials: Comply with Section 088000 "Glazing".~~
- 8. ~~Weather Stripping: Provide woven pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.~~
  - a. ~~Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702."~~
- B. ~~Screens: Provide manufacturer's standard aluminum framed screen matching finish of curtainwall framing.~~
  - 1. ~~Construct Insect screens with extruded frames, rigidly joined at the corners.~~
    - a. ~~Splines shall be extruded vinyl removable to permit rescreening.~~
    - b. ~~Screen frames shall be finished to match the aluminum window.~~
    - c. ~~Provide sliding screen wickets.~~
  - 2. ~~Insect screening: FS RR-W 365A, woven 0.011 inch blackened aluminum in an 18 by 16 mesh size as manufactured by Phifer Wire Products, Tuscaloosa, AL, or approved equal.~~
- C. ~~Fabrication:~~
  - 1. ~~Framing Members, General: Fabricate components that, when assembled, have the following characteristics:~~
    - a. ~~Profiles that are sharp, straight, and free of defects or deformations.~~
    - b. ~~Accurately fit joints; make joints flush, hairline and weatherproof.~~
    - c. ~~Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.~~
    - d. ~~Physical and thermal isolation of glazing from framing members.~~
    - e. ~~Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.~~

- f. ~~Provisions for field replacement of glazing.~~
- g. ~~Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.~~
- 2. ~~Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.~~
- 3. ~~Fabricate aluminum windows that are re-glazable without dismantling sash or framing.~~
- 4. ~~Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact. Thermal barriers shall be designed in accordance with AAMA TIR A8.~~
  - a. ~~Frame thermal barrier shall be polyamide with a minimum of 1" (25.4 mm) separation, installed continuously and mechanically bonded to the aluminum.~~
  - b. ~~Sash thermal barrier shall be polyamide with a minimum of 1/2" (12 mm) separation, installed continuously and mechanically bonded to the aluminum.~~
- 5. ~~Weather Stripping: Provide full perimeter weather stripping for each operable sash.~~
- 6. ~~Weep Holes: Provide weep holes and internal passages in window frames to conduct infiltrating water to exterior.~~
- 7. ~~Provide water shed members as required above lines of natural water penetration.~~
- 8. ~~Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.~~
- 9. ~~Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.~~
- 10. ~~Factory Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Section 088010 Exterior Glass and Glazing and with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).~~
- 11. ~~Glazing Stops: Provide snap-on glazing stops coordinated with Section 088010 Exterior Glass and Glazing. Provide glazing stops to match sash."~~

#### 2.142.12 MISCELLANEOUS MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Thermal break construction:

1. When low conductance thermal barrier is capable of holding glazing assembly in position and provides composite structural performance the thermal break composite shall conform to the following:
    - a. Thermal break assemblies shall be tested in conformance with AAMA TIR A8-08 for composite structural performance.
    - b. Thermally broken assemblies shall pass AAMA 505 Dry Shrinkage and Composite Performance Thermal Cycling Test Procedure for dry shrinkage thermal cycling.
    - c. Thermal breaks shall be mechanically locked in the metal frames to provide composite action and the mechanical locks shall restrain the thermal break material in all directions to resist shear, flexural bending, thermal loads, and other forces that can be imposed on the member.
    - d. Manufacturers shall conform to AAMA QAG 1 Quality Assurance Processing Guide.
    - e. Minimum 3/8 inch separation of inside and outside by material with conductivity less than 2.2 Btu.in/hr/ft<sup>2</sup>/oF or air.
    - f. The thermal break shall be aligned with the building insulation and insulating glass units.
  2. When low conductance thermal barrier is used only as a thermal separation (Thermal break) and does not comply with the Section "Miscellaneous Materials" paragraph "Thermal break construction", the thermal separation material and framing member shall not be considered as a composite element in the design of the system.
    - a. In such case provide connections or mechanical connections between the thermal break and metal framing elements that will accommodate the differential movement between different materials or that are strong enough to resist structural and cyclic thermal loads.
  3. Thermal break materials and assemblies shall not degrade under UV and Ozone exposure when tested in accordance with ASTM G155 and G151.
  4. Acceptable thermal break materials:
    - a. Thermal breaks systems as manufactured by Technoform-Bautec.
    - b. Two or more strips of crimped in place, mechanically locked, glass fiber reinforced polyamide nylon thermal barriers.
    - c. Insulbar thermal break systems as manufactured by Ensinger.
    - d. GFRP and CFRP pultruded shapes, plates, and profiles of polyester resin reinforced with glass and carbon fibers.
    - e. Polyethylene or PVC thermal isolators.
- C. Setting blocks: ASTM C1115, Provide setting blocks at the sill quarter points of all glass lites, or as recommended by the glass manufacturer and proven by analysis. Setting blocks shall be dense silicone or heat cured silicone rubber with a hardness of 85 ±5 Shore A Durometer and color to match IGU seals. Minimum length of 4" or length determined in inches by multiplying the glass area in feet by 0.1 per GANA guidelines, and a minimum width which will provide a bearing surface for both the inboard and outboard glass lites without interrupting or otherwise creating a discontinuity in the silicone weather sealant at each IGU perimeter.
- D. Edge Blocks: Elastomeric material to limit glass lateral movement (side walking). ASTM C1115, 65-75 Shore A Durometer. Minimum length of 4" and a minimum

width which will provide a bearing surface for both the inboard and outboard glass lites without interrupting or otherwise creating a discontinuity in the silicone weather sealant at each IGU perimeter. Color to match IGU seals.

- E. All products in contact with IGU secondary sealant shall be demonstrated to be compatible.
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type B (Bi-cellular material) or Type C (Closed cell material), jacketed, non-gassing, compatible with sealant and primer, and of a resilient nature, "Sof-Rod" made by Nomaco Inc. or equal, twenty-five (25) percent wider than joint width, of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
  - 1. Shape: Selected for each joint type; round for common butt type joints or triangular for fillet type sealant joint.
- G. Glazing tapes: Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800.
- H. Bond Breaker Tape: Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.
- I. Weep Hole Baffle: PVC-coated, reticulated open-cell urethane foam, 45 pores per 1 linear inch; filter to be installed compressed to 50 percent of original width.
- J. Expanding Foam Sealant: Preformed, expanding, adhesive-backed, closed-cell polyurethane foam impregnated with water repellent material conforming to AAMA 812. The foam sealant shall have a pressure build not more than 0.05psi when tested according to AAMA 812.
  - 1. Minimum thermal resistance of 5.5 degF.ft<sup>2</sup>.hr/BTU.in, aged values in accordance with ASTM C1303 Part A.
  - 2. Density: Not less than 2.0 pounds per cubic feet when tested according to ASTM D 1622.
  - 3. Closed-Cell Content: 90 percent when tested according to ASTM D 2856.
- K. Provide straps, plates, and brackets, built-in inserts, as required for support and anchorage of the fabricated items to adjacent surfaces.
- L. Provide aluminum brackets, clips, high density plastic shims and reinforcements as required.
- M. Flashing required within the system shall be aluminum and of approved design.
- N. Flashing required to join the system to adjacent construction shall be aluminum.
- O. Cleaners, Primers, and Sealers: Types compatible and recommended by sealant or gasket manufacturer.

## ~~2.15~~ ~~GLASS SPANDREL CONSTRUCTION [ADD #9]~~

- ~~A. Storefront spandrels, as indicated on design drawings.~~
  - ~~1. Steel back pan: Installed at spandrel panels as indicated on design drawing.~~

- ~~a. Galvanized sheet shall comply with requirements in Section "Mild (Ferrous) Steel" with a minimum thickness of 0.060" (1.52 mm).~~
- ~~b. Finish: Galvanized per ASTM A525 (G90).~~
- ~~2. Maintain a minimum clear dimension of two inches from the back surface of the glass.~~
- ~~3. Opaque spandrel glazing shall receive full coat coverage ceramic frit.~~
- ~~4. Provide means of mechanically capturing insulation inside of spandrel cavity.~~

## 2.162.13 INSULATION, FIRESAFING, AND SOUND DEADENING

- A. Thermal Insulation: Comply with Section 072100 "Thermal Insulation".
- B. Provide insulation where shown.
- C. Utilize foil faced Storefront spandrel insulation and unfaced Safing Insulation. For foil faced insulation apply vapor retarder tape over all joints in Storefront Assembly insulation and where Storefront Assembly insulation abuts framing. Seal all joints in Storefront Assembly insulation with vapor retarder tape. Apply vapor retarder tape at intersection of storefront insulation with storefront framing, floor slab, and similar intersections to insure a vapor tight seal. Repair all tears in Storefront Assembly insulation foil facing with vapor retarder tape.
- D. All fire safing insulation shall comply with ASTM E84, ASTM E2307 (2 hours), ASTM E136.
- E. High Density Semi Rigid Mineral Fiber Safing and Thermal Insulation:
  - 1. Faced or unfaced as required, ASTM C 612, maximum flame-spread and smoke- /developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics.
  - 2. Nominal density of 8 lb/cu. ft. (128 kg/cu. m), Type III, thermal resistivity of 4.2 deg F x h x sq. ft./Btu x in. at 75 deg F.
  - 3. Passes ASTM C 665 corrosion test.
  - 4. Insulate spandrels with Thermafiber Firespan 90 or equal exterior wall insulation with minimum thickness as shown on Drawings and as required to meet specified thermal performance and foil vapor barrier (permeability not to exceed 0.020 Perms) at interior surface and all edges. Locate foil surface of insulation flush with innermost surface of vertical framing members. Butt joints are acceptable. Each piece of insulation shall be retained at a minimum of two opposite edges.
  - 5. Provide Thermafiber Firespan 90 or equal for firesafing insulation with minimum thickness as required to meeting specified firesafing performance.
  - 6. Insulation shall be retained by steel impaling pin assemblies with bases fastened to frames with screws or adhesive applied.
  - 7. Seal all edges, joints, punctures and tears in vapor barrier with aluminum foil tape to insure continuous vapor barrier.
- F. Smoke Seal Compound
  - 1. Caulking compound specifically intended for inhibiting the passage of smoke, Hilti CP, 3M Firebarrier Spray, or Specified Technologies Inc.
  - 2. Sound-deadening: Acoustical board, thickness and density as required by design, non-combustible waterproof type, approved by Architect.



~~2.172.14~~ STOREFRONT FABRICATION AND ASSEMBLY

## A. General:

1. All work shall be of the highest quality, in accordance with the best trade practices, and performed by skilled workmen. All work shall be accomplished to the satisfaction of the Architect and Owner.
2. To the fullest extent practicable, fabrication and assembly shall be executed in the shop. All Work that is not shop-assembled shall be shop-fitted.
3. The design of the Storefront shall endeavor to keep site operations to a minimum. Manufacturing, finishing, and assembly processes shall, wherever possible, be carried out off-site and under controlled environmental conditions.
4. To the extent possible, all fabrication shall be done prior to finishing. Any exposed mill finish edges shall be finished to match adjacent construction.
5. All components exposed in the finished work shall be free from warping and oil-canning effects, the telegraphing of welds and other fasteners, cut marks, streaks, tool and die marks.
6. Form aluminum shapes before finishing.
7. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual".
8. Fabricate components that, when assembled, have the following characteristics:
  - a. Sharp profiles, straight and free of defects or deformations, including but not limited to, warping; oil-canning effects; the telegraphing of welds, studs, and other fasteners; streaks; and tool or die marks.
  - b. Accurately fitted joints with ends coped or mitered.
  - c. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
  - d. Physical and thermal isolation of glazing from framing members.
  - e. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
  - f. Provisions for reglazing from exterior.

## B. Fabrication Tolerances:

1. Tolerances at joints and junctions shall take precedence over tolerances for components or assemblies.
2. Unless otherwise specified, tolerances shall be:
  - a. Joint width:  $\pm 1/16$  inch.
  - b. Length and width of major components:  $\pm 1/32$  inch.
  - c. Diagonals of major components:  $\pm 1/16$  inch.
  - d. Aluminum extrusions: 50% Aluminum Association standards.
  - e. Misalignment of mating surfaces:  $\pm 1/16$  inch.
3. In addition to special care used to handle and fabricate assemblies, employ the following fabrication techniques.

- a. Welds ground smooth: Fabricator shall grind welds smooth. For groove welds, the weld shall be made flush to the surfaces each side and be within +1/32 inch, minus 0 inch of plate thickness.
  - b. Contouring and blending of welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition and to match profile on approved mock-up.
  - c. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
  - d. Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving. Distortion of the web or stem, and of outstanding flanges or legs of angles shall be visibly acceptable to the Architect from a distance of 10 feet under any lighting condition determined by the Architect.
- C. Holes:
1. Provide holes and connections for site assembly and to accommodate work of others as required. Holes shall be drilled, or punched and reamed, perpendicular to the surface. Holes will not be permitted in areas where the completed Work will remain visible.
- D. Joinery:
1. Accurately fit and firmly secure all exposed metal joints with metal to metal hairline contracts.
  2. All fastenings shall be installed at an approved spacing. Fasteners shall not penetrate gutter and drainage systems.
  3. All jointing and splicing of members shall be concealed.
  4. Conceal all joint sealants except as noted on the drawings.
  5. All work shall be properly reinforced to resist all loads imposed upon them by all doors, hardware, anchors, and other attachments.
  6. Exposed Fasteners:
    - a. Exposed fasteners shall occur only where expressly permitted by the Architect.
    - b. Spacing and location of all fasteners shall be as approved by the Architect.
    - c. No self-drilling fasteners shall be allowed outboard of the air-seal line.
    - d. Where exposed in finished and visible surfaces, fasteners shall be countersunk or counter bored with allen or pozidrive head unless indicated on the Drawings or as approved by the Architect. Exposed portions of the fastener shall match the adjacent surface.
- E. Built-up Members and Reinforcement:
1. Where two or more sections of aluminum are used in built-up members, contact surfaces shall be smooth, true and even, in continuous alignment, and secured so that the joints are tight without the use of filling materials.
  2. Steel reinforcement of aluminum members shall be hot-dip galvanized with shop primer and completely enclosed and separated from aluminum as specified herein.

- F. Aluminum Welding:
1. General: Weld before finishing components. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
  2. Welded joints shall typically be confined to concealed locations. Any exposed joints shall be subject to Architect's approval.
  3. Procedures:
    - a. Submit details of proposed welding procedures before commencing.
    - b. Other than site welds indicated on approved shop drawings, do not weld on site without prior approval. Where practical, locate site welds in positions for down hand welding.
    - c. Do not weld:
      - 1) Finished surfaces.
      - 2) Adjacent to finished surfaces or glass, unless adequately protected from damage, as recommended by appropriate manufacturers.
  4. Finish: Welds shall be de-scaled and free of surface and internal cracks, slag inclusion, and porosity.
  5. Welding Dissimilar Metals:
    - a. Do not commence until approved in writing. Submit details of welding of dissimilar metals, including:
      - 1) Type and thickness of materials to be welded.
      - 2) Proposed joint preparation and welding procedures.
      - 3) Proposed filler metal.
      - 4) Expected dilution (proportion of fused parent metal in the weld metal).
    - b. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings. Marking shall be of a type that can be removed with water or solvents after assembly. Marking should be positioned on unexposed surfaces where possible.

#### **2.182.15 GLAZING SYSTEMS ATTACHMENTS**

- A. Internal Gutters, diverters, and seals:
1. Provide all required internal weeps, baffles, joint plugs, end dams, zone dams, internal sealant, and similar as required to prevent the air and water penetration through the completed assembly. Where visible, provide matching materials and finishes.
  2. Construct weep holes as required to drain water passing joints within the system to the exterior. Provide weep hole baffles.
  3. Apply sealants and gaskets under the climatic conditions recommended by the manufacturer(s). Sealant shall not be installed when substrates are wet or when ambient temperature is below 40°F. All surfaces to receive sealants shall be treated (cleaned, primed or unprimed) in accordance with the recommendations of the sealant manufacturer. Use no sealant that has started to set in its container, or any sealant that has exceeded the shelf life published by the manufacturer.

4. Protect all joining surfaces not to receive sealants against staining by masking and/or other methods. Sealant joints shall be concealed from view to the extent possible.

B. Perimeter Flashing:

1. Comply with the "Architectural Sheet Metal Manual" as issued by SMACNA for flashing recommendations.
2. Install flashing using skilled workmen in strict accordance with the recommendations and directions of the manufacturer.
3. Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges, and corners, free from defects.
4. All flashings shall be cut and folded to approved profiles out of non-corrosive materials, with protective coatings as required. Flashing shall be factory fabricated in long lengths where practical, and pre-painted on visible surfaces.
5. Install, in as long lengths as practical, at concealed locations only, with as few joints as possible, and without wrinkles, buckles or distortions.
6. Where anchors or other materials penetrate the flashing, solidly fill the penetrations with the sealer to insure a fully watertight condition.
7. Where flashing is installed to provide air barrier continuity between the glazing system and surrounding construction, flashing shall be painted aluminum or stainless steel as specified herein to provide sufficient rigidity to resist potential fluctuations in air pressure, unless otherwise determined through pre-construction mock-up testing.
8. All flashings shall be continuous and air (where required for air barrier continuity) and water tight, allowing for thermal movement at splices and terminations. Inside and outside corners and end dams shall be prefabricated watertight. Provide mechanically engaged, continuously sealed splice plates at joints in flashing.
9. Flashing of isolated openings shall extend 12" past each jamb of the opening and turn up 3" and then extend from the outer face of the wall to the inside face of the wall where it shall be turned up 3" vertically and be bedded in sealant. Turn up head and sill flashing at sides to form a pan.
10. Where flashings are fitted to pre-formed rebates, coordinate cast-in grooves or reglets as required.
11. Materials:
  - a. Unexposed metal flashing: ASTM A240 or A666, Type 304, dead soft fully annealed except where harder temper required for forming or performance; not less than 0.025 in. thick (24ga) unless otherwise shown, finish No. 2D. Provide 60-40 tin/led solder, with acid-chloride type flux, except use rosin flux over tinned surfaces in accordance with ASTM B32. Aluminum sheet, not less than 0.062" gauge (1.02 mm). Provide 80-20 tin/led solder if flashing can be visible in occupied areas.
  - b. Exposed metal flashing, fascias, coping attachments, roof curb flashing and covers: Unless otherwise indicated on the Drawings, types and

locations shall be stainless steel not less than 0.079" thick (2 mm) with non-directional bead blast satin finish and aluminum sheet not less than 0.125" (3 mm) thick with high performance organic coating.

- 1) Provide thickness required to prevent oil canning.
  - 2) Location of seams to be approved by Architect with shop drawings.
  - 3) Seams: As shown or minimum 1-inch flat lock seams.
  - 4) Cleats: Minimum 2-inches long in seam.
  - 5) Minimum 2 fasteners per cleat.
  - 6) Thermal movements perpendicular to seams: Accommodate within seams
  - 7) Thermal movements parallel to seams: Allow sheet metal to slide at attachment cleats.
  - 8) Do not penetrate visible panels with fasteners and do not expose fasteners.
  - 9) Fold seams to shed water.
  - 10) Align all joints and seams.
- c. Fasteners for sheet metal flashing: AISI, Types 304 and 316 stainless steel fastener system suitable for substrate.
- d. Uncured EPDM Strip: Permitted in exposed or unexposed locations.
- e. Uncured Neoprene strip: Permitted only in unexposed locations as alternate flexible flashing.
- f. Self-Adhering, High-Temperature Underlayment Sheet for use under sheet metal flashing: Minimum 60 mils (1.5 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
- 1) Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
  - 2) Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.

C. Aluminum "Break Metal" and "Panning Work"

1. Fabricate and install all extruded aluminum and formed sheet aluminum "brake-metal" work in conjunction with the aluminum window and storefront work as detailed and as reasonably required to complete the work including sill extensions, snap trim pieces, jamb and sill trim, closures, coverings, flashings and other miscellaneous extruded and formed "brake-metal" work in conjunction with aluminum windows.
  - a. Provide extruded shapes wherever possible, reserving formed work for conditions where extrusions are not applicable.
  - b. Provide sheet metal panning not less than 0.060 inch thick.
  - c. Fasten trim clips, at not more than 16 inches on center.
2. Protect surfaces from marring when forming work. Provide sufficient material thickness with all necessary concealed reinforcement and anchorage to prevent "oil canning" or deformation of the finished work. Material deemed defective by the architect will be replaced at no cost to the Owner.

**2.492.16 ALUMINUM FINISHES**

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

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- B. Appearance: Unless more stringent requirements exist in the “Metal Finishes Manual for Architectural and Metal Products”, when viewing abutting or adjacent pieces, significant visible color variation from a minimum distance of 10 feet, shall not be apparent. Provide samples of color variation for review during submittal process.
- C. Material shall not be shipped, delivered, or supplied when the finish of that material:
1. Has not been inspected and tested in the manner and by the means prescribed herein and as approved.
  2. Does not meet all specifications for the finishes set forth in the alloy manufacturer’s instructions.
  3. Does not fall within the color and tonality range approved by the Architect.
  4. Has been rejected by the Architect or Owner.
  5. Has not otherwise been processed in accordance with these instructions.
  6. The Architect shall have final authority to accept or reject any or all material that does not conform to these finishes standards or any of the other requirements of the drawings and specifications.
  7. To ensure consistency of color and tonality in the finished work, the Glazing Subcontractor shall implement a quality control program to the approval of the Architect. The quality control program shall be vertically integrated and include controls by the alloy manufacturer and the finisher, as well as the Glazing Subcontractor to provide three independent checks of color and tonality at the point of finishing, during assembly, and during installation.
  8. No production finishing shall commence prior to approval of the quality control program by the Architect. Notwithstanding the implementation of an approved quality control program, any installed work with defects in finish or variation in color or tonality in excess of the approved range shall be subject to rejection.
  9. A full-time supervisor shall be assigned to each production shift; the inspector shall inspect all production materials and maintain a complete record of all inspections.
- D. Superior-Performance Organic Coating Finish for shapes, plates, and sheets exterior and interior side: AA-C12C42R1x cleaned with inhibited chemicals, corrosion coated with an acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below. Apply finish in strict compliance with paint manufacturer’s instructions using a licensed applicator.
1. Fluorocarbon High Performance Organic Coating, Three-Coat Metallic PVDF System: Manufacturer’s standard three-coat, thermo-cured pigmented polyvinylidene fluoride resin (PVDF) coating system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat, containing not less than 70 percent of the fluoropolymer resin Kynar 500 or Hylar 5000 by weight; complying with AAMA 2605.
    - a. The coating system shall be spray applied under factory conditions to pretreated base metal in a three-coat process in strict accordance with the coating system manufacturer’s recommendations, and to the minimum standards of AAMA 2605 “Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels”.

- b. The coating system shall be applied by a licensed applicator approved by the coating system manufacturer. The applicator shall propose a program of records and samples of the entire coating production for approval by the Architect, and which records and samples shall be made available to the Architect or Owner upon request.
- c. Provide and furnish a compatible field touch-up PVDF coating system formulated for air-drying at ambient temperature, based on the Kynar ADS fluoropolymer resin, in color match the factory applied finish. Submit applied coating system, subject to sample approval procedures described herein. Such repairs shall match the original finish for color and gloss and shall adhere to the original finish when tested in accordance with AAMA 2605 Dry Adhesion.
- d. Warrant that the organic coating shall not peel, check, crack, chalk or change color for a period of twenty (20) years from the Completion Date stipulated in the Certificate of Substantial Completion and that the finish exceeds or meets the standards set out in AAMA 2605-05 which include, but are not limited to the following:
  - 1) Three-coat PVDF finish system thickness shall be a minimum of 1.85 mils DFT.
  - 2. An acceptable organic coating is PPG Industries Duranar XL or equal.
    - a. Custom metallic color to match Architect's sample.
- E. Aluminum finish on structural silicone adhesion surfaces shall be a minimum Alodine conversion coating or other suitable adhesion substrates.
- F. Aluminum not exposed to view shall receive, as a minimum, the chromium phosphate chemical conversion coat associated with organic coating.
- G. All chemical conversion coatings shall meet the minimum requirements of ASTM D1730, Type B, Method 5 with a minimum coating weight of 40 mg/ft<sup>2</sup>.
  - 1. Remove die markings on any exposed architectural surfaces prior to finishing operations. Where necessary to remove die markings from any part of the work, all members must be finished by the same process, whether or not die markings exist. Perform this work in addition to the finish specified. Scratches, abrasions, dents and similar defects are unacceptable.
  - 2. All aluminum, whether concealed or exposed shall be finished. No mill finish aluminum shall be permitted.
  - 3. Finishing of all components exposed to view shall be done after the completion of all fabrication processes.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Prior to start of installation, inspect the building and verify as-built conditions and dimensions as being acceptable to receive the Work of this Section. Verify elevations of concrete and structural steel framing, and location of embeds and other anchorages for compliance with the Work of this Section.
- B. Should any conditions be found that may prohibit proper execution of the Work, the Glazing subcontractor shall immediately notify the Architect in writing of these conditions. Installation shall not proceed until a recommended course of remedial

action has been submitted and approved in writing by the Architect, prior to execution in the field.

- C. Provide a complete site survey of existing conditions to ensure the accuracy of layout and dimensional information.
- D. Joint widths as noted in the Contract Documents are the design joint width at the ambient temperature of 75°F. Installation procedures should be adjusted to take into account the ambient temperature at the time of installation.

### 3.2 PREPARATION

- A. Provide connections for temporary shoring, bracing, and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the glazing systems through the process of erection.
- B. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- C. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.3 ANCHORS AND CONNECTIONS:

- A. Coordinate relationship between brackets and concrete reinforcement.
- B. Supply anchorage items to be embedded in or attached to other construction. Provide embed layouts, setting diagrams, templates, instructions and directions as required for installation.
- C. After system components are positioned, fix connections to building structure as indicated on approved Shop Drawings. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration.
- D. Connections between different materials shall be designed to allow for the differential thermal movement of the respected materials.
- E. Self-drilling, self-threading fasteners shall not be permitted for use into concrete or masonry.
- F. Avoid excess shimming that may induce additional stress on the fastener. The total thickness (t) of a shim pack shall not exceed a dimension equal to the diameter (d) of the fastener/anchor. Where  $t > d$ , the fastener/anchor shall be recalculated to take into account the additional stress from bending on the fastener with the assumption that the shim does not contribute to resistance to fastener bending. Additional stress due to bending shall be added to tension stress and the tension/shear interaction analyzed.
- G. Anchorages to Structural Steel shall not induce rotational forces in supporting members.



- H. Shim packs that resist compressive forces only may be high-impact plastic, Korolath type, or equal. Shim packs subject to shear shall be stainless steel or HFG steel plates pinned together to form a monolithic shim.

### 3.4 GLAZED ALUMINUM EXTERIOR WALL SYSTEMS

#### A. General:

1. Use no materials, equipment, or practices that may adversely affect the functioning, appearance or durability of the completed Storefront Assembly and related construction.
2. The Storefront Assembly shall be accomplished in compliance with the specified criteria without buckling, opening of joints, undue stress on fasteners, sealants, and gaskets, opening of welds, cracking of glass, leakage, noises, or other harmful effects.
3. Conform strictly to the materials, finishes, shapes, profiles, sizes, thickness, and joint locations required by the Drawings and Specifications.
4. Match all materials to produce continuity of line, texture, and color.
5. All work shall be of the highest quality, in accordance with the best trade practices, and performed by skilled workmen. All work shall be accomplished to the satisfaction of the Architect and Owner.
6. To the fullest extent practicable, fabrication and assembly shall be executed in the shop. All Work that is not shop-assembled shall be shop-fitted.
7. To the extent possible, all fabrication shall be done prior to finishing. Any exposed mill finish edges shall be finished to match adjacent construction.
8. All components exposed in the finished work shall be free from warping and oil-canning effects, the telegraphing of welds, studs, and other fasteners, and streaks, tool and die marks.
9. Exposed metal edges shall be finished to match typical finished surfaces.
10. Storefront Assembly design shall typically incorporate an outside weatherseal and an inside air-seal, and provide a pressure-equalized drainage system.
11. Fit joints to produce hairline joints free of burrs and distortion.
12. Rigidly secure non-movement joints.
13. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
14. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
15. Seal joints watertight, unless otherwise indicated.

#### B. Fabrication and Assembly

1. The design of the Storefront Assembly shall endeavor to keep site operations to a minimum. Manufacturing, finishing, and assembly processes shall, wherever possible, be carried out off-site and under controlled environmental conditions.
2. Assembly procedures to be carried out on site shall be simple to execute and capable of execution within the time(s) allowed in the Master Construction Program.

#### C. Manufacturer's Standards

1. Materials, components, and systems incorporated in the Work shall be mixed, applied, installed and otherwise used in strict accordance with the recommended standards and procedures of the respective manufacturers.
- D. Storage and Handling
1. Materials shall be stored in a dry, well ventilated location. Handling of materials shall be kept to a minimum, and all materials shall be carefully protected from soiling and from condensation and other harmful moisture.
- E. Jointing and Reinforcing
1. Accurately fit and firmly secure all exposed metal joints with metal to metal hairline contacts.
  2. All fastenings shall be installed at an approved spacing. Fasteners shall not penetrate gutters and drainage systems.
  3. Exposed fasteners shall occur only where expressly permitted by the Architect. Where exposed in finished surfaces, screw heads shall be Phillips oval-head countersunk type, finish to match adjacent surfaces.
  4. All jointing and splicing of members shall be concealed.
  5. Accommodation of thermal expansion and contraction shall be resolved within the Storefront Assembly. No loads due to thermal variation may be transferred to the building structure.
  6. Conceal all joint sealants except as noted on the drawings.
  7. All work shall be properly reinforced to resist all loads imposed upon them by all doors, hardware, anchors, and other attachments.
- F. Metal Protection
1. Where dissimilar metals contact, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
  2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint or with high solids epoxy coating equal to Amerlock 400.
- G. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- H. Erection Tolerances: Install glazed aluminum exterior wall systems plumb, level, square, and true, and to comply with the following maximum tolerances:
1. Plumb: 1/8 inch (3 mm).
  2. Level: 1/8 inch (3 mm).
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 3 inch (76 mm) wide, limit offset from true alignment to 1/32 inch (.8 mm). Otherwise limit offset to 1/16 inch (3.2 mm).
    - b. Location: Limit variation from plane to 1/8 inch in 12 feet (3 mm in 3.7 m); but no greater than 1/2 inch (12.7 mm) over total length.

## 3.5 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
1. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust according to requirements in referenced glazing publications, including the "Glass Manual" as issued by GANA.
  2. Prior to glazing, all structural silicone glazed glass shall receive a continuous 1 inch wide skim coat of silicone at the perimeter of the lite to conceal sealant and glazing accessories. Color to be determined by Architect.
  3. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
  4. Provide temporary marking, if required, with an approved removable marking for visibility during construction, by a method that does not harm the glass, and remove all traces on completion.
  5. Setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
  6. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
  7. Never permit direct glass to frame contact.
  8. Provide spacers for glass lites where length plus width is larger than 50 inches.
  9. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
  10. Install glass and glazing materials under the climate conditions recommended by the fabricator and manufacturer.
- B. Sample Section of Sealant:
1. At the beginning of sealant installation work in exterior wall, the manufacturer of sealant shall send his representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.
  2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.
  3. Accepted control section shall be standard to which all other sealant work must conform.
- C. Supervision: Submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of

their materials. Use only skilled and experienced workmen for installation of sealant.

- D. Install glass and glazing materials under the climate conditions recommended by the fabricator.
- E. The location, type, size and position of all setting blocks shall be inspected for compliance with the approved shop drawings before IGU installation, and again prior to the installation of structural silicone sealant and exterior weatherseals.
- F. Install the glass unit in the opening using temporary glass retainers. Care shall be exercised not to set fingerprints on the glass and glazing materials in the structural silicone sealant bond area during installation.
- G. Glazing rabbets shall be clean, dry, and free of any materials that might adversely affect the bond and seal of the glazing materials or the drainage of the rabbet.
- H. The insulating glass unit shall be fully supported by framing members in the installed position. Inboard and outboard glass lites shall be fully supported by the setting blocks prior to the application of structural silicone sealant.

### 3.6 GLAZING SEALANTS

- A. General: Site glazing shall be carried out and evaluated by approved glaziers in accordance with ASTM C 1394 and ASTM C 1401, and other referenced standards. An approved glazing supervisor shall supervise all work.
  - 1. Comply with the sealant manufacturer's recommendations regarding surface preparation, priming, pot-life, sealant bead application, and the acceptable range in surface temperature and humidity at time of application and for a period at least eight hours following sealant application.
  - 2. Cleaning: Surfaces to receive glazing materials shall be thoroughly cleaned of all dirt, dust, grease, finger-prints and extraneous materials. Where recommended by the glass manufacturer, contact surfaces shall be wiped with Isopropyl Alcohol or equivalent allowed by sealant and glass manufacturer to a dry condition.
    - a. Clean joint surfaces immediately before installation of backing rod and again before applying the sealant as recommended by sealant manufacturer.
    - b. Remove protective tape or removable films and ensure that no residue remains.
    - c. Joint areas to be protected with masking shall be cleaned before application of tape or film.
    - d. Glass:
      - 1) Cleaning compounds shall be applied with clean lint-free disposable towels. A two-wipe method of application shall be employed, where one towel is used to wipe the surface dry and clean, and the second is used to apply the cleaning compound. The cleaning compound shall not be allowed to air-dry on the substrate.
    - e. Porous substrates, concrete, stone:
      - 1) Clean where necessary by grinding, mechanical abrasion, detergent washing or a combination of methods to ensure a clean sound interface.

- 2) Remove laitance mechanically. Remove oils by blast cleaning. Remove loose particles that remain in joints following mechanical surface preparation by blasting with oil free compressed air.
  - 3) Clean and etch masonry joint surfaces as recommended by sealant manufacturer.
- f. Acid washing shall not be used unless approved in writing by the Architect.
3. Priming: Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
  - a. Do not allow primer/sealer to spill or migrate onto adjoining surfaces. Areas adjacent to joints to be sealed shall be protected where there is likelihood that contamination by cleaning compound, primer, or sealant could occur.
  - b. If recommended by the sealant manufacturer, roughen surfaces to remove protective coatings or imperfections that may prohibit provision of clean, sound base surface for sealant adhesion.
4. Application and tooling: Refer to Section 079200 "Joint Sealants", unless otherwise specified in this section. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - a. Place sealants so they directly contact and fully wet joint substrates.
  - b. Completely fill recesses in each joint configuration.
  - c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  - d. Exposed sealants shall be installed so that the top surfaces of the sealant beads are sloped to drain water away from the glass. Exposed sealant surfaces shall be tooled smooth.
5. Care shall be exercised to prevent three sided adhesion and cohesive failure of joint sealant in all movement joints. Provide bond breakers where necessary.
6. Curing:
  - a. Cure sealants in compliance with manufacturer's recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.
  - b. Do not relocate sealed components within the factory or on-site, until the joint has developed sufficient bond strength and cohesive integrity.
  - c. Do not field test for adhesion or water penetration until joints are fully cured.
7. Exposed sealants shall be installed so that the top surfaces of the sealant beads are sloped to drain water away from the glass. Exposed sealant surfaces shall be tooled smooth. Sealant that has started to set in its container shall not be used and be discarded.
8. Do not use sealant that has exceeded the shelf life published by the manufacturer.
9. Do not install sealant if the ambient temperature is below 40°F. Maintain this temperature during and 48 hours after installation of sealant.
10. Replace sealants that have accumulated debris prior to full cure.
11. Remove any masking material and excess sealant immediately after application of sealant bead is complete and "clean-down" adjacent surfaces

as work progresses. All finished work shall be left in a neat and clean condition.

- B. Field Applied Weather Sealants: Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
  - 1. Tool exposed surfaces of sealants to provide a substantial wash away from glass and to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation. Comply with gasket requirements in "Glass Manual" as issued by GANA.
  - 1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
  - 2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense vulcanized compression gaskets, corner molds, and pressure-glazing stops, applying pressure uniformly to compression gaskets for form continuous weather-stripping. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
  - 3. Install gaskets so they protrude past face of glazing stops.
- D. Setting blocks shall be the full width of the rabbet, and placed at the glass quarter points. They shall be of a length recommended by the glass manufacturer and be configured in such a way as not to impede water drainage of the glazing rabbet.
- E. Anti-walk blocks shall be used to prevent glass from moving out of alignment so that glass bite is maintained.
- F. Jamb blocks shall be used for each glass unit supported on four sides.
- G. Glass shall be centered in each opening to provide the purchases and clearances recommended by the glass manufacturer and approved by the Architect.

### 3.7 DOORS

- A. Examine doors and installed door frames before hanging doors.
  - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Hardware: For installation, see Section 087100 – Door Hardware.
- C. Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

- D. Job-Fitted Doors: Align and fit doors in frames with uniform clearances; do not trim stiles and rails.
- E. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
- F. Rehang or replace doors that do not operate freely.
- G. Install to produce weathertight enclosure and tight fit at weatherstripping.
- H. Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

### 3.8 CORROSION PROTECTION

- A. Ensure by design that no metals, including alloys of the same base metal, are placed together in a manner, combination, or location likely to give rise to damage by electrolytic action or other corrosion. In particular, avoid metal to metal contact between aluminum and metals other than an appropriate grade and composition of stainless steel as per the recommendations of the metal manufacturer and to the approval of the Architect. Ensure that dissimilar aluminum alloys in contact with each other are compatible with each other or isolated. Any other dissimilar materials are to be treated or protected in such a manner as necessary to prevent corrosive action.
- B. Isolation of dissimilar metal surfaces to prevent electrolytic action shall be accomplished by materials which are impervious to moisture and non-absorptive.
- C. Aluminum surfaces in contact with mortar, concrete, fireproofing, plaster, masonry, or absorptive materials of any kind shall be coated with an anti-galvanic material, impervious to moisture.

### 3.9 FLASHINGS

- A. Elastomeric or metal flashing connecting to work of other Sections shall be provided by the Glazing Subcontractor for the work of this Section, including the attachment to this Work and to other work.
  - 1. Comply with flashing manufacturer's instructions and recommendations.
  - 2. Clean substrates prior to installation of flashings.
  - 3. Make flashings waterproof and air tight.
  - 4. Make flashings continuous.
  - 5. Make flashings collect, control, and direct water to the exterior and to weeps.
  - 6. Shingle seams to best shed water.
  - 7. Inspect all flashings prior to covering or concealing.
  - 8. Ensure flashings are continuous, waterproof, and air tight.
- B. Where indicated on the Drawings and where required to accommodate movement, an elastomeric flashing system shall be used.

- C. Where elastomeric or metal flashing connects to roofing and waterproofing work provide 8 inches of flashing beyond the point of attachment to the Work of this Section.
- D. Elastomeric flashing shall be carefully bonded to the substrates without blistering; joints shall be neat and as infrequent as possible. Adhered flashing shall have a minimum 90 degree peel adhesion of 6 pounds per linear inch when tested in accordance with ASTM D3330 Method F or ASTM D 903.
- E. Elastomeric flashing not supported by substrate material shall receive another layer of 60 mil flashing for reinforcement, fully bonded to the finish layer and the substrate, and extending at least 1 inch beyond the unsupported area.
- F. Connect air and vapor barrier in glazed exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, walls, exterior doors and other intersection conditions and perform sealing of penetrations, using accessory materials and in accordance with the manufacturer's recommendations.
- G. Flashing Slope:
  - 1. Slope all flashings at least 5 percent to drain to the exterior.
  - 2. Ponding on flashings is not acceptable at any location.
  - 3. Grout or shim under flashings to create slope.
  - 4. Do not use any organic material to create slope.
- H. Discontinuous Horizontal Flashings - Flashing Pans: Where horizontal flashings are not continuous:
  - 1. Provide flashing pans with three vertical walls.
  - 2. Make pan walls 4 inches high to the greatest extent possible.
  - 3. Never make pan walls less than 1.5 inches high.
  - 4. Make corners permanently waterproof. Sealant sealed corner is not acceptable.
  - 5. Extend flashings the entire width of the obstruction to downward flow of water.
  - 6. Ensure jamb flashings drop into pan flashings.
- I. Metal Flashing Installation:
  - 1. Reference Standard: Conform to the requirements of 5th Edition of the Sheet Metal and Air Conditioning Contractors Association (SMACNA) Architectural Sheet Metal Manual.
  - 2. Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges, and corners, free from defects. Fold exposed metal edges back not less than 1/2" and form drip.
  - 3. Isolate dissimilar metals.
  - 4. Fully solder seams and joints.
  - 5. Clean metal to bare metal prior to soldering.



6. Use flux when soldering.
  7. Do not damage flexible flashing when soldering metal near flexible flashing.
  8. Slip Joints: Locate slip joints not more than 24 feet apart and not more than eight (8) feet from corners. Form slip joints as slip-type-joint, or loose lock joint in accordance with SSINA "Standard Practices for Roofing, Flashing, and Copings".
- J. Flexible Flashing Installation:
1. Install flashing using skilled workmen in strict accordance with the recommendations and directions of the manufacturer.
  2. Do not install fabric flashing when the temperature is 32 deg. F. and falling.
  3. Install, in as long lengths as practical, at concealed locations only, with as few joints as possible, and without wrinkles, buckles or distortions.
  4. Set flashing in a full and continuous troweled-on bed of setting cement, with joints lapped a min. of 4". Where flexible flashing meets metal flashing, it shall overlap at least 4" with laps completely buttered and pressure applied for perfect adhesion.
  5. Seal holes with a "patch" of flashing.
  6. Extend flashing "patch" at least 4 inches onto adjacent undamaged areas on all sides.
  7. Where anchors or other materials penetrate the flashing, solidly fill the penetrations with the sealer to insure a fully watertight condition.
  8. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.
  9. At through-wall flashings, provide an additional 6 inch wide strip of manufacturer's recommended membrane counterflashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with non-corrosive termination bar and sealant.
  10. Do not allow materials to come in contact with chemically incompatible materials.
  11. Inspect installation prior to enclosing assembly and repair punctures, damaged areas, and inadequately lapped seams with a patch of membrane lapped as recommended by manufacturer.
  12. Meet specified installed, in place, peel adhesion performance.
  13. Extruded Silicone Flexible Flashing and Transition: Comply with manufacturer's instructions and recommendations.
    - a. Clean substrates to remove all contamination and bond breakers.
    - b. Confirm substrate moisture and temperature are within manufacturer's recommended limits.
    - c. Apply primer to substrates recommended by flashing manufacturer.
    - d. For visible locations, mask installation area to control spillage and migration.
    - e. Provide continuous adhesive/sealant to bond flashing into place.
    - f. Provide bonding area shown or, if not shown, minimum 0.75 inch on each side of joint.
    - g. Embed flashing into uncured, fresh adhesive/sealant.

- h. Roll installed flashings into adhesive/sealant with pressure.
  - i. Hold flashing in place until adhesive/sealant grabs and holds.
  - j. Complete horizontal work before vertical work.
  - k. Remove masking and spilled adhesive/sealant.
  - l. Provide uniform, straight, flashings free from wrinkles, fish mouths, and distortion.
  - m. Provide well adhered flashings which meet manufacturer's adhesion performance.
  - n. Provide 100 percent waterproof assemblies including terminations and intersections.
14. Limitations: Use sheet metal flashings and non flexible flashings at the following locations and conditions.
- a. Where flashing is visible.
  - b. Where flashing is exposed to sunlight and manufacturer restricts sunlight exposure.
  - c. Where sealant is shown adhered to the flashing.
  - d. Where metal flashing is shown, indicated, or identified.
  - e. Where flashing is in contact with materials containing creosote or coal tar, or pressure treated wood.
  - f. Where flexible flashing cannot be practically installed due to its self-adhesive properties.
  - g. When environmental conditions during installation are outside flashing manufacturer's limits.

### 3.10 FIELD QUALITY CONTROL

- A. Structural Requirements: The Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports. Refer to Division 1 section "Independent Inspections" or "Special Inspections" for detailed bolt and weld testing requirements and coordination. The P.E. responsible for the design and engineering of the Storefront Assembly of this section shall be responsible for preparing the Statement of Special Inspection required by the building code.
- B. Field Air infiltration and Water Penetration Chamber Testing:
- 1. Owner will engage an independent, fully accredited testing agency to field test the Work of this Section for air leakage and water penetration at 1.0 times the rate specified in "Performance Requirements" Article of this specification, tested according to AAMA 503-08:
    - a. For storefront systems, air infiltration test shall be ASTM E783 and water penetration test shall be ASTM E1105. The Glazing Subcontractor shall propose the testing scope, location, and schedule for review by the Architect and Owner.
    - b. Tests shall include:
      - 1) Storefront Fixed Assemblies: Three (3) vertical assemblies during each stage.
      - 2) Storefront Operable Windows: Two (2) vertical assemblies during each stage.

- c. Tests shall be performed at the beginning, middle and end stages of installation for each system.
  - d. Wherever possible, test area shall incorporate interface conditions with adjacent cladding systems.
  - e. Insect screens shall be removed prior to commencing testing.
  - f. Interior side of test area shall be left open and unobstructed, permitting the full length of all joints to be examined from the indoor side.
2. Water infiltration criteria shall conform to the requirements of Part 1.
  3. In the event of failure, additional field testing in accordance with AAMA 501.2 may be required to isolate the point(s) of entry and leak path(s) so that appropriate corrective action can be developed and implemented by the Glazing Subcontractor.
  4. Failure shall be defined as air leakage rate greater than allowable and uncontrolled water penetration as defined in "Performance Requirements" Article of this Specification.
  5. In the event of failure, corrective measures shall be made, and additional testing shall be performed until a passing result is achieved.
  6. All recommended corrective measures (if required) shall be approved in writing by the Architect and/or the Owner's Designated Representative.
    - a. Repair or remove work where test results indicate air/water infiltration of systems.
    - b. Perform additional testing to determine air/water infiltration resistance of replaced or additional work.
    - c. Corrective work and subsequent retesting shall be performed at no additional cost to the Owner. Glazing Subcontractor shall also pay any additional fees and expenses incurred by the Architect, and their consultants.
    - d. Perform an additional test at one new location for each failure, at no cost to the Owner. Glazing Subcontractor shall also pay any additional fees and expenses incurred by the Architect, and their consultants.
    - e. All corrective measures required to pass testing shall be implemented throughout the remainder of the project where applicable.

C. Field Water Hose Testing:

1. Owner will engage an independent, fully accredited testing agency to field test the Work of this Section for water penetration resistance in accordance with the following:
  - a. Water tests shall be performed at the beginning and end stages of installation for each of the following systems:
    - 1) Storefront Fixed Assembly: At least three (3) "initially successful" tests at each of the beginning and end stages of installation.
  - b. When possible, typical and non-typical areas (such as corners) shall be tested for each wall type.
  - c. Wherever possible, test area shall incorporate interface conditions with adjacent cladding systems.
  - d. Interior side of test area shall be left open and unobstructed, permitting the full length of all joints to be examined from the indoor side.
  - e. Water infiltration criteria shall conform to the requirements of Part 1.

- f. Test installed glazing in accordance with AAMA 501.2. Testing shall include:
    - 1) At vertical façade, minimum 35 linear feet, including minimum 15 feet horizontal joints and minimum 10 feet vertical joints. Tested joints must include corner joinery.
  2. In the event of failure, additional field testing in accordance with AAMA 501.2 may be required to isolate the point(s) of entry and leak path(s) for uncontrolled water penetration observed during initial field testing so that appropriate corrective action can be developed and implemented by the Glazing Subcontractor.
  3. Failure shall be defined as uncontrolled water penetration, as defined in “Performance Requirements” Article of this Specification.
  4. In the event of failure, corrective measures shall be made, and additional testing shall be performed until a passing result is achieved.
  5. All recommended corrective measures (if required) shall be approved in writing by the Architect and/or the Owner’s Designated Representative.
    - a. Repair or remove work where test results indicate water penetration of systems.
    - b. Perform additional testing to determine water penetration resistance of replaced or additional work.
    - c. Corrective work and subsequent retesting shall be performed at no additional cost to the Owner. Glazing Subcontractor shall also pay any additional fees and expenses incurred by the Architect, and their consultants.
    - d. Perform an additional test at one new location for each failure, at no cost to the Owner. Glazing Subcontractor shall also pay any additional fees and expenses incurred by the Architect, and their consultants.
    - e. All corrective measures required to pass testing shall be implemented throughout the remainder of the project where applicable.
- D. Field Adhesion Testing for Sealants:
1. Field test joint-sealant adhesion to joint substrates as follows:
    - a. Extent of Testing: Test completed and cured sealant joints as follows:
      - 1) Perform ten tests for the first 1000 feet of joint length for each type of sealant and joint substrate.
      - 2) Perform one test for each 1000 feet of joint length thereafter.
    - b. Tests shall be performed by the sealant manufacturer(s) whose product(s) are being supplied for the sealant joint(s).
    - c. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in ASTM C 1521.
    - d. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
    - e. Inspect tested joints and report on the following:
      - 1) Whether sealants filled joint cavities and are free of voids.
      - 2) Whether sealant dimensions and configurations comply with specified requirements.

- 3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
- f. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- g. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- h. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.11 ADJUSTING, CLEANING AND PROTECTION

#### A. Adjusting:

1. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.

#### B. Protection:

1. Protect exterior glass and exposed aluminum finishes from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
2. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
3. Remove and replace glass that is broken, chipped, cracked, or abraded or that is exposed to weld splatter, permanently etched, damaged from natural causes, accidents, and vandalism, during the construction period.
4. Comply with GANA TD-03-1003 "Construction Site Protection of Architectural Glass" and glass manufacturer's recommendations.
5. Alkaline including ammonia and trisodium phosphate can etch glass.
  - a. Phosphoric and hydrofluoric acids sometimes used to clean concrete can quickly etch glass and should not come in contact with glass, glazing, and frame assemblies.
  - b. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of the Storefront Assembly. Such touch up work shall be done in accordance with manufacturer's instructions as specified herein.

- c. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

C. Cleaning:

1. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer. Clean the glass according to the glass manufacturer's recommendations.
2. Use only glazing gasket lubricants recommended by gasket manufacturers.
  - a. Do not use soap and liquid cleaners, which can etch glass, as lubricants.
3. At completion of installation, clean the work area and the Work of this Section to remove all marks, soiling and the like, according to the glass manufacturer's recommendations.
4. At the completion of all adjacent work by others, including services work, attend the Site, inspect the work areas generally, and repair all damage, complete or make good finishing, trimming and sealing, and replace any damaged or dislodged work
5. Finished work shall be free from defects and mechanical imperfections such as scratches, scrapes, dents, and abrasion.
6. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.12 PROJECT CLOSE-OUT

- A. Repair and Replacement: Repair or remove and replace work that does not conform to specified requirements. Repairs made in one area shall be incorporated into all other similar areas as applicable.
- B. Site Modifications: Finished work that contains unauthorized site modifications, or work not in accordance with the approved shop drawings, or submittals specified herein, may require additional modification in the field, or removal and replacement at no additional cost to the Owner. Any additional calculations and testing required for approval by the Architect shall also be provided at no additional cost to the owner.
- C. Acceptance of the completed installation of the exterior wall system requires that the installation be structurally sound, weather tight, and free from defects of materials and workmanship.

End of Section

Section 08 80 00  
GLAZING**PART 1 – GENERAL**

## 1.1 SUMMARY

- A. The work of this Section consists of glass and glazing work where shown on the Drawings, as specified herein, and as required for a complete and proper installation.
- B. General requirements and definition of glass types for glazing work specified under other individual specifications.
  - 1. Insulated glass in aluminum entrance and storefront.
  - 2. Insulated glass in aluminum curtainwall systems.
  - 3. Bullet resistant glass in bullet resistant aluminum storefront framing system.
- C. Furnish and install the following:
  - 1. Tempered glass in wood and hollow metal doors and frames.
  - 2. Tempered glass in interior aluminum storefront doors and frames.
  - 3. Intruder resistant glass at designated locations.
  - 4. Insulated glass in hollow metal window frames.
  - 5. Fire protective glazing in designated rated doors and frames.
  - 6. Low-iron glass at locations indicated and scheduled.
  - 7. All materials required to properly install glass furnished hereunder, including sealant, tapes, setting blocks, and spacers.
- D. Work of this section includes installation of glazing beads furnished under related sections.

## 1.2 RELATED REQUIREMENTS

- A. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
- B. Section 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS: Procedural and administrative requirements relating to required *Northeast CHPS Verified Program*, (NE-CHPS) Certification.
- C. Section 07 92 00 - JOINT SEALANTS: Requirements for sealants and backing materials.
- D. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: Steel doors, door and window frames, and related glazing stops, for both fire-resistance rated (labeled) and non-rated (labeled) conditions.
- E. Section 08 14 16 - FLUSH WOOD DOORS: Wood doors, and related glazing stops.
- F. Section 08 43 13 - ALUMINUM-FRAMED STOREFRONTS: Storefront framing and doors to receive glazing from this Section 08 80 00.

- G. Section 08 43 15 - BULLET RESISTANT ALUMINUM STOREFRONT FRAMING SYSTEM:
- H. Section 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS.
- I. Section 08 86 00 - FIRE-RATED GLAZING AND FRAMING SYSTEMS: Specialized fire-rated framing and doors systems with fire-resistant glazing.
- J. Section 08 87 00 - GLAZING SURFACE FILMS.
- K. Section 10 28 13 - TOILET ACCESSORIES: Framed mirrors.

### 1.3 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
  - 1. AAMA 804.1 - Ductile Back-Bedding Compound.
  - 2. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
  - 3. ANSI/NFRC 100 – Procedure for Determining Fenestration Product U-Factors.
  - 4. ANSI/NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
  - 5. ANSI/NFRC 300 – Procedure for Determining Solar Optical Properties of Glazing Materials and Systems.
  - 6. ASTM C794 – Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
  - 7. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
  - 8. ASTM C1036 - Standard Specification for Flat Glass.
  - 9. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
  - 10. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
  - 11. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
  - 12. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints.
  - 13. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - 14. ASTM D1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
  - 15. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser.
  - 16. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems.
  - 17. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.
  - 18. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.



19. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
20. ASTM D4585/D4585M - Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
21. ASTM D4977/D4977M - Standard Test Method for Granule Adhesion to Mineral-Surfaced Roofing by Abrasion.
22. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
23. ASTM E546 – Standard Test Method For Frost/Dew Point of Sealed Insulating Glass Units.
24. ASTM E576 – Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position.
25. ASTM E695 - Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
26. ASTM E1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.
27. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
28. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
29. ASTM E2010 – Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
30. ASTM E2074 - Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.
31. ASTM E2188 - Standard Test Method for Insulating Glass Unit Performance.
32. ASTM E2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
33. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
34. ASTM F1233 - Standard Test Method for Security Glazing Materials and Systems.
35. Federal Safety Standards for Architectural Glazing Materials 16CFR1201.
36. FS TT-S-001543A - Sealing Compound, Silicone Rubber Base.
37. GANA Sealant Manual (2008 edition).
38. IGCC: Certified Products Directory, and Certification Guidelines.
39. NFPA Publication 80 - Fire Doors and Windows.
40. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.
41. NFPA 257 – Standard on Fire Test for Window and Glass Block Assemblies
42. SGCC: Certified Products Directory, and Certification Guidelines.
43. UL publication 752 - Test Requirements for Bullet Resistant Equipment
44. UL publication 9 – Standard for Fire Tests of Window Assemblies.
45. UL publication 10B – Standard for Fire Tests of Door Assemblies.

46. UL publication 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.
  47. UL publication 263 – Standard for Fire Tests of Building Construction Materials
- B. Inclusionary References: The following reference materials are hereby made a part of this Section by reference thereto:
1. GANA Laminated Glazing Reference Manual (2019 edition).
  2. GANA - Glazing Manual (50<sup>th</sup> Anniversary edition).
  3. SIGMA - Vertical Glazing Guidelines, Number A3000-87.
  4. Consumer Product Safety Commission (CPSC) 16CFR 1201 Code of Federal Regulations for Architectural Glazing Materials.
- C. Sustainability Requirement Reference: The following sustainability requirements are hereby made a part of this Section by reference thereto:
1. High Performance Schools Exchange, Northeast Energy Efficiency Partnerships NE-CHPS, (referred to herein as “NE-CHPS”).

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Sequencing:
1. Field Measurements
    - a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
    - b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
  2. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Subcontract, have been received and approved by the Architect.
  3. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Glass shall be design by a qualified Professional Engineer, currently licensed in the licensing jurisdiction.
- B. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
1. Structural loads.

2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
4. Glazing systems shall be weather tight and have weather tight interfaces between other exterior wall system assemblies.
5. Dimensional tolerances of building frame and other adjacent construction.
6. Failure includes the following:
  - a. Material failures.
  - b. Deflection exceeding specified limits.
  - c. Thermal stresses transferred to building structure.
  - d. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
  - e. Noise or vibration created by wind and thermal and structural movements.
  - f. De-lamination.
  - g. Sealant failure.
  - h. IG fogging.
  - i. PIB migration.
  - j. Other visual obstructions.

C. Structural Performance

1. Refer to 084313 Aluminum-Framed Storefronts and 084413 Glazed Aluminum Curtain Walls for structural loading requirements.
2. Applicable loads shall be considered in accordance with the load combinations specified by the applicable Building Code. Generally, glass design shall be conducted using ASD load combinations.
3. Insulated glass units (IGU) shall be designed to safely resist any loads due to internal air pressure, altitude, temperature, during production or other related sources creating differential pressures between the cavity and ambient.
4. Unless otherwise defined by Contract Documents, overall thickness of each glass type, and component thicknesses of multiple layer glass types, shall be determined by analysis of project loads and in-service conditions, and consistent within adjacent window systems. Glass strength and thickness for vertical and sloped glazing shall conform to the applicable Building Code and ASTM E1300.
  - a. When subject to specified loading, minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst case Probability of Breakage (POB) does not exceed the following:
    - 1) Lites up to 15deg from Vertical: 8/1000
    - 2) Sloped Lites 15deg or more from Vertical: 1/1000
5. When ASTM E1300 does not apply, provide additional project specific engineering for structural glass applications.
6. Effects of interlayers shall be taken into account for analysis of laminated glass. Unless demonstrated otherwise interlayer properties shall be taken at:

- a. 50°C.
  - b. The appropriate load duration for the loads under consideration.
  - c. Effects of ceramic frit shall be taken into account using a reduction factor, confirmed by the fabricator, on allowable glass stress for affected areas. Where glass is point supported, ceramic frit pattern design shall be coordinated to prevent strength reduction at areas of high stress concentration.
7. Where differential shading within individual glass lites is present, design glass to resist associated thermal gradients and stresses.
  8. Provide safety glass where required by load, code, and/or thermal effect.
  9. Allowable Glass Deflections:
    - a. Glass load duration factors shall not be applied for determining deflections.
    - b. Wind loads for glass center deflection may be reduced to 10-yr reoccurrence values if permitted by glass manufacturer. Wind loads may not be reduced for glass edge deflections.
    - c. Center Deflection of 4 side supported Vertical Glass Lites:
      - 1) Glass center deflection relative to glass edges at 100 percent of specified design pressures shall not exceed L/60 of its clear span, or 1-inch maximum, where L is the shortest edge length.
    - d. IGU Pillowing: Deflection of exterior lite due to changes in cavity temperature and pressure shall be limited to the lesser of D/1000 or 5mm, where D is the diagonal dimension of the panel.
  10. Where heat treatment is required, fully tempered glass shall only be used where increased material capacity is required as demonstrated by calculation. Heat strengthened preferred when possible.
  11. IGU Secondary Seal Design:
    - a. Comply with 079200 Joint Sealants, 084313 Aluminum-Framed Storefronts and 084413 Glazed Aluminum Curtain Walls.
    - b. Where insulating glass is structurally silicone glazed, tensile stress at narrowest point of secondary seal shall not exceed 20 PSI (0.138 MPa) at outward design wind pressure.
    - c. Provide IGU secondary seals with structural bite adequate to restrain the glass at 100% of the design loads without exceeding sealant allowable stress. Silicone shall not fail when tested to 1.5 times design pressures and loads according to ASTM E330.
    - d. Structural silicone of IGU secondary seals shall not fail when subjected to a racking test (AAMA 501.4).
    - e. Verify that frit extended to glass edge to obscure visibility of spacer bars will not interfere with bond, long-term durability and performance of IGU seals.
- D. Thermal movements:
1. Comply with Section 084313 Aluminum-Framed Storefronts and 084413 Glazed Aluminum Curtain Walls

## 1.6 SUBMITTALS

- A. Submit the following according to Conditions of the Construction Contract and Division 1 Specification Sections.
1. Submissions shall be complete and comprehensive and include all shop drawings, samples, material data submissions, and engineering calculations for each glazing system specified herein, and shall include fully coordinated interface details between each glazing system and the adjacent construction such that air/moisture barrier continuity between the materials, components and systems that comprise the above-grade building envelope can be reasonably evaluated by the Architect-of-Record against the design intent of the contract documents. All work shall be coordinated by the General Contractor prior to submission. Incomplete, non-conforming, or uncoordinated submissions shall be subject to rejection or return without action by the Architect.
  2. Each submittal shall be dated, signed, and certified by the Glazing Subcontractor, as being correct and in strict conformance with the Contract Documents. In the case of Shop Drawings, each sheet shall be dated, signed, and certified. No consideration for review by the Architect of any Glazing Subcontractor submittal will be made for any items which have not been so certified by the Glazing Subcontractor. All non-certified submittals will be returned to the Glazing Subcontractor without action taken by the Architect, and any delays caused by thereby shall be the total responsibility of the Glazing Subcontractor.
  3. Analysis: All requirements specified herein shall be analytically and mathematically proven, except for those requirements called for to be proven exclusively by physical testing methods. Calculations and related data and their application in engineering, fabrication, assembly, and installation shall be the responsibility of the Glazing Subcontractor's registered Professional Engineer.
  4. In addition to the performance requirements herein, the Glazing Subcontractor shall provide, for Architect's approval, physical samples for the review of the materials' visual appearance. If approved, materials shall be permitted to be used for the Work of this section.
- B. Product Data: For each glass product and glazing material indicated, including test data, manufacturer's quality assurance documentation, and preparation and installation recommendations. Also include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
1. Include product data for:
    - a. Each glass type, including optical data as necessary to demonstrate compliance with performance requirements herein.
    - b. All proprietary accessories.
    - c. Applied finishes, including preparation and pre-treatment, application, curing, and maintenance procedures.
    - d. Submit safety glazing letter from manufacturer. Permanent etched safety label on glass shall not be permitted unless required by code.
      - 1) The method of packaging and identifying the BIPV roof panels shall be specified. Identification shall include the evaluation report number and notice of any product installation limitations.

- C. Glass Samples: For each type of glass product and the following products; 12 inches (600 mm) square.
  - 1. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
  
- D. Glass / Glazing Analysis and Engineering Calculations
  - 1. Comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified Professional Engineer responsible for their preparation.
  - 2. The glass analysis shall clearly demonstrate the following:
    - a. The statistical POB for each glass type at the design loads and combinations will not exceed the specified statistical POB.
    - b. For the specified service temperature range, the effects of partial and full shading on the glass and thermal stress gradients have been accounted for. Append to the thermal stress analysis a statement from the glass manufacturer that based upon this analysis the resulting thermal stresses will not reduce the specified statistical POB for other load combinations.
    - c. Glass deflections are at or below allowable for each load combination.
  - 3. Submit certification from the glass manufacturer that the glass manufacturer has reviewed all glazing details and thicknesses and finds same suitable for the purpose intended in accordance with these specifications.
  - 4. For structural silicone glazing, submit stress analysis for structural sealant used for IGU secondary seals. Append to the silicone analysis a certification from the sealant manufacturer stating that they have reviewed all sealant details and that when exposed to the specified loads the stress in the silicone sealant of dimensions shown does not exceed manufacturer's recommendations.
  - 5. All calculation sheets shall be of one size and submission shall bear the seal of a Professional Engineer currently licensed in the licensing jurisdiction.
  
- E. Thermal Performance Calculations
  - 1. Submit calculations and/or test data demonstrating solar shading and thermal transfer values across glass assemblies.
  
- F. Qualification Data: For Glazing Subcontractor, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency, and sealant testing agency.
  
- G. Product Certificates: For glass and glazing products, from manufacturer.
  
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass, glazing sealants, and glazing gaskets.
  
- I. Preconstruction adhesion and compatibility test report.
  
- J. Materials testing reports
  - 1. Insulating Glass sealant: Submit compatibility test report from manufacturer of insulating glass edge sealant and coated glass manufacturer indicating that glass edge sealants and coated glass were tested for compatibility with other

- glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.
2. Fully tempered glass: Submit EN 14179 test report for fully tempered glass.
  3. Laminated Glass interlayer: Submit compatibility test report from manufacturer of interlayer indicating that interlayer was tested for compatibility with glazing sealants.
- K. Submit Manufacturers' Quality Assurance Inspection and Production Testing Programs
1. Inspection and production testing programs are subject to the Owner's Representative's approval.
  2. Submit detailed description of inspection and production testing programs and inspection reports for:
    - a. Float Glass
    - b. Laminated Glass
    - c. Insulating Glass Units Fabrication
    - d. IGU Secondary Seal
- L. Installation procedures manual:
1. Submit a comprehensive manual containing all installation procedures, equipment and personnel required for acceptance prior to the commencement of installation works. Comply with requirements in "Quality Assurance" Article.
- M. Warranties: Sample of special warranties.
- N. Hazardous Materials Notification: In the event no product or material is available that does not contain asbestos, PCB or other hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.
- O. Asbestos and PCB Certification: After completion of installation, but prior to Substantial Completion, Glazing Subcontractor shall certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB), using format in Division 1 Section "Closeout Procedures".

## 1.7 QUALITY ASSURANCE

- A. The work of this section shall be performed by a company which specializes in the type of glass and glazing work required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workmen thoroughly experienced in the necessary crafts.
1. Work shall be performed in compliance with Owner's insurance underwriters' requirements and UL approvals and testing for materials, assemblies, and procedures.
- B. Manufacturer shall have the facilities capable of meeting all requirements of Contract Documents as a single-source responsibility and warranty.
- C. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

- D. Glazing Subcontractor Qualifications: A qualified Glazing Subcontractor who employs glass subcontractors for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- E. Manufacturers and suppliers of all materials and components of the Work of this Section are subject to approval by the Architect.
- F. All products and individual or aggregate components of the Exterior Wall Systems for which acceptable engineering or test data are not available shall be physically tested.
- G. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- H. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- I. Source Limitations for Glass: Obtain glass from single source, from single manufacturer, from a single facility for each glass type.
- J. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- K. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 °F, and the fire-resistance rating in minutes.
- L. The Certification Entities shall be accredited as operating in compliance with International Standards Organization (ISO) or similar agency authorized or otherwise qualified and accredited to provide periodic, independent review and certification of each Certification Agency's Quality Assurance program.
- M. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual".
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines".
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing".
  - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use".
- N. Production testing programs for insulating glass:
  - 1. IGMA TM-3000 North American Glazing Guidelines for Sealed Insulating Glass for Commercial and Residential Use.
  - 2. IGMA TM-4000 insulating glass manufacturing quality procedures technical manual.



3. The IG Certification Program shall require mandatory IG testing by its program participants at least once every 2 years utilizing independent testing laboratories that are accredited to ISO 17025 for the applicable IG testing procedures.
  4. The IGC Entity shall perform at least two (2) audits of its certification program participant's IG fabrication facilities per year.
  5. Minimum Requirements for Certified IG Products. The IGC Program shall require IG Products submitted for certification to meet the following requirements:
  6. Comply with the requirements of ASTM E2190.
  7. Comply with ASTM C1249 and ASTM C1369 for IGU secondary edge seals.
  8. Establish proof of gas content to a minimum initial 90% insulating gas fill content and a minimum of 80% insulating gas fill content following completion of respective IG durability testing. Demonstration of gas content for argon shall qualify other gases provided the same gas filling method is used.
- O. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- P. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- Q. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Provide full sized glass samples for each exterior glass types. Glass samples to be reviewed at glass fabrication facility.
  2. Install glazing in mockups as specified in Section 084400 "Curtain Wall and Glazed Assemblies" to match glazing systems required for Project, including glazing methods.
  3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- R. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings". Review methods and procedures related to glazed steel and aluminum exterior wall system including, but not limited to, the following:
1. Review and finalize construction schedule and verify availability of materials, Glazing Subcontractor's personnel, equipment, and facilities needed to make progress and avoid delays.
  2. Review temporary protection requirements for glazing during and after installation.
  3. Review and discuss condition of substrate and other preparatory work performed by other trades.
  4. Review structural loading limitations.

5. Review and finalize construction schedule and verify availability of materials, Glazing Subcontractor's personnel, equipment, and facilities needed to make progress and avoid delays.
  6. Review required inspecting, testing, and certifying procedures and coordinate with installation schedule and work of individual trades to avoid delays in the Work.
  7. Review weather and forecasted weather conditions, and procedures established to mitigate the impact of unfavorable weather conditions on the quality and progress of the Work.
- S. Quality control measurements (pre-construction):
1. Bow and Warp Distortion (Flatness) Tolerance:
    - a. Prior to the visual observation by the Architect and Owner of the preconstruction glass mockups, measure each mockup lite for bow and warp in accordance with ASTM C 1048. Measure the lites on a vertical plane with an aluminum straight edge or fishing line.
      - 1) Measure the mockup glass lites for compliance with the bow and warp tolerances under Article "Heat-Treated Float Glass".
    - b. Document and record results for each glass lite. Tag each glass lite that falls outside of the maximum bow and warp limits and certify that these non-conforming glass lites will not be incorporated into the Work.
      - 1) Provide written documentation of the bow and warp readings in fractions of an inch or millimeters for each mockup glass lite to the Owner and Architect at the preconstruction glass mockup meeting. Provide additional written documentation as requested by the Owner and Architect.
  2. Roll Ripple Distortion (Flatness) Tolerance:
    - a. Prior to the visual observation by the Architect and Owner of the preconstruction glass mockups, measure each monolithic ply in the mockup containing heat-treated glass using a LiteSentry Osprey Series or similar optical scanning measurement device complying with ASTM C 1652.
      - 1) Measure the monolithic mockup glass lites for compliance with the flatness tolerances under Article "Heat-Treated Float Glass".
    - b. Document and record results for each glass lite. Tag each glass lite that falls outside of the maximum flatness limits and certify that these non-conforming glass lites will not be incorporated into the Work.
      - 1) Provide written documentation of the flatness readings in fractions of an inch, in millimeters, and in millidiopters, for each mockup glass lite to the Owner and Architect at the preconstruction glass mockup meeting. Provide additional written documentation as requested by the Owner and Architect.
  3. Color Tolerance:
    - a. Prior to the visual observation by the Architect and Owner of the preconstruction glass mockups, measure each monolithic mockup glass unit using a spectrophotometer. Color measurement shall be taken from the uncoated side.
      - 1) Tolerance limits for the color variation shall be as accepted on the visual mockup.

- 2) Color variation of glass lites shall not exceed 1 .5  $\Delta E_{00}$  (CIEDE2000) as defined by ASTM D2244.
  - 3) Transmitted and reflected color for all coated glass shall be consistent and fall on the same side of the neutral axis of the color spectrum as defined in ASTM D 2244.
- b. Document and record results for each glass unit. Tag each unit of glass that falls outside of the color variation limits and certify that these non-conforming glass units will not be incorporated into the Work.
- T. Quality Control Measurements (Production): As a minimum, provide the following quality control measurements for the exterior glass units:
1. Bow and Warp Distortion (Flatness) Tolerance:
    - a. During the production of the heat-treated glass lites, measure for bow and warp in accordance with ASTM C 1048. Measure the lites on a vertical plane with an aluminum straight edge or fishing line.
      - 1) Measure the monolithic glass lites for compliance with the bow and warp tolerances under Article "Heat-Treated Float Glass", unless otherwise accepted by the Owner and Architect at the preconstruction glass mockup.
    - b. During glass production, and once an hour, randomly select a single heat-treated glass lite and measure it. Document and record results. Tag each glass lite that falls outside of the maximum bow and warp limits and certify that these non-conforming glass lites were not incorporated into the Work.
    - c. Provide written documentation of the bow and warp readings in fractions of an inch or millimeters for each tested glass lite to the Owner and Architect, if requested. Provide additional written documentation as requested by the Owner and Architect.
  2. Roll Ripple Distortion (Flatness) Tolerance:
    - a. During the production of the heat-treated glass lites, measure each low monolithic glass lite using a LiteSentry Osprey Series or similar optical scanning measurement device complying with ASTM C 1652.
      - 1) Measure the monolithic glass lites for compliance with the flatness tolerances under Article "Heat-Treated Float Glass", unless otherwise accepted by the Owner and Architect at the preconstruction glass mockup.
    - b. Document and record results for each glass lite. Tag each glass lite that falls outside of the maximum flatness limits and certify that these non-conforming glass lites were not incorporated into the Work.
      - 1) Provide written documentation of the flatness readings in fractions of an inch, in millimeters, and in millidiopters, for each glass lite to the Owner and Architect, if requested. Provide additional written documentation as requested by the Owner and Architect.
  3. Color Tolerance: During production, test monolithic coated and coated insulating glass units for color compliance as follows:
    - a. Establish a color target selected from the accepted pre-construction glass mockup unit(s) and perform quality control color control checks using a spectrophotometer. Examples of acceptable off-line devices include Minolta 2500d/2600d; examples of acceptable on-line devices

- include Benchmodel Spectrophotometers. Color measurement shall be taken from the uncoated side.
- b. Frequency: Test a minimum of one unit every hour.
  - c. Document and record results for each glass unit. Tag each unit of glass that falls outside of the color variation limits and certify that these non-conforming glass units will not be incorporated into the Work.
4. Insulating Glass Unit Requirements: During production, test insulating glass units as follows:
- a. Butterfly Unit Adhesion Pull Testing:
    - 1) Adhesion Criteria: Comply with the pass/fail requirements of the sealant manufacturer's published guidelines and/or sealant manufacturer's certification audit requirements/recommendations. Minimum pull back to 30° from horizontal with no adhesive failure.
    - 2) Frequency: Test one minimum 24-by-36-inch (600 x 900-mm) size unit each eight-hour shift and after each sealant drum change.
    - 3) Test units shall be fabricated on the same production line and processing equipment and with the same spacers and sealant used in the production of the insulating glass units fabricated for the Project.
  - b. Desiccant Temperature Rise Testing:
    - 1) Test Criteria: Comply with the desiccant manufacturer's written recommendations.
    - 2) Frequency: Test a minimum of once every eight-hour shift and after each drum change.
  - c. Air Space Measurement Concave/Convex:
    - 1) At time of fabrication, measure center cavity dimension on all units. Dimension shall be within +/- 1/16" of nominal. Document and record results for each glass lite. Visually check each unit. Tag each glass lite that falls outside of the limits and certify that these non-conforming glass lites were not incorporated into the Work.
    - 2) Provide written documentation of the air space measurement readings in fractions of an inch or millimeters for each tested glass lite to the Owner and Architect, if requested.
  - d. Skips and voids in the primary or secondary seals are not acceptable and maximum gap at primary/secondary seal interface shall be 1 inch (25.4 mm) in length and 1/16 inch (1.59 mm) in width.
  - e. Document and record results. Provide additional documentation upon request by the Owner or Architect.
- U. Manufacturer's identification tags or marks are not acceptable on surfaces which will remain exposed to view after installation.
- 1. Evidence of "patching" after removal of tags or marks is not acceptable.
- 1.8 MOCK-UPS
- A. Provide glazing for mock-ups under provisions of Section 01 43 39 – MOCK-UPS.
- 1.9 DELIVERY, STORAGE AND HANDLING
- A. Delivery and Acceptance Requirements:

1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  2. Deliver materials in labeled, protective packages, when and as required.
- B. Storage and Handling Requirements:
1. Store and handle in strict compliance with manufacturer's instructions and recommendations of GANA Glazing Manual. Use clean gloves and tools when handling materials, avoid contamination. Use rolling blocks and suction cups to move glass units not in shipping crates.
    - a. Carefully store materials to avoid overloading any building component or structure.
    - b. Do not unpack material until it is to be set, unless un-packing is required for inspection by the Architect.
    - c. Comply with insulating-glass manufacturer's written recommendations for venting units to avoid hermetic seal ruptures due to temperature and pressure changes within airspace.
  2. Store mirrors and coated glass in a dry place with acid-free paper between glass sheets.
  3. Protect factory finished materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.

#### 1.10 SITE CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees Fahrenheit.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

#### 1.11 WARRANTY

- A. General: Submit the following warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS, and in compliance with Section 01 78 36 – WARRANTIES.
  1. Warranties shall be effective starting from Date of Project Substantial Completion and are effective for specified term lengths.
- B. Manufacturer Warranty/Guarantee: All shall include replacement of defective glass and mirrors, and delivery of replacement glass products furnished f.o.b. from point of manufacturer to project site.
  1. Laminated glass: Manufacturer's 10 year written guarantee covering against defects in materials and workmanship of laminated glass and replacement of the same. Warranty shall be effective from date of original factory shipment to site.
    - a. Provide coverage in Guarantee for manufacturing defects, including failure of laminated glass units as evidenced by edge separation, delamination, or discoloration of inner layer.
  2. Insulating Glass: Manufacturer's 10 year written guarantee covering insulating glass against defects in materials and workmanship, including failure of seals effective on date of original factory shipment to site.

- a. Provide coverage in Guarantee for manufacturing defects, including failure of hermetic seal of air space (except by glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating or other visual indications of seal failure or performance.
3. Manufacturer's Special Warranty for Coated and Fritted Glass Products: Manufacturer's standard form in which coated or fritted glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated or fritted glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning the glass contrary to manufacturer's written instructions. Defects include peeling, cracking, fading, and other indications of deterioration in coating or frit.
  - a. Warranty Period: 10 years from date of Substantial Completion."

## PART 2 - PRODUCTS

### 2.1 GLASS PRODUCTS

#### A. General

1. In order to reduce the possibility of glass color range rejection, the supplier of float (primary) glass products shall provide glass for the entire Project from a single facility using stockpiled batch run materials from a single source for the entire Project.
2. All glass shall be prefabricated and delivered in the required sizes. No field modifications shall be allowed.
3. All exposed edges shall be arrissed and polished unless specifically indicated otherwise on the Drawings.
4. Thickness: Where glass thickness is indicated, it is a nominal thickness. Provide glass lites in thicknesses as needed to comply with requirements indicated.
5. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
6. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - a. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  - b. U-Factors: Center-of-glazing values, according to NFRC 100 and based on current version of LBNL WINDOW computer program, expressed as Btu/sq. ft. x h x °F.
  - c. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on current version of LBNL WINDOW computer program.
  - d. Optical Properties: Center-of-glazing values, according to NFRC 300.

- B. Annealed float glass: ASTM C1036, Type I (transparent flat glass), Quality-Q3; of Class I amended as follows: Except for skylights, glass surfaces with detectable linear blemishes that exceeds "Light Intensity" according to Table 4 in ASTM C1036 will not be accepted.
1. Glass dimensional tolerances shall be 50% of those specified by ASTM C1036.
  2. In addition to the limitations included under ASTM C 1036, all glass shall be supplied meeting the following quality standards:
    - a. A maximum of 3 acceptable scratches/rubs are allowed.
    - b. Water blow-off stains, tag residue, and handprints will not be permitted.
  3. Ultra-Clear (Low-Iron) Float Glass: Minimum 91 percent visible light transmission.
- C. Heat treated float glass: ASTM C 1048, Type I (transparent flat glass), Quality-Q3; of class indicated, of kind and condition indicated. All heat strengthening and tempering shall be by the horizontal process, with IG units fabricated in such a manner as to have all roller distortion in a horizontal direction as installed in the building.
1. The minimum surface and edge compression shall comply with requirements of ASTM C 1048.
  2. Requirements of ASTM C 1048 listed for 6mm HS glass shall also apply for greater thicknesses.
  3. Fully Tempered glass shall conform to ANSI Z97.1.
  4. Fully tempered glass shall be 100% heat soak tested per EN 14179-2016 in calibrated oven.
    - a. Unless otherwise specified, all fully tempered glass shall be heat soaked to minimize the occurrence of nickel sulfide (NiS) crystals. This process shall be strictly controlled and carried out to EN 14179 paying particular attention to the temperature and duration of treatment.
    - b. Records must be kept of heat soaking for each batch for QA/QC purposes and made available to the Architect on request. Such records shall include, as a minimum, the following:
      - 1) Traceability of glass, i.e. source of supply and evidence of batching.
      - 2) Dates of tempering/heat soaking.
      - 3) Certification that the glass will meet the performance requirements of this Specification.
      - 4) Records to include details of all units that failed during the heat soak test.
    - c. Responsibility for NiS Inclusions:
      - 1) Where glass is heat soak tested, failure due to NiS at a rate greater than 5 broken plies per 1000 represents a bad batch of glass, and Glazing Subcontractor shall replace, at no cost to the owner, all panels broken as a result of NiS.
      - 2) A ply is a single sheet of un-laminated glass.
  5. Glass flatness tolerances shall conform to the following:
    - a. Maximum Overall Bow: 0.2% of smallest edge length, or 50% of ASTM limits whichever is more stringent.
    - b. Localized bow in any direction, and corner/edge lift/dip/curl:

- 1) Heat strengthened glass: 0.012" (0.3mm) over a length of 12" (300mm), or 50% of ASTM limits whichever is more stringent.
  - 2) Fully tempered glass: 0.02" (0.5mm) over a length of 12" (300mm), or 50% of ASTM limits whichever is more stringent.
- c. Roller Wave: The Glazing Subcontractor shall state in his Submission his proposals to control the extent of roller wave, if any. The Glazing Subcontractor shall provide full size samples of all specified heat strengthened and toughened glass to signify the range of bowing and roller wave throughout the works, prior to commencing production of the glass.
- 1) Peak to valley deviation shall not exceed: 0.003" (0.08mm) at non-edge locations.
  - 2) Maximum of 0.008" (0.2mm) within 10.5" of the leading or trailing edge.
  - 3) The average roller wave distortion shall be certified not to exceed 0.002" (0.05mm).
  - 4) Must be coordinated so that the orientation of the roller waves is horizontal throughout the Contract Works.
- d. Millidiopter Criteria:
- 1) 1/4", 5/16", and 3/8" Thicknesses: 95% of all measurements for a single lite shall be less than 100 millidiopeters.
  - 2) Other Thicknesses: 95% of all measurements for a single lite shall be less than 125 millidiopeters.
  - 3) In no case shall the millidiopter reading for a single lite exceed the 95% fractile measurements of the approved visual mockup glass.
- e. Fabricator Quality Control: Test all heat treated glass for distortion.
- 1) Test Method: GANA "TD 04-03-26 Standard Test Method for In Plant Measurement of Roll Wave in Heat Treated Architectural Glass", or ASTM C 1651 and C 1652.
6. Assessment of visual quality appearance for anisotropy (Visual Quality Glass Samples):
- a. Appearance against anisotropy will be assessed by one full size glass samples (typical size) for primary coating and glass type configuration and thicknesses to be supplied by the Glazing Subcontractor. These samples are offered for review to the Architect, the Façade Consultant, General Contractor and Client's Representative.
    - 1) Light conditions: normal daylight (not direct sunlight), and exposed to sky so anisotropy can be considered. Viewing in boxes with artificial or overcast lights is not permitted.
    - 2) Viewing position: room side for transmission, outside for reflection. The glass sample shall be placed on a movable platform able to rotate 360° to assess the conditions under different light conditions and orientations.
    - 3) Viewing distance for light transmission, reflection and any defects: 1 meter at eye level for any monolithic, laminated, double glazed and coated glass.
    - 4) Viewing angle: any angle.
    - 5) Time limit for assessment: 1 week.
  - b. Once the samples will be approved, then they are to be marked (signed) by the Architect, the Façade Consultant, the General Contractor and the



Client's Representative and photographed, with copies of the photographs to be retained by all parties. The accepted samples shall be kept on site as a control sample. Records of the production equipment and process parameters used to produce the visual quality samples shall be retained by the glass processor for reference throughout the project.

- c. The Glazing Subcontractor shall select the glass suppliers for this project to obtain improved quality standards and minimize the effect of anisotropy. Excessive anisotropy may not be permitted following a review of the above Visual Quality Glass Samples by the Architect, the Façade Consultant, and Client's Representative.
  - d. Should the Architect or the Client's Representative not approve the proposed visual quality glass samples due to optical phenomena, then the Glazing Subcontractor has to propose an alternative solution to satisfy the Architect's aesthetic aspirations (ie. switching to thicker annealed glass instead of heat treated glass): any cost or time implications will be at the Glazing Subcontractor's expenses.
7. Orange peel or Heat speckle: Surface defects on the upper face of heat treated glass that appears in reflection as a scattering of irregular dimples of similar size which causes a general blurring of the image when looking through the glass, are not permitted.
  8. Longitudinal Fine Waves (LFW): Defects in the region of 1 micron amplitude and around 20 mm in wavelength, are not permitted.
  9. Dish: Any oval or elliptical dish as an effect of overheating the glass and in the quench or other manufacturing causes is not permitted.
  10. White Haze: Fine mechanical scratching or contamination of small particles caused by some faults from the tempering line (dust in the rollers, non flatness of the rollers, etc...) are not permitted.
  11. Roller Pick-up or Roller Marks: Surface defects on the lower face that appear as elongated dimples (that can often be seen at regular intervals equal to the roller circumference) are not permitted.
  12. Kind: Kind CV (coated vision glass), except that Kind CO coated overhead glass may be used where the lower edge of the glass is more than 6 feet above the adjacent floor level or cannot be approached closer than 10 feet.
- D. Low-e and Reflective Coatings
1. Low-Emissivity coating(s) shall be neutral in transmitted and reflected color and otherwise exhibit the visual and performance characteristics of the products specified herein as well as in accordance with ASTM C 1376.
  2. Low-E coatings shall typically be applied through the MSVD (magnetic sputter vacuum deposition) process.
  3. Visual quality control acceptance criteria of the low-E coating shall be consistent with industry guidelines, subject to approval of the Architect.
    - a. Pinholes with diameters in excess of 1/16 inch are not acceptable. Acceptable pinholes shall be separated by 12 inches minimum.
    - b. Scratches no longer than 3 inches in length are acceptable provided that they occur within 3 inches of an edge. Acceptable scratches shall be limited to 3 inches maximum in length separated by 36 inches minimum. Concentrated scratches or abraded areas are not allowed.
  4. Provide edge deletion of low-e coating to ensure proper seal in insulating unit.

5. Color variation of glass lites shall not exceed 1 .5  $\Delta E_{00}$  (CIEDE2000) as defined by ASTM D2244.
6. All coated glass on entire project to be manufactured in a single production line to ensure uniform coating.
7. Low-e coating uniformity to be maintained for all glass in each type of application. When viewing adjacent coated glass units, significant visible color variation from a minimum distance of 10 feet, shall not be apparent. Provide samples that establish range of color variation for review during submittal process.
8. Transmitted and reflected color for all coated glass shall be consistent and fall on the same side of the neutral axis of the color spectrum as defined in ASTM D 2244.
9. The coating shall be as approved by the Architect.
10. Edge deletion of reflective and low-e coatings shall be provided at all insulating glass and structural silicone glazing unless manufacturer submits test data acceptable to the Architect indicating that edge deletion is not required. Width of edge deleted zone of reflective and low-e coatings shall be to the centerline of PIB primary seal and sufficient to prevent corrosion due to vapor migration through secondary edge seal.
11. Low-e coating uniformity to be maintained for all glass in each type of application. When viewing adjacent coated glass units, significant visible color variation from a minimum distance of 10 feet, shall not be apparent. Provide samples that establish range of color variation for review during submittal process.

E. Ceramic Frit Coating on Glass

1. All ceramic frit coated glass shall be heat-strengthened (Kind HS) and meet the requirements specified herein, but in no case less than the minimum requirements of ASTM C 1048.
  - a. Glazing Subcontractor to confirm adequacy of strength design of glass for ceramic frit coated glass.
2. Ceramic frit color is subject to approval by the Architect.
3. Visual Quality Control acceptance criteria of the ceramic fritted surface shall be consistent with industry guidelines, subject to approval by the Architect.
4. Patterns shall be located not more than 1/16 inch [1.5 mm] off parallel from the locating glass edge.
  - a. Frit shall be evenly applied and consistent in tone. Where indicated provide custom ceramic frit on interior surfaces of glass lites.
5. For dual image frits, the stacking tolerance is 0.002" maximum.

F. Glass edges

1. Structurally glazed glass edges shall be seamed.
2. Butt glass edges shall be seamed and ground (matte finish).
3. Exposed edges, such as at corners, shall be arissed and polished.
4. Hidden edges shall be seamed.
5. All edges of structural glass shall be arissed and polished.
6. Acute corners to receive treatment in accordance with glass manufacturer's recommendations.

7. All glass edges shall conform to the following requirements:
    - a. Shark teeth shall not penetrate more than 25% the glass thickness.
    - b. Serration hackle shall not penetrate more than 10% of the glass thickness.
    - c. Flare shall not exceed 1/16" as measured perpendicular to the glass surface at the edge.
    - d. Bevel shall not exceed 1/16".
    - e. Flake chips shall not exceed 1/32" in length or 1/4" in diameter.
    - f. Rough chips exceeding the dimensions listed for flake chips above shall not be permitted.
  8. Cutting:
    - a. Edges may be wheel cut or sawed and seamed at manufacturer's option.
    - b. Do not cut, seam, nip, grind, or abrade heat-treated glass.
  9. Laminated Glass Edges
    - a. All interlayers at exposed laminated glass edges to be hot-knife trimmed for a clean consistent appearance. No interlayer fragments shall be permitted on the exposed glass edges.
    - b. Glass to be stacked racked or otherwise supported during lamination process to ensure no dust or other debris contaminates the interlayer.
    - c. No delamination shall be permitted.
    - d. Allowable edge offset:
      - 1) Edge length less than 80" (1000mm):  $\pm 0.04$ " (1.0mm).
      - 2) Edge length greater than 80" (2000mm):  $\pm 0.08$ " (2mm).
      - 3) When edge of glass is visible the edges of the laminated glass plies shall be flush and level  $\pm 0.04$ " (1.0mm).
      - 4) Interlayer snap-back to be less than 0.08" (2mm).
- G. Insulating Glass
1. Insulating glass: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified. Units shall be fabricated using the dual-seal system, consisting of two lites of glass with a primary seal of extruded polyisobutylene, and a secondary seal of structural silicone, color to be approved by Architect.
  2. Insulating glass units shall be certified by IGMA and shall comply with ASTM E 2188 and E 2189.
  3. Insulating glass shall not experience fogging, wetting or staining within the sealed space, spacer corrosion, spacer migration, adhesive or cohesive failure of primary or secondary edge seal.
  4. Insulating glass shall not experience decrease in the air space dimension due to chemical reaction of desiccant with entrapped air. Size of insulating glass spacer shall be calculated according to the pressure differential of the inboard and outboard glass sheets in opposite directions of each unit to prevent contact between the glass sheets in the center of the large insulated glazing units.
  5. The insulating glass dimensional tolerances shall conform to the following:
    - a. Edge length: +0.12" (3mm), -0.08" (-2mm).

- b. Thickness (with tempered glass): +0.08" (2mm), -0.06" (-1.5mm).
    - c. Thickness (with laminated glass): ±0.06" (1.5mm).
  6. Primary sealant contact width between spacer and glass shall be as tested per ASTM E 2188, +/- 1mm, with a 2mm minimum dimension, and continuously applied on four sides, including corners.
  7. The lites comprising insulating glass units shall be heat treated or laminated where required to meet loading or safety glazing requirements, or as recommended by the specified glass fabricator to insure against breakage due to thermal stress and to assure adequate glass performance at the specified design pressures specified under the performance criteria herein.
  8. IGU Spacers
    - a. The spacer shall be made of stainless steel 'warm edge' spacers and shall be finished black or natural silver to meet the Performance Requirements article indicated herein and Section 084400. Color to be confirmed by Architect. Glazing Subcontractor shall demonstrate compliance to BS EN 1279 part 2 and 3 for moisture penetration and gas leakage prior to assembling the units: this compliance must be proven by testing the exact project glazing and framing conditions.
    - b. Aluminium spacers, butyl spacers (ie TPS), silicone spacers or structural foam spacers (such as "superspacers") are not to be used.
    - c. The spacers shall be continuous, with bent corners and welded joints to ensure integrity of the seal. Where composite spacers are required due to thermal requirements, the use of corner joints fabricated in accordance with suppliers recommendations are acceptable.
    - d. The spacer shall contain desiccants to minimize any risk of condensation. Any spillage of the desiccant into the cavity during unit manufacturing, transportation or installation is not permitted. The Glazing Subcontractor shall assess any desiccant spillage issues prior to erection and replace the glass panes.
    - e. The spacer shall be:
      - 1) Height up to 10 feet: within +/- 1mm of nominal position.
      - 2) Height up to 20 feet: within +/- 2mm of nominal position.
      - 3) Height up to 30 feet: within +/- 3mm of nominal position.
    - f. For IGUs with an edge length of less than 20 feet, there will be one butt joint in the spacer. For IGUs from 20 to 40 feet, there will be a maximum of 2 joints. Joint layout in warm edge spacers to be submitted for approval.
  9. The silicone edge seal of the IGU shall be selected from manufacturer's standard color options as approved by Architect.
  10. Desiccant: Molecular sieve or silica gel, or blend of both.
- H. Low-Iron Glass: Low-iron soda-lime float glass, fully tempered safety glass, in 1/4 inch thickness, except as otherwise indicated.
  1. Performance criteria for 1/4-inch (6mm) thickness glass:
    - a. Visible Light Transmittance: minimum 90 percent.
    - b. Reflectance Visible Light: 8 percent.
    - c. U-V transmission: minimum 85 percent.
    - d. Solar Heat Gain Coefficient (SHGC): 0.90.

2. Acceptable Products: Subject to compliance with requirements, provide one of the following, or approved equal:
  - a. AGC Industries, product "Krystal Klear".
  - b. Guardian Industries, product "Guardian Ultra White".
  - c. UltraGlas Inc., product "Low-Iron Glass", formerly "Starphire".
  - d. Pilkington North America, product "Optiwhite".
  - e. Vitro Architectural Glass, product "Starphire Ultra-Clear".
3. Sole Source: All low-iron glass incorporated into the work shall be from single source and same product.

## 2.2 LOW-E COATINGS

- A. Low-Emissivity Coatings (Low-E): Magnetron Sputter Vacuum Deposition (MSVD) thin film "Sputter coatings" in compliance with specified performance requirements.
  1. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering MSVD Low-E coatings include the following, or approved equal:
    - a. AGC Glass Company North America, Alpharetta GA.
    - b. Cardinal Glass Industries, Inc., Eden Prairie MN.
    - c. Guardian Glass LLC, Auburn Hills, MI.
    - d. Oldcastle Building Envelope, Santa Monica, CA.
    - e. Vitro Architectural Glass (formerly PPG Glass), Cheswick, PA.
    - f. Viracon Inc., Owatonna, MN.
- B. Pyrolytic Low-Emissivity Coatings (Low-E) will not be considered as equivalent to MSVD coatings.

## 2.3 EXTERIOR GLASS TYPES

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering similar products include the following, or approved equal:
  1. Cardinal IG, Minneapolis MN.
  2. Guardian Industries Corporation, Lewiston PA.
  3. Oldcastle Glass, Atlanta, GA.
  4. PPG Industries Inc, Glass Group, Pittsburgh PA.
  5. Viracon, Owatonna MN.
  6. Rochester Insulated Glass Inc., Manchester NY.
- B. General: For locations of glass types, comply with the following descriptions and refer to Door Schedule, Interior Elevations and Exterior Elevations for additional locations, and as additionally noted on Drawings.
  1. Glass Type A - Insulated "Low-E" glass units:
    - a. Typical all locations except where type B is required.
  2. Glass Type B - Insulated "Low-E" tempered glass units:

- a. Provide at all sidelights within 36 inches of a door opening, and all locations where bottom of glass is less than 18 inches to either finished floor or grade (whichever is less).
3. Glass Type C – 1/4-inch tempered safety glass
- C. Glass Type A: Insulated “Low-E,” clear glass 1 inch thick units:
  1. Components
    - a. Outer layer: 1/4 inch (6 mm) thick heat-strengthened glass with Low-E sputter coating on number 2 surface.
    - b. Inner layer: 1/4 inch (6 mm) thick clear heat-strengthened glass.
    - c. Air space: 1/2 inch (13 mm) thick.
      - 1) Gas fill: 90% Argon/10% Air.
  2. Performance Requirements: Insulated glass units shall meet the following performance characteristics.
    - a. Visible Transmittance: 72 percent
    - b. Solar Heat Gain Coefficient: 0.40
    - c. Solar Blockage: 59%
    - d. Reflectance (interior): 12 percent
    - e. Reflectance (exterior): 11 percent
    - f. U Value (Winter): 0.30
    - g. Fading Transmission UV: 0.16
    - h. Fading Transmission TDW-K: 0.33
    - i. Fading Transmission TDW: 0.55
- D. Glass Type B: Insulated “Low-E,” glass 1 inch thick units with tempered glass:
  1. Components
    - a. Outer layer: 1/4 inch (6 mm) thick clear tempered glass with Low-E sputter coating on number 2 surface.
    - b. Air space: 1/2 inch (13 mm) thick.
      - 1) Gas fill: 90% Argon/10% Air.
    - c. Inner layer: 1/4 inch (6 mm) thick full tempered clear glass.
  2. Performance Requirements: Same as Glass type A.
- E. Glass Type C –Tempered glass, 1/4 inch (6 mm) thick clear full tempered glass.
  1. Provide at interior aluminum entrance doors and frames.
- F. Glass Type D: Insulated “Low-E” glass 1 inch thick units in spandrel units:
  1. Components:
    - a. Outer layer: 1/4 inch (6mm) thick clear heat-strengthened glass with Low-E neutral sputtered triple silver softcoat on number 2 surface.
    - b. Air space: 1/2" inch (13mm) thick.
      - 1) Gas fill: 90% Argon/10% Air.
      - 2) Warm Edge Spacer.
    - c. Inner layer: 1/4 inch (6mm) thick clear heat-strengthened glass.
    - d. Ceramic Frit:

- 1) Basis of Design: OPACI-COAT-300 by ICD Coatings
- 2) Full coat frit on #4 surface.
  - a) Color: #3-8222LI Signal Gray (LI)
2. Performance:
  - a. Solar Heat Gain Coefficient: 0.40
  - b. U Value (Winter): 0.30
- G. Glass Type F – Bullet Resistant Glass: **Glazing shall be UL Listed Level 5 per UL 752, Manufacturer’s proprietary laminated-insulated glass with PVB interlayers, polycarbonate layers as specified under Section 08 43 15 – BULLET RESISTANT ALUMINUM STOREFRONT FRAMING SYSTEM. Refer to Section 08-43-15.**

## 2.4 INTERIOR GLASS TYPES

- A. Glass Type 1 - Tempered safety glass: 1/4 inch thick.
  1. Locate heat-tempered safety glass for all of the following:
    - a. Typical all locations except where Type 3 or 4 is required or unless noted otherwise on the drawings.
    - b. Within 18 inches of walking surfaces and elsewhere as indicated.
    - c. Within 36 inches of a door jambs.
    - d. At all non-rated door and frame assemblies.
- B. Glass Type 2: Nominal 1/4 inch thick laminated glass.
  1. Outer face: 1/8 inch (3 mm) thick heat strengthened clear glass
  2. Interlayer: 0.030 inch thick translucent clear polyvinyl butyl innerlayer
  3. Inner face: 1/8 inch (3 mm) thick heat strengthened clear glass.
- C. Glass Type 3: 8mm-9 mm thick (5/16 inch-3/8 inch) transparent wire-less fire rated ceramic glazing material with polished finish.
  1. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
    - a. Nippon Electric Glass Co., Ltd., “Firelite Plus”.
    - b. Vetrotech Saint-Gobain, “SSG Keralite FR-L”.
    - c. SAFTI First, “Pyran Platinum L”.
  2. For fire rated door assemblies, conform with latest edition of ASTM E152, ASTM E163, NFPA-80, NFPA 252, NFPA 257.
  3. Conforms to ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
  4. Permanently identify each individual glazing unit with a listing mark visible after installation.
  5. In accordance with manufacturer's specifications, glass must be glazed into frames with a similar rating, using silicone glazing compound which shall be supplied with the glazing material.
- D. Glass Type 4: Interior glazing at acoustical walls and sidelights, transoms, and windows at corridors to classrooms. Insulated glass units comprised of:

1. Classroom Side: 1/4 inch thick fully tempered safety glass (Glass type 1).
  2. Air space: 1/2 inch (13 mm) thick.
    - a. Gas fill: 100% Air
  3. Outer Side: Nominal 1/4 inch thick laminated glass (Glass Type 2).
- E. Glass Type 5: Not Used.
- F. Glass Type 6 - Frameless mirror glass, 1/4 inch thick:
1. Size: Provide sizes shown. If not shown, provide continuous one piece mirrors from top of back splash to the underside of ceiling and extending in one piece the full length of the countertop. Extend mirrors wall to wall where countertop is in an alcove.
- G. Glass Type 7 - Glazing shall be UL Listed Level 5 per UL 752, Manufacturer's proprietary laminated glass with PVB interlayers, polycarbonate layers as specified under Section 08 43 15 - BULLET RESISTANT ALUMINUM STOREFRONT FRAMING SYSTEM.**
- ~~G.H.~~ Clear Laminated Glass: Consisting of multiple plies of glass and PVB interlayers
- H.I. Intruder Resistant Glass: Laminated glass units with security strengthened core, 3/8 inch thick or as otherwise scheduled on Drawings equal to LTI Smart Glass, Inc., product "School Guard Glass SG4" or approved equal.
1. Locate where indicated.

## 2.5 FABRICATION

- A. General: Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
- B. Fabricate glass as required to openings with edge clearances and bite on glass as recommended by the manufacturer with clean-cut edges where concealed, and smooth-ground, polished and seamed edges where exposed to view. Do not cut, seam, nip or abrade glass after heat-tempering.
1. For non-tempered to be cut at site, provide glass larger than required so as to obtain clean cut edges without seaming or nipping.
- C. Fabricate glass with the following edge treatments.
1. Exposed edges: Polished-finished radiused (penciled).
  2. Concealed edges: Cut edges with minimum edge work.
  3. Butt-joint edges: Flat round and finished with edges eased.
- D. Shop Fabrication:
1. All vision panels and baffles shall be cut to size by manufacturer or by fabricator prior to delivery to site. All glass edges shall be ground smooth, polished and eased. Provide all necessary holes wherever required by the approved Shop Drawings, drilled and tapped to suite project requirements. Do all cutting and drilling prior to tempering.



## 2.6 ACCESSORIES

- A. Joint Sealer for silicone butt-joint glazing: One-part low modulus, moisture curing, synthetic rubber sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, NS, Class 50, in black or clear color, as selected by Architect:
1. Dow Corning, product "999-A".
  2. GE Silicones, product "SilPruf SCS2000".
  3. Tremco, product "Spectrem 2".
- B. Glazing tape: Preformed butyl-polyisobutylene rubber with 100 percent solids contained in extruded tape roll form and complying with AAMA 804.1; coiled on release paper; of sizes required for proper glazing. equal to one of the following:
1. Protective treatments 3030 or 606.
  2. Tremco Preshimmed 440.
  3. Woodmont Chem-Tape 40.
- C. Setting blocks: Neoprene, 80-90 shore A durometer hardness, certified to be "silicone compatible"; sized as follows:
1. Length: 0.1 inch per square foot of glass, but not less than 4 inches.
  2. Width: equal to glazing rabbet space minus 1/16 inch.
  3. Height to suit glazing method and pane weight and area.
- D. Spacers: Neoprene, 60-80 shore A durometer hardness; sized as required.
- E. Mirror mastic: Asphalt-based adhesive mirror mastic compatible with mirror backing for adhesive application to wall substrate. Provided mastic wall-board sealer as recommended by adhesive manufacturer.
1. Palmer Products Corporation, Louisville, KY., product: "Palmer Mirror Mastic".
  2. Pecora Corporation, Harleysville PA, product "7hr4 Mirror-Tac".
  3. Royal Adhesives and Sealants, South Bend, IL, "Gunther Brand" product "Ultra/Bond Mirror Mastic"
- F. Mirror mounting clips: Chrome plated brass, nickel plated brass, 'Anachrome' brass, or stainless steel J-shape mirror clips designed for 1/4 inch mirrors, minimum 1 inch support width, equal to C.R. Laurence Co., Inc., Los Angeles CA., "Dallas Mirror Clip", model N°. 778B.
- G. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

## 2.7 ACCESSORIES FOR FIRE-RESISTANT GLAZING

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2.5 percent.
- B. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
1. Dow Corning Corporation, Midland MI.; product, "795".

2. General Electric Company (GE Silicones) Waterford NY.; product "Silglaze-II 2800"
  3. Tremco, Beachwood OH.; product, "Spectrem 2".
- C. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION AND PREPARATION**

- A. Inspect receiving surfaces and ensure that they are dry and free from dust, or other foreign materials before glazing. Clean all surfaces with cloth saturated with mineral spirits of high-flash naphtha as recommended by glazing tape manufacturer, before glazing.
- B. Field Measurements: Verify that field measurements are as indicated on approved Shop Drawings.
1. Check all openings, prior to glazing, to make certain that the opening is square, plumb and secure in order that uniform face and edge clearances are maintained.
  2. Determine the actual sizes required by measuring the receiving openings. Size glass and mirrors to permit required clearance and bite around full perimeter of glass, as set forth in the referenced GANA standards, or as recommended by the glass manufacturer. Do not nip edges, to remove flares or to reduce oversize dimensions, under any circumstance.
- C. Beginning of installation means acceptance of existing conditions.

#### **3.2 GENERAL INSTALLATION OF GLASS HAVING PERMANENT LABELS**

- A. Install glass units so that appropriate manufacturer's permanent label for safety glass, and permanent label for fire-rated glass are visible.

#### **3.3 INSTALLATION - DRY GLAZING**

- A. Utilize dry glazing methods for field installation of glass in interior doors and frames.
1. Install in vision panels in fire-rated doors and frames to requirements of NFPA 80.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (2 mm) above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane.
- E. Place glazing tape on free perimeter of glazing in manner as described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

- G. Knife trim protruding tape.

### 3.4 INSTALLATION - WET GLAZING

- A. Utilize wet glazing methods for field installation of glass in exterior curtainwall, storefront and window systems.
- B. Place setting blocks at quarter points on web of sill receiving member. Set glass unit in place with equal spaces on all sides.
- C. Install spacers at a spacing not exceeding 24 inches apart uniformly around perimeter, between interior face of glass unit and the fixed glazing rabbet.
- D. Apply a continuous heel bead of specified sealant between the outer edges of the glass unit and the web of the receiving member, in sufficient quantity to engage the leg of the applied glazing stop, when installed.
- E. As the glazing stop is being applied, install spacers between the outer face of the glass unit and the stop, locating the spacers directly opposite the previously installed interior spacers. Install the glazing stops, ensuring that all clearances around the perimeter of the glass unit conform to the requirements of the respective standards referenced herein.
- F. Apply a continuous bead of sealant around the exterior and interior perimeters, between the glass unit and the fixed rabbet, and between the glass unit and the applied glazing stop, extending the sealant material slightly above the sight line to permit proper tooling thereof.
- G. Tool all exposed sealant at a 45 degree angle away from the glass surface, leaving the sealant surface uniformly dense and smooth.
- H. Immediately remove all excess sealant from surfaces of metal and glass.

### 3.5 PROTECTION

- A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of the glass. Do not apply warning markings directly to the glass.
- B. Protect mirrors from breakage immediately upon installation. Cover mirrors to protect it from activities that might abrade the glass surface.
- C. Cover glass To protect it from activities that might abrade the glass surface.
- D. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- E. Comply with GANA TD-03-1003 "Construction Site Protection of Architectural Glass" and glass manufacturer's recommendations.
- F. Alkaline including ammonia and trisodium phosphate can etch glass.
  - 1. Phosphoric and hydrofluoric acids sometimes used to clean concrete can quickly etch glass and should not come in contact with glass and glazing.

- G. Use only glazing gasket lubricants recommended by gasket manufacturers.
  - 1. Do not use soap and liquid cleaners, which can etch glass, as lubricants.
- H. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- I. Remove and replace glass that is broken, chipped, cracked, or abraded or that is exposed to weld splatter, permanently etched, damaged from natural causes, accidents, and vandalism, during the construction period."

### 3.6 CLEANING

- A. Clean glass surfaces promptly after installation, exercising care to avoid damage to the same. Remove excess glazing tape, labels, dirt, and other contaminants.
- B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.7 SCHEDULE

- A. Safety Glass (fully tempered glass or laminated) glass is required at conditions identified by applicable codes, which include, but are not limited to the following:
  - 1. Glazing in swinging doors except jalousies.
  - 2. Glazing in fixed and sliding panels of sliding patio door assemblies and panels in other doors, including walk-in closets and wardrobes.
  - 3. Glazing in storm doors.
  - 4. Glazing in unframed swinging doors.
  - 5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers.
  - 6. Glazing in any portion of a building wall enclosing these above compartments where the exposed edge of the glazing is less than 60 inches above a standing surface.
  - 7. Glazing in an individual fixed or operable panel adjacent to a door where the nearest exposed edge of the glazing is within a 24-inch arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches above a walking surface. (panels where there is an intervening wall or other permanent barrier between the door and the glazing are exempt.)
  - 8. Glazing in an individual fixed or operable panel where the exposed area of an individual pane is greater than 9 square feet and the exposed bottom edge is less than 18 inches above the floor, the exposed top edge is greater than 36 inches above the floor, and one or more walking surface(s) are within 36 inches horizontally of the plane of the glazing. Exceptions include a panel with a protective bar (1-1/2 inches or more in height and capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass installed on the accessible sides of the glazing 34 inches to 38 inches above the floor), and an outboard pane in insulating glass units or multiple glazing where the bottom exposed edge of the glass is 25 feet or more above any

grade, roof, walking surface of other horizontal or sloped surface adjacent to the glass interior.

9. Glazing in guards and railings, including structural baluster panels and nonstructural in-fill panels, regardless of height above a walking surface.
10. Glazing in walls and fences enclosing indoor and outdoor swimming pools and spas when the bottom edge of the glazing on the pool side is less than 60 inches above a walking surface on the pool side of the glazing and the glazing is within 60 inches horizontally of a water's edge.
11. Glazing adjacent to stairways, landings and ramps when it is within 36 inches horizontally of a walking surface, within 60 inches horizontally of a bottom tread of a stairway in any direction, and the bottom edge is less than 60 inches above the plane of the adjacent walking surface (or stairway, measured from the nose of the tread).

### 3.8 PROJECT CLOSE-OUT

- A. Repair and Replacement: Repair or remove and replace work that does not conform to specified requirements. Repairs made in one area shall be incorporated into all other similar areas as applicable.
- B. Site Modifications: Finished work that contains unauthorized site modifications, or work not in accordance with the approved shop drawings, or submittals specified herein, may require additional modification in the field, or removal and replacement at no additional cost to the Owner. Any additional calculations and testing required for approval by the Architect shall also be provided at no additional cost to the owner.
- C. Acceptance of the completed installation of the exterior wall system requires that the installation be structurally sound, weather tight, and free from defects of materials and workmanship."

End of Section

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